



**KIRBY MISPERTON A WELLSITE**

**KM8 PRODUCTION WELL**




**HYDRAULIC FRACTURE STIMULATION**

**ENVIRONMENTAL MONITORING PLAN**

**(REF: TE-EPRA-KM8-HFS-EMP-10)**



**APPROVAL LIST**

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## 1 DEFINITIONS

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<b>ATD:</b>	Automated Thermal Desorption
<b>BTEX:</b>	An acronym that stands for benzene, toluene, ethylbenzene, and xylenes.
<b>DECC:</b>	Department of Energy and Climate Change
<b>EC:</b>	Electro Conductivity;
<b>EMP:</b>	Emissions Monitoring Plan
<b>H2S:</b>	Hydrogen Sulphide
<b>Km:</b>	Kilometre
<b>KMA:</b>	Kirby Misperton A wellsite
<b>KM8:</b>	Kirby Misperton 8 well
<b>LA90,1hr:</b>	Noise level exceeded for 90% of the measurement period
<b>M:</b>	Magnitude
<b>m/s:</b>	Meters per second
<b>NMP:</b>	Noise Management Plan
<b>ORP:</b>	Oxidation Reduction Potential
<b>PM10:</b>	Particulate Matter up to 10 micrometers in size
<b>ppm:</b>	Parts per million
<b>SEM-EDS:</b>	Scanning Electron Microscopy combined with Energy Dispersive X-Ray Analysis
<b>TDS:</b>	Total Dissolved Solids
<b>VOC:</b>	Volatile Organic Compounds

## 2 INTRODUCTION

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Third Energy UK Gas Limited (Third Energy) is the operator of gas fields within the Ryedale area and, at the time of submitting this application, holds interests in a total of six (6) Petroleum Licences and one (1) Petroleum Appraisal Licence, granted by the Secretary of State at the Department of Energy and Climate Change (DECC). Under the Petroleum Licensing system this permits the licence holder to *'search, bore and get petroleum within the licence boundary'* subject to the granting of planning permission, in accordance with the Town and County Planning Act 1990.

Many of the Ryedale gas fields were originally discovered by Taylor Woodrow Exploration Limited and subsequently developed by Kelt UK Limited. Kelt sold its interest in the Ryedale Gas Fields to Tullow Oil and Edinburgh Oil and Gas. Tullow Oil went on to acquire the interest held by Edinburgh Oil and Gas. The Applicant acquired the interests of the Ryedale Gas Fields from Tullow in 2003 and has subsequently undertaken an active drilling and workover programme to enhance production of gas from the gas fields located at Kirby Misperton, Pickering, Marishes and Malton. Third Energy Holdings Limited acquired Viking UK Gas in 2011 and has since continued to enhance gas production. In 2014 Viking UK Gas underwent a change of name to Third Energy UK Gas Limited.

Third Energy also holds a number of exploration licences and has previously constructed and drilled wells at Ebberston Moor, within the North York Moors National Park.

In 2013 Third Energy drilled the first of two permitted boreholes from the Kirby Misperton 1 extension, KM8. Third Energy is now proposing to hydraulically stimulate and test the various geological formations previously identified during the 2013 KM8 drilling operation and subsequent analysis of the data, followed by the production of gas from one or more of these formations into the existing production facilities.

The development will consist of five principal phases:

1. Pre-Stimulation Workover
2. Hydraulic Fracture Stimulation/Well Test
3. Production Test
4. Production
5. Site Restoration

During the proposed development a scheme of environmental monitoring will be undertaken. The purpose of this document is set out the monitoring arrangement, drawing together the schemes of monitoring provided by the third party consultants and Third Energy.

Proposed environmental monitoring includes:

- Air Quality;
- Groundwater & Surface Water Quality;
- Seismic Monitoring; and
- Noise.

### 3 SCOPE

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This document has been produced to provide information relating to emissions monitoring to be undertaken at the Kirby Misperton A wellsite (KMA). This document has been produced to meet the requirements of Pre-Operational Measure 3 (PO3) within Environmental Permit EPR/DB3002HE where there is a requirement to submit and Emissions Monitoring Plan to the Environment Agency under the Environmental Permitting (England and Wales) Regulations 2016, (EPR 2016).

This Emissions Monitoring Plan is applicable to the proposed KM8 hydraulic fracturing operation to be undertaken within Kirby Misperton A wellsite, subject to obtaining all relevant planning and environmental permits. It is applicable to Third Energy UK Gas Limited, its contractors and subcontractors and can be used in support of applications to the Environment Agency under EPR 2016.

## 4 EMISSIONS MONITORING PLAN

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The Emissions Monitoring Plan sets out the emissions that will be monitored prior to, during and, where relevant, after the proposed KM8 hydraulic fracturing operation.

Third Energy has appointed a number of contractors to undertake emissions monitoring at the KMA wellsite, emissions to be monitored include:

- Air Quality Monitoring:
- Groundwater Monitoring:
- Noise Monitoring:

A summary of the methodology, frequency, duration and reporting of each emission being monitored is provided within Section 5 of this Emissions Monitoring Plan, with full details provided within Appendix 1 to 3.

The management of emissions monitoring associated with the KM8 hydraulic fracturing operation will be coordinated by a person appointed by Third Energy, in accordance with this Emissions Monitoring Plan. The appointed person(s) shall have the necessary competence to coordinate and supervise and document the emissions monitoring. The appointed person will coordinate access to the KMA wellsite and/or offsite monitoring locations.

All providers of environmental monitoring shall be appointed in accordance with TE-HSEMS-GD02-Contractor Selection and Management document.

Emissions monitoring results will be maintained at the Knapton Generating Station and made available for inspection upon request by the relevant Regulator.

## 5 EMISSIONS MONITORING

### 5.1 Air Quality Monitoring

Third Energy has appointed Ground-Gas Solutions Limited (GGS) to conduct air quality monitoring at the KMA wellsite as part of the hydraulic fracturing stimulation operation. Full details of the KMA air quality monitoring has been provided within Appendix 1 of this Emission Monitoring Plan.

Air emissions generated within the KMA wellsite will be restricted to routine onsite operations such as exhaust systems from vehicles generators and lighting towers and any associated equipment involved within the hydraulic fracture stimulation operations. In addition, air quality monitoring will identify any abnormalities in the unlikely event of fugitive emissions.

Table 5.1 below outlines the substances to be monitored as part of the air quality monitoring programme.

Parameters	Monitoring Frequency	Required By
Methane (CH <sub>4</sub> )	Continuously (ten (10) minute sampling), & periodic spot monitoring	Environment Agency / NYCC
Carbon Dioxide (CO <sub>2</sub> )	Continuously (ten (10) minute sampling), & periodic spot monitoring	Environment Agency
Carbon Monoxide (CO)	Continuously (ten (10) minute sampling), & periodic spot monitoring	NYCC – Planning Condition 25
Oxygen (O <sub>2</sub> )	Continuously (ten (10) minute sampling), & periodic spot monitoring	NYCC – Planning Condition 25
TSP, PM <sub>10</sub> , PM <sub>2.5</sub> , PM <sub>1.0</sub>	Continuously (ten (10) minute sampling)	Environment Agency
Dust	2 weekly passive DustScan sampling	Environment Agency
BTEX	2 weekly passive sampling (TWA)	Environment Agency
Top 10 VOC	2 weekly passive sampling (TWA)	Environment Agency
Nitrogen dioxide (NO <sub>2</sub> )	Continuously & 2 weekly passive sampling (TWA)	Environment Agency
Nitric Oxide (NO)	Continuously & 2 weekly passive sampling (TWA)	Environment Agency
Hydrogen Sulphide (H <sub>2</sub> S)	2 weekly passively (TWA)	NYCC – Planning Condition 25
Ozone (O <sub>3</sub> )	Continuously & 2 weekly (TWA)	--

Table 5.1: Air Quality Monitoring Substance Table

The Ambient Air Quality Monitoring Plan is designed to address both the Environment Agency's permit (reference: Decision Document EPR/DB3002HE) and North Yorkshire County Council planning permission conditions (reference: Decision Notice C3/15/00971/CPO). The plan includes the monitoring of the parameters listed in Table 1 together with the proposed frequency of monitoring.



### 5.1.1 Baseline

A number of air quality samples have already been taken at the KMA wellsite prior to KM8 hydraulic fracturing stimulation operation taking place. Initial baseline data was undertaken between February and April 2015 to inform Third Energy of Baseline conditions and provide a benchmark for future results collected during the hydraulic fracture stimulation operation to ascertain if Third Energy's operations have any significant effect on air quality.

In addition to baseline sampling conducted in 2015, the British Geological Survey (BGS) has undertaken air emissions monitoring at the KMA wellsite from January 2016 which is still currently being undertaken at the KMA wellsite to date. The results of the BGS data has been made publicly available and will be used together with the initial sampling undertaken in 2015 to establish a strongly representative baseline. For clarity the BGS air quality monitoring will continue to be undertaken KM8 hydraulic fracture stimulation operation.

Further baseline monitoring has also been proposed two (2) weeks prior to the KM8 hydraulic fracture stimulation operation to ascertain a more recent. Two weeks is considered suitable due to the previous baseline data having already been established. This baseline data will again be used to inform and establish the overall baseline conditions at the wellsite.

For clarity Sulphur Hexafluoride will no longer be monitored at the KMA wellsite, due to the levels being insignificant. The Environment Agency are satisfied with this approach as laid out within the Environmental Permit EPR/DB3002HE decision document.

### 5.1.2 Active Site Monitoring

Ambient air monitoring will be undertaken throughout the duration of site operations with particular attention given to spot monitoring during key site operations including well stimulation. Ambient air monitoring will then continue and for four weeks after the site operations have ceased and the hydraulic fracturing plant and machinery has been removed from the site.

GGs will attend the site at two weekly intervals for the duration of the ambient air monitoring plan to collect time averaged samples for laboratory analysis and to maintain the continuous monitoring equipment.

For Clarity the KMA wellsite will not involve the incineration of natural gas or any other substance and no flare unit or incinerator will be present on the KMA wellsite.

### 5.1.3 Methodology

A GGS engineer will attend the KMA wellsite prior to the workover operations taking place. A total of four (4) tripod stands shall be placed around the KMA wellsite. The location for each stand can be found within the KMA Air Quality Monitoring Plan provided as Appendix 1 of this Environmental Monitoring Plan. The locations of each stand have been decided based on the prevailing wind, the elevation of the site, and the sources of emission. Each stand will incorporate a plastic container which will house the required diffusion tubes for each parameter. GGS will locate DustScan passive samplers at all four monitoring locations.

**Methane**

GGs will continuously monitor methane at the Monitoring Locations 1A and 1B using a transportable tuneable diode laser (TDL 500) linked to a telemetry enabled Gas Sentinel data logger to provide continuous (10-minute moving average sampling) of ambient air methane concentrations. Where the moving average value exceeds a threshold of 5 ppmv, the sampling logging rate will be increased to 1hz. The limit of detection (LoD) for the TDL 500 is 1 ppmv with a detection range of 0-10,000 ppmv.

Ten (10) minute duration, spot monitoring, using a hand held TDL 500 will be carried out every two weeks at the four locations. In addition, further ten-minute duration spot monitoring will be carried out during key operations, including well stimulation operations. These locations will be variable and will be chosen on the day by the wind speed and direction to ensure that maximum concentrations of any gas plume is recorded.

In addition, as part of the operator's safe method of working, all surface pipework will be checked for leaks prior to and during operations using an intrinsically safe TDL 500.

**Carbon Dioxide**

GGs will continuously monitor carbon dioxide at Monitoring Locations 1A & 1B using a transportable Gas Sentinel, a multi-gas monitoring device with data logger to provide continuous (ten (10) minute sampling) of ambient air carbon dioxide concentrations. The CO<sub>2</sub> sensor has a resolution of 10 ppm and an accuracy  $\pm 10\%$  of the reading. In addition, spot monitoring, using a hand held GFM 100 series, will be carried out by GGS every two weeks at all four locations. The limit of detection of the GFM 100 series for carbon dioxide is 100 ppm.

**Carbon Monoxide**

GGs will continuously monitor carbon monoxide at Monitoring Locations 1A & 1B using a transportable Gas Sentinel, a multi-gas monitoring device with data logger to provide continuous (ten (10) minute sampling) of ambient air carbon monoxide concentrations. The CO sensor has a limit of detection and resolution of 1 ppm and an accuracy  $\pm 10\%$  of the reading. In addition, spot monitoring, using a hand held GFM 400 series, will be carried out by GGS every two weeks at all four monitoring locations. The limit of detection of the GFM 400 series for carbon monoxide is 100 ppm.

**Oxygen**

GGs will continuously monitor oxygen at Monitoring Locations 1A & 1B using a transportable Gas Sentinel, a multi-gas monitoring device with data logger to provide continuous (ten (10) minute sampling) of ambient air oxygen concentrations. The O<sub>2</sub> sensor has a limit of detection and resolution of 0.1%v/v and an accuracy  $\pm 10\%$  of the reading. In addition, spot monitoring, using a hand held GFM 400 series, will be carried out by GGS every two weeks at all four locations. The limit of detection of the GFM 400 series for oxygen is 0.5%.

**Total Solid Particulates - PM<sub>10</sub>, PM<sub>2.5</sub>, PM<sub>1.0</sub> & Dust**

GGs will continuously monitor particulates at Monitoring Locations 1A & 1B using a transportable Turnkey Osiris with measurements taken every ten (10) minutes. This instrument has been issued with the Environment Agency's MCERTS certification and has a resolution to 0.01  $\mu\text{g m}^{-3}$  and a measurement range of 0 to 6,000  $\mu\text{g m}^{-3}$ .

In addition, GGS will locate DustScan passive samplers at all four monitoring locations. The DS100-D combines the DS100 sticky pad directional dust gauge with the DD100 DustDisc settlement gauge. The directional gauge samples fugitive dust in flux from 360° around the sampling head to determine the direction/s from which dust has arisen. The passive settlement gauge samples dust depositing out of the air. The collected dust is measured in terms of AAC and EAC % (established annoyance/nuisance criteria) as an average for the monitoring period. If subsequently required, the collected dust can be characterised in respect of its mass, particle size and chemistry.

### **BTEX**

GGS will passively sample BTEX using Tenax sorbent tubes located at the four monitoring stations. These tubes will be collected every two weeks and taken to a UKAS accredited laboratory for analysis by thermal desorption and analysis by GC/FID or GC/MS to give a time weighted average. The limit of detection for this technique is variable and depends on the compounds that are present.

### **Top 10 VOCs**

GGS will passively sample for the Top 10 VOCs using Tenax sorbent tubes located at the four monitoring stations. These tubes will be collected every two weeks and taken to a UKAS accredited laboratory for thermal desorption and analysis by GC/FID or GC/MS to give a time weighted average. The limit of detection for this technique is variable and depends on the compounds that are present. For clarity Top 10 VOCs by definition means the 10 VOCs which have the highest concentration within the samples.

### **Nitrogen Dioxide**

GGS will continuously monitor nitrogen dioxide at the monitoring stations Locations 1A & 1B using a semi-permanent AQMesh with measurements taken every ten (10) minutes to provide trends through time. This instrument has a limit of detection of <10 ppb for nitrogen dioxide and a monitoring range of 0-4,000 ppb.

Passive sampling for nitrogen dioxide will also be undertaken using diffusion tubes at all four locations. These will be exposed at the monitoring station and replaced approximately every 2 weeks before being taken to a UKAS accredited laboratory for analysis to give a time weighted average. The limit of detection for this technique is variable but will be circa 0.7 µg/m<sup>3</sup>.

### **Nitric Oxide**

GGS will continuously monitor nitric oxide at the monitoring station Locations 1A & 1B using a semi-permanent AQMesh with measurements taken ten (10) minutes. This instrument has a limit of detection of <5 ppb for nitric oxide and a monitoring range of 0-4,000 ppb.

Passive sampling for nitric oxide will also be undertaken using diffusion tubes. These will be exposed at all four monitoring stations and replaced approximately every 2 weeks before being taken to a UKAS accredited laboratory for analysis to give a time weighted average. The limit of detection for this technique is variable but will be circa 2.2 µg/m<sup>3</sup>.

### **Hydrogen Sulphide**

GGS will monitor hydrogen sulphide by installing passive absorbent tubes at all four monitoring stations. These tubes will be collected every two weeks and taken to a UKAS accredited laboratory for

analysis by UV/Visible Spectrophotometry to give a time weighted average. The limit of detection for this technique is circa  $0.2 \mu\text{gm}^{-3}$ .

### **Ozone**

GGs will continuously monitor ozone at the monitoring stations Locations 1A & 1B using a semi-permanent AQMesh with measurements taken ten (10) minutes. This instrument has a limit of detection of <5 ppb for ozone and a monitoring range of 0-1,8000 ppb.

Passive sampling for ozone will also be undertaken using diffusion tubes. These will be exposed at all four monitoring stations and replaced approximately every 2 weeks before being submitted to a UKAS accredited laboratory for analysis to give a time weighted average. The limit of detection for this technique is variable but will be circa  $1.0 \mu\text{g}/\text{m}^3$ .

#### **5.1.4 Reporting**

Once the baseline monitoring has been carried out, the results of the continuous monitoring, spot monitoring and laboratory analyses will be reported to the Environment Agency and North Yorkshire County Planning Authority within 28 days from date of the last samples being collected from site.

During the on-site operations, regular bi-weekly reports, containing the results of the continuous monitoring, spot monitoring and available laboratory analyses will be submitted to the Environment Agency and North Yorkshire County Planning Authority. The last monitoring results will be submitted within 28 days from date of the last samples being collected.

In addition, with specific reference to methane concentrations, if threshold concentrations, as determined from baseline monitoring carried out prior to well stimulation operations and as agreed with the Environment Agency, are exceeded then the source of the exceedance will be identified and the Environment Agency will be informed within 24 hours of the occurrence.

All monitoring equipment referenced in the submitted reports will be accompanied by valid calibration certificates supplied by the equipment supplier, together with records of GGS calibration testing carried out in line with the company's internal quality assurance procedures.

## 5.2 Groundwater Quality Monitoring

Due to the way Third Energy constructs its wellsites and subsequent well, the risk to groundwater from both surface operations and well operations are not significant as identified within the Environmental Risk Assessment, submitted as part of the permit application. Although fluids will remain within the formation the likelihood of them coming into contact with groundwater is minimal due to the formation being tight. Third Energy has appointed Envireau Water to undertake groundwater monitoring to ensure that groundwater quality does not deteriorate both during and after the operations.

### 5.2.1 Baseline

A baseline groundwater quality for the KMA wellsite has been established in advance of the KM8 hydraulic fracturing operation commencing. Baseline monitoring has been undertaken at nine (9) offsite locations. The nine (9) locations comprised of six (6) established groundwater boreholes in addition to three (3) surface water features. Five (5) purpose built onsite groundwater monitoring boreholes have also been monitored to provide baseline conditions. For Clarity Sugar Hill Drain has two (2) samples taken for both upstream and downstream analysis.

Third Energy has collected an additional three months of baseline water quality data from a range of surface water and groundwater features at and close to the KMA Wellsite. Monitoring has been carried out in accordance with the requirements of the permit and the deviation that was agreed with the Environment Agency.

### 5.2.2 Active Site Monitoring

During the KM8 hydraulic fracture stimulation operation a scheme of groundwater monitoring shall be implemented. This will be undertaken at the same monitoring locations as those used to establish the baseline.

Monitoring shall continue until it has been deemed sufficient by Envireau Water and in agreement with the Environment Agency.

### 5.2.3 Methodology

Water samples have been collected from the various surface water and groundwater features with reference to relevant parts of BS ISO 5667 (Water Quality Sampling). The sampling techniques are described in a separate sampling protocol that has been prepared by Envireau Water and adopted as a Third Energy operational technique which has also been included within Appendix 2 of this Emissions Monitoring Plan.

#### Surface Water Sampling

Surface water samples are collected using a telescopic sampling pole. The beaker at the head of the sampling pole is detached and cleaned using sanitising wipes or fluids. The beaker is then rinsed with distilled water and reattached to the pole.

The sample pole is extended to the required length and used to retrieve a water sample and where possible, samples are collected away from the bank. In the case of rivers/streams, samples are

collected where water can be observed to flow; ideally midstream. Water samples are not collected when there is insufficient depth of water to submerge the beaker.

Sufficient sample is obtained to fill the required sample containers. A sample of water is collected and used for field chemistry analysis using an In-Situ Smartroll multi parameter device, and field measurements recorded. Field measurements include:

- Date / Time;
- Weather Conditions;
- General Observations;
- Water Levels;
- Water Appearance;
- Water Chemistry Parameters including;
  - Water Temperature;
  - pH;
  - Electrical Conductivity; and
  - Redox Potential;

### **Offsite Groundwater Sampling**

The construction of the offsite boreholes is variable. The following sampling methods are therefore employed:

Where boreholes contain pumps or are artesian, water samples are collected using existing pumping equipment and sample taps within the distribution network. Sample taps are cleaned using sanitising wipes or fluids (where practicably possible) and water purged for at least five minutes before water samples are collected.

Where boreholes do not contain pumps, water samples are collected using disposable single valve bailers lowered into the borehole on Kevlar rope or (in the case of some very shallow supplies) a telescopic sampling pole.

A sample of water is used for field chemistry analysis using an In-Situ Smartroll multi parameter device, and field measurements, consistent with those for surface water sampling, are recorded. Excess water is discharged to surface.

### **Onsite Groundwater Sampling**

A number of methods are used to obtain groundwater samples. The KMA wellsite monitoring boreholes have had low volume pneumatic bladder pumps installed. The pumps are suspended from specially designed well plugs that form a seal at the top of the borehole casing and incorporate a gas sampling valve that connects to portable gas detection equipment.

The well plug is removed from the borehole, allowing access to an airline and water discharge line connected to the bladder pump inside the borehole. Groundwater levels are measured using a hand held dip meter and recorded, together with the date and time the dip measurement is taken. The probe of the dip tape is cleaned prior to dipping each borehole, using sanitising wipes or fluids.



The compressor is connected to the airline of the bladder pump. A dedicated water discharge line is used at surface to avoid cross-contamination when sampling. Water collecting in the bucket is emptied into the drainage system at the wellsite. A calibrated Smartroll multi parameter device is then installed and connected to an Android device to measure and record field chemistry data.

The compressor is switched on and water is then purged from the borehole at a rate less than ~1 litre/minute. The pressure settings on the compressor can be adjusted to achieve the required flow rate. Water chemistry is monitored and recorded through Vu-situ software, which includes a 'stability test' to determine the stability of the water passing through the through cell. Once all the parameters stabilise, purging continues for a minimum of three logging intervals before water samples are collected. This generally takes in the region of 30 - 45 minutes per borehole. Water sample containers are then filled.

#### **5.2.4 Analysis and Reporting**

The details on each sample label are checked to ensure they have the correct details including Sample ID, location, date and time.

Samples are packaged in a cool box with appropriate protection to prevent damage and then couriered to the laboratory within 24hours of sample collection. A chain of custody is completed and included within the consignment.

Sample analysis results are reviewed for consistency and compared to blank and duplicate samples. Anomalies are checked with the laboratory to determine if re-analysis of samples is required. Sample analysis results are tabulated, graphed and are reported as per the requirement of the environmental permit.

### 5.3 Noise Monitoring

Third Energy has appointed Castle Group to undertake noise monitoring at local receptors as identified within the Noise Management and Monitoring Plan. This will be undertaken throughout several stages of the proposed development.

#### 5.3.1 Baseline

A baseline noise assessment has been undertaken to determine the background noise levels at the nearest sensitive receptors to the KMA wellsite. From the baseline assessment, a quantitative prediction of noise levels at the nearest sensitive receptors is made for each phase of the operation, which is presented in the form of a Noise Impact Assessment, submitted in support of the planning application. The results of the Noise Impact Assessment show that once mitigation measures have been applied the residual impact of noise will be neutral.

A scheme of noise monitoring will be undertaken during the KM8 hydraulic fracturing stimulation operation to monitor compliance, both with the Noise Impact Assessment and any conditions imposed on the operation through planning condition. Results of the noise monitoring during the operation will be made available for inspection by the Environment Agency at its request.

#### 5.3.2 Active Onsite Monitoring

No onsite monitoring will take place at the KMA wellsite.

Offsite noise monitoring will take place throughout various phases of the hydraulic fracture stimulation operation, the monitoring is described below and a Noise Management and Monitoring Plan can be found as Appendix 3 of this Emissions Monitoring Plan.

#### 5.3.3 Methodology

Noise monitoring will take place as a precautionary approach and will be undertaken at two (2) locations, they are:

- Kirby O Carr farm located south of the wellsite: and
- 5 Shire Grove 820m north east of the wellsite

Kirby O Carr is approximately 210m south of the wellsite and the measurement position is in the front garden of the bungalow, and does not benefit from screening by the temporary noise barrier, as it is opposite the gap within the barrier where access to the wellsite exists.

Shire Grove is approximately 820m northeast from the wellsite and represents a large number of properties within the Kirby Misperton village. It is in a position where complaints have been received in the past. The locations of each monitoring location can be found within Appendix 3 of this Emissions Monitoring Plan.

Monitoring will be carried out simultaneously using unattended logging equipment at the locations described above. The logging equipment is capable of remote checking and downloading of data (subject to mobile phone signal). This will monitor LA10,1hr, LA90,1hr and LAeq,1hr continuously day, evening and night, for the initial period of each phase until the levels are shown to be stable. A wind monitoring station will be located at Kirby O Carr to establish wind direction so this can be compared with noise data.

A second noise monitor and microphone will record a 10s sample sound file every 30-60 minutes at both locations. Where levels are high, then the noise specialist will visit site and these sound recording samples (very large data files) will be downloaded by removing data storage cards from meters and transferring to a portable pc for analysis and listening.

During this visit, the noise specialist will undertake a brief survey of noise of equipment on the site and report these values along with comments to the Site Manager.

#### 5.3.4 Duration and Frequency

Development Phase	Time When Monitored
Pre-stimulation Workover	Unmanned monitoring day and night
HF and Well Testing	Unmanned monitoring day and night
Normal Production	Attend measurement on site and extrapolation in noise model, day only
Restoration	Unmanned monitoring day only

#### 5.3.5 Reporting

Formal reports will be issued on completion of each of the three phases during which noise is planned to be monitored. These will give all the results from the noise monitors, including post processing to extract the levels during the day, evening and night, discounting data where the wind velocities are in excess of 5m/s and also if appropriate considering results grouped by wind direction. In addition, a short sample of 10s large sized sound files will be available for listening.

Reporting the results of inspections, reviews and monitoring is a key element in the NMP, and provides Stakeholders or the EA with information against which to determine compliance with permit terms and conditions.

#### 5.3.6 Changes to the Noise Monitoring Plan

If any change is required as a result of:

- Inability to reach or install equipment at the permitted location; or
- Any technical reason outside the control of Third Energy,

then Third Energy will submit a revision of the noise monitoring plan to the relevant regulatory bodies for approval.

## 5.4 Seismic Monitoring

Operators who intend to carry out hydraulic fracture stimulation operations are required to submit for approval a Hydraulic Fracture Plan (HFP) to the Oil & Gas Authority (OGA) and the Environment Agency (EA).

The Oil & Gas Authority will approve the HFP if it is deemed acceptable following consultation with both the Health and Safety Executive (HSE) and the Environment Agency (EA).

Table S1.3 of Environmental Permit EPR/DB3002HE places a requirement on Third Energy to submit a written Hydraulic Fracture Plan and obtain written approval by the EA.

Both OGA and EA must approve the HFP before hydraulic fracturing can take place.

Full details of seismic monitoring has been provided within the HFP which when approved by the EA will form a part of this emissions monitoring plan.

## 6 ADDITIONAL MONITORING

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### 6.1 Gas Detection

All personnel present within the KMA wellsite will be required to wear a personal gas monitor for the purpose of detecting H<sub>2</sub>S. The gas monitors shall be provided by either a third party contractor or by Third Energy. Personal gas monitors shall be recalibrated daily and maintained in accordance with manufacturer's instructions.

In addition to personal gas monitors several Tetra 3 gas detection monitors shall be onsite which will monitor;

- Methane
- Hydrogen Sulphide
- Oxygen
- Carbon Monoxide

Area gas detection units shall be used on the KMA wellsite for monitoring purposes. All gas monitoring devices can be used to identify any leakages within the site layout.

### 6.2 Soil Analysis

As part of the wellsite construction a geotechnical evaluation was undertaken which included a chemical analysis of the underlying soils at the site, the report is held by Third Energy and will be used as a reference upon the restoration of the site to restore the land to its former condition. Site restoration however is not included within the permit application and would be subject to a separate application.

## 7 MANAGEMENT OF MONITORING

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Person(s) with the responsibility of ensuring all monitoring is undertaken and requirements are met shall be appointed by Third Energy. The appointed person(s) will be selected based on the responsibility required for the scope of monitoring works and the competency of the person(s).

Although the appointed person(s) will not be undertaking the monitoring themselves, they will be responsible for the management and supervision of all service contractors who have been selected by Third Energy to undertake environmental monitoring.

The approved contractor shall liaise with the Third Energy appointed person(s) to gain access and egress from the site, discuss potential issues or concerns in relation to environmental monitoring, and the production and delivery of reports for each sample collected together with a conclusion of the results.



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## APPENDIX 1 – AIR QUALITY MONITORING PLAN

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# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well

## **GGS**

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Experts in Continuous Monitoring

## **Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.**



**Prepared for:**

**Third Energy UK Gas Ltd.**

For: Third Energy UK Gas Ltd.

Ref No.: GGS1197 Ambient Air Quality Monitoring Plan

Date: 19/09/2017

Page 1 of 25






Experts in Continuous Monitoring

# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## Document Control Page

<b>Client</b>	Third Energy UK Gas Ltd. Knapton Generating Station, East Knapton, Malton, North Yorkshire, YO17 8JF
<b>Document Title</b>	Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.
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<b>Project Revision</b>	Fifth Issue – Second Revision
<b>Revision Detail</b>	Revised monitoring plan for four monitoring locations and details of additional monitoring.
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**GGs is the trading name of Ground-Gas Solutions Limited**

# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

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# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## 1 Introduction

Third Energy has appointed GGS to conduct ambient air quality monitoring at the KMA wellsite before, during and after the hydraulic fracturing stimulation operations. Air emissions generated within the KMA wellsite will be restricted to routine onsite operations such as exhaust systems from vehicles, generators and lighting towers and any associated equipment involved with hydraulic fracture stimulation. In addition, the ambient air quality monitoring will identify any abnormalities due to fugitive emissions.

Ambient air quality monitoring undertaken before hydraulic fracturing stimulation operations commence will establish a baseline condition at the KMA wellsite. This will allow Third Energy to benchmark future results collected during the hydraulic fracturing stimulation operations, to determine whether Third Energy's operations have any significant effect on air quality.

Parameters	Monitoring Frequency	Required By
Methane (CH <sub>4</sub> )	Continuously (10 minute sampling), & periodic spot monitoring	Environment Agency / NYCC
Carbon Dioxide (CO <sub>2</sub> )	Continuously (10 minute sampling), & periodic spot monitoring	Environment Agency
Carbon Monoxide (CO)	Continuously (10 minute sampling), & periodic spot monitoring	NYCC – Planning Condition 25
Oxygen (O <sub>2</sub> )	Continuously (10 minute sampling), & periodic spot monitoring	NYCC – Planning Condition 25
TSP, PM10, PM2.5, PM 1.0	Continuously (10 minute sampling)	Environment Agency
Dust	2 weekly passive DustScan sampling	Environment Agency
BTEX	2 weekly passive sampling (TWA)	Environment Agency
Top 10 VOC	2 weekly passive sampling (TWA)	Environment Agency
Nitrogen dioxide (NO <sub>2</sub> )	Continuously & 2 weekly passive sampling (TWA)	Environment Agency
Nitric Oxide (NO)	Continuously & 2 weekly passive sampling (TWA)	Environment Agency
Hydrogen Sulphide (H <sub>2</sub> S)	2 weekly passively (TWA)	NYCC – Planning Condition 25
Ozone (O <sub>3</sub> )	Continuously & 2 weekly (TWA)	--

**Table 1.** Required Ambient Air Quality Parameters.

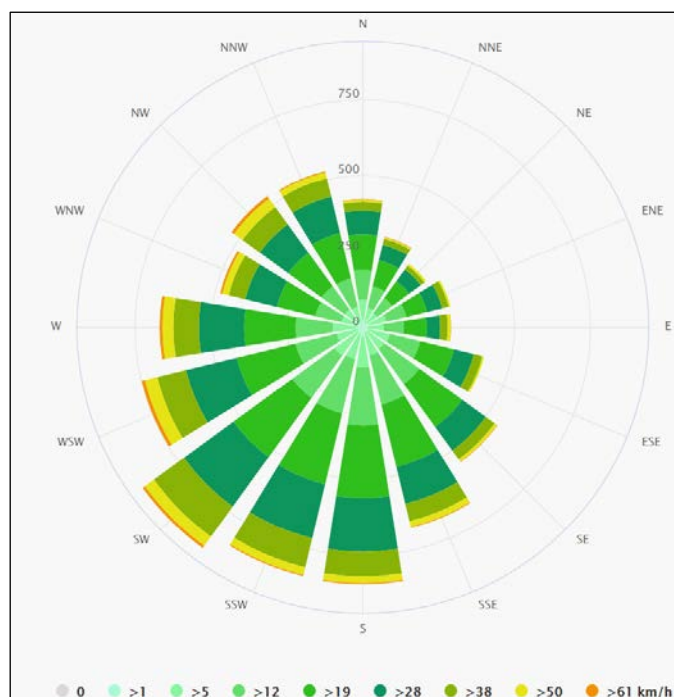
## Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

The Ambient Air Quality Monitoring Plan is designed to address both the Environment Agency's permit (reference: Decision Document EPR/DB3002HE) and North Yorkshire County Council planning permission conditions (reference: Decision Notice C3/15/00971/CPO). The plan includes the monitoring of the parameters listed in Table 1 together with the proposed frequency of monitoring.

# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## 2 Ambient Air Quality Monitoring

The nearest Met Office weather station to the site is at Fylingdales, approximately 25 kms to the North East of the site. The windrose of average hours per year wind blows from the indicated direction at Fylingdales, based on the last thirty years, is shown in Figure 1.



**Figure 1:** Windrose of average annual wind direction for Fylingdales Met Office Weather Station.

This shows that the prevailing wind at the site is from the South West. Therefore, the main ambient air quality monitoring station will be established immediately down wind of the KM8 Production Well, i.e. to the North East of the well (Locations 1A & 1B) as indicated in Figure 2.

### 2.1 Baseline Monitoring

Initial baseline sampling was undertaken in 2015 to inform the permit application and it is considered that this data is still suitable for use when establishing baseline conditions. In addition, significant baseline data has been, and is still currently, being undertaken at the KMA wellsite by the British Geological Survey, which again will feed into Third Energy's acquisition of baseline data.

GGs will carry out further two weeks of baseline air quality monitoring at the KMA wellsite to inform the overall baseline condition with data acquired immediately prior to activities taking place at the KMA wellsite, namely the management of extractive waste as presented within Table S1.1 as activity A1 of the environmental permit. For clarity, the management of extractive waste does not commence until the extraction process of the mining waste begins. i.e. the bringing of waste streams to surface.

# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

To summarise, 4 sets of data will be used to establish the overall air quality baseline level at the KMA wellsite, this includes:

- Initial data obtained using spot sampling and diffusion tubes from Feb/March 2015;
- Additional data using spot sampling and diffusion tubes collected 2 weeks prior to the commencement of mining waste activities (Locations 1A, 2, 3 and 4);
- Continuous data obtained from BGS; and
- Additional continuous data acquired by GGS, following the erection of the noise barriers and safe working platform (Location 1B only).

Prior to the erection of noise barriers, the spot sampling and diffusion tubes will be positioned at Location 1A on top of the existing soil mound. In addition, GGS will establish three other monitoring stations around the site in order to give a wide coverage to capture the baseline conditions for non-prevailing wind directions. Location 2 will be established in the North West corner of the wellsite, a more remote 'upwind' monitoring station will be established outside the South West corner of the KMA wellsite, 20m south along the access track (Location 3) and Location 4 will be established in the South West corner of the wellsite.

Time averaged passive monitoring and/or spot monitoring will be undertaken for all of the required parameters at these locations.

The 'upwind' monitoring station located outside the South West corner of the wellsite will give the make up of any gas and particles coming onto the wellsite from the prevailing wind direction. This will then be deducted from other samples and monitoring results to give a true picture of the emissions and particulates generated from the well stimulation works being carried out on the site.

Following the erection of the noise barriers the monitoring equipment will be moved from Location 1A and relocated to Location 1B on the safe working platform next to the noise barriers. The continuous monitoring equipment will also be installed at Location 1B. All continuous monitoring undertaken prior to the commencement of the mining waste activity shall be classified as baseline.

## 2.2 Monitoring Stations During and After Well Operations

A noise attenuation barrier will be constructed around the well site in preparation for the planned well stimulation operations. This barrier has the potential to shield the monitoring station at Location 1A from any potential emissions from the wellsite. Therefore, it is proposed that this monitoring station is temporarily re-located onto a platform built on the noise barrier at Location 1B for the duration of the well operations.

## Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

At the end of the well stimulation operations following the removal of the noise barrier the monitoring station will be moved to Location 1A.

During the well stimulation operations, additional, ten minute duration spot monitoring for methane will be carried out (see Section 4.1). The additional spot monitoring locations will be variable and will be chosen on the day by the wind speed and direction. A minimum distance from the methane emission sources will be 5m on a still/calm day, with a maximum of 20 meters on a windy day. The location will also be dependent on any ATEX zones that are established at the KMA wellsite and will be subject to appropriate safe working procedures.

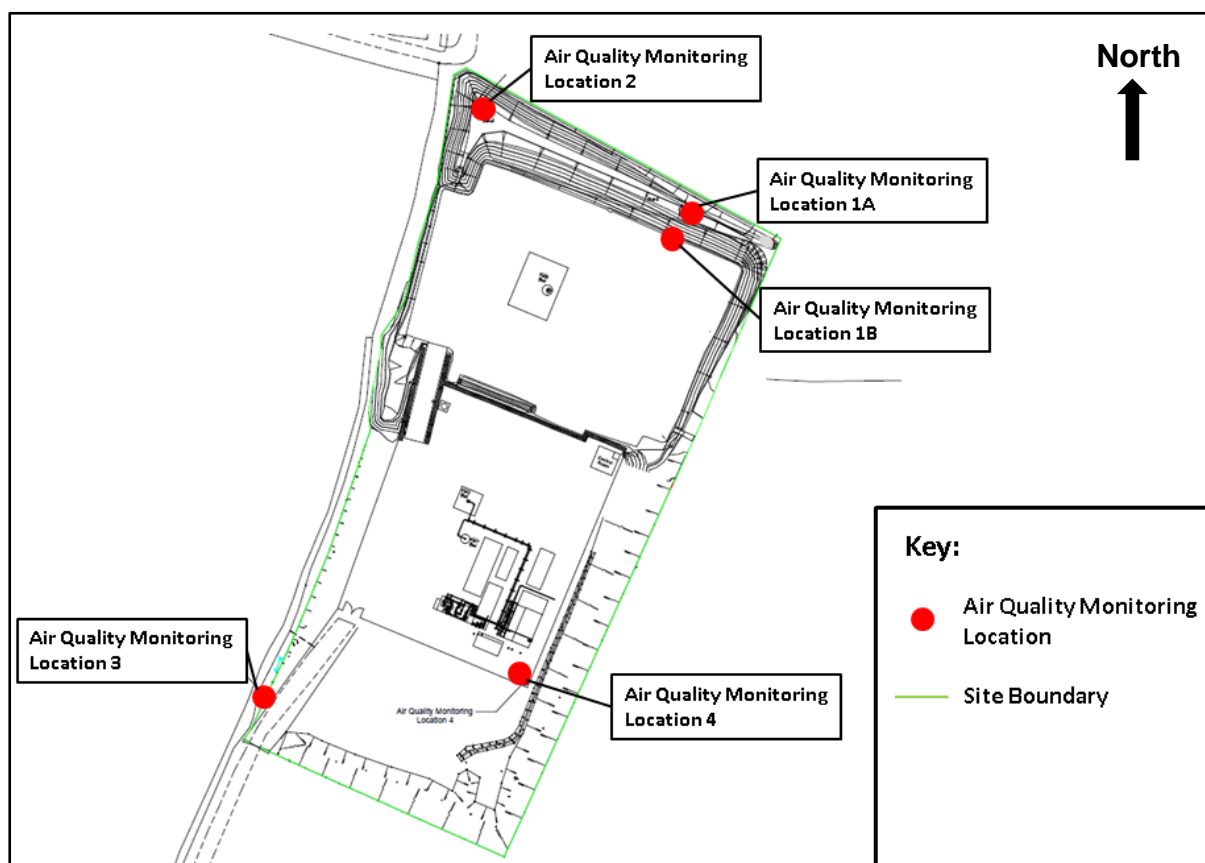
# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## 3 Site Monitoring Programme

GGs will carry out a further two weeks of baseline ambient air quality out before commencement of the mining waste activities.

Ambient air monitoring will then be undertaken throughout the duration of site operations with particular attention given to spot monitoring during key site operations including well stimulation. Ambient air monitoring will then continue for four weeks after the site operations have ceased and the hydraulic fracturing plant and machinery has been removed from the site.

GGs will attend the site at two weekly intervals for the duration of the ambient air monitoring plan to collect time averaged samples for laboratory analysis and to maintain the continuous monitoring equipment.



**Figure 2.** Location of Ambient Air Quality Monitoring Stations.

### 3.1 Additional Monitoring

The site process equipment is monitored continuously via the fibre optically linked SCADA system which enables the Control Room at the Knapton Generating Station to monitor pressures, temperatures and flows in real time and react should there be any evidence of a change. Site visits are carried out on a daily basis, which includes visual inspections, gas detection checks and 'leaks and seeps' surveys. The Company also operates a comprehensive PPM system which allocates scheduled

## Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

maintenance from inspection to overhaul on all of the Company's assets and equipment.

# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## 4 Methodology

The ambient air quality monitoring stations will house an array of monitoring devices for the range of parameters to be monitored. These devices and the methods of monitoring are discussed in the following sections:

### 4.1 Methane (CH<sub>4</sub>)

Methane is naturally occurring in the environment and arises from organic rich soils and ruminant cattle. It is also the principle constituent of the target gas to be produced from the geological formations that are proposed to be hydraulically fractured. Methane is a greenhouse gas and fugitive emissions of methane could potentially arise during the proposed operations. Therefore, the permit requires that this gas is included in the Ambient Air Quality Monitoring Plan.

Continuous monitoring of methane has been carried out at the site by the BGS since January 2016. This has identified the current background methane concentrations at the site to vary between 1.9 and 4.7 ppm.

GGs will continuously monitor methane at the Monitoring Locations 1A and 1B using a transportable tuneable diode laser (TDL 500) linked to a telemetry enabled Gas Sentinel data logger to provide continuous (10 minute moving average sampling) of ambient air methane concentrations. Where the moving average value exceeds a threshold of 5 ppmv, the sampling logging rate will be increased to 1hz. The limit of detection (LoD) for the TDL 500 is 1 ppm with a detection range of 0-10,000 ppm. The full technical specifications of the TDL 500 and the Gas Sentinel are provided in the Appendix.

Ten minute duration, spot monitoring, using a hand held TDL 500, will be carried out every two weeks at the four locations. In addition, further ten minute duration spot monitoring will be carried out during key operations, including well stimulation operations. These locations will be variable and will be chosen on the day by the wind speed and direction to ensure that maximum concentrations of any gas plume is recorded.

In addition, as part of the operator's safe method of working, all surface pipework will be checked for leaks prior to and during operations using an intrinsically safe TDL 500.

### 4.2 Carbon Dioxide (CO<sub>2</sub>)

Carbon dioxide is a natural constituent of the atmosphere and is produced from both volcanic activity and animal respiration. It is also produced by the combustion of petroleum based fuels and the Environment Agency requires it to be monitored.



# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

Continuous monitoring of carbon dioxide has been carried out at the site by the BGS since January 2016. This has identified the current background concentration of carbon dioxide varies between 364 and 601ppm.

GGs will continuously monitor carbon dioxide at Monitoring Locations 1A & 1B using a transportable Gas Sentinel, a multi-gas monitoring device with data logger to provide continuous (10 minute sampling) of ambient air carbon dioxide concentrations. The CO<sub>2</sub> sensor has a resolution of 10 ppm and a tolerance  $\pm 10\%$  of the reading. The full technical specification of the Gas Sentinel is provided in the Appendix.

In addition, spot monitoring, using a hand held GFM 100 series, will be carried out by GGS every two weeks at all four locations. The limit of detection of the GFM 100 series for carbon dioxide is 100 ppm. A full specification for the GFM 100 series is provided in the Appendix.

## 4.3 Carbon Monoxide (CO)

Carbon Monoxide is a constituent of the exhaust gases from diesel engines and North Yorkshire County Council require it to be monitored under Planning Condition 25.

The BGS is not currently measuring background concentrations of carbon monoxide at the site.

GGs will continuously monitor carbon monoxide at Monitoring Locations 1A & 1B using a transportable Gas Sentinel, a multi-gas monitoring device with data logger to provide continuous (10 minute sampling) of ambient air carbon monoxide concentrations. The CO sensor has a limit of detection and resolution of 1 ppm and an accuracy  $\pm 10\%$  of the reading. The full technical specification of the Gas Sentinel is provided in the Appendix.

In addition, spot monitoring, using a hand held GFM 400 series, will be carried out by GGS every two weeks at all four monitoring locations. The limit of detection of the GFM 400 series for carbon monoxide is 100 ppm. A full specification for the GFM 400 series is provided in the Appendix.

## 4.4 Oxygen (O<sub>2</sub>)

Oxygen, at a concentration of 21%, is the second most common gas in the atmosphere and is essential for respiration in animals. It is also used in the combustion of diesel fuels and is required by North Yorkshire County Council to be monitored at the site under Planning Condition 25.

The BGS is not currently measuring background concentrations of oxygen at the site.

## Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

GGs will continuously monitor oxygen at Monitoring Locations 1A & 1B using a transportable Gas Sentinel, a multi-gas monitoring device with data logger to provide continuous (10 minute sampling) of ambient air oxygen concentrations. The O<sub>2</sub> sensor has a limit of detection and resolution of 0.1%v/v and an accuracy  $\pm 10\%$  of the reading. The full technical specification of the Gas Sentinel is provided in the Appendix.

In addition, spot monitoring, using a hand held GFM 400 series, will be carried out by GGS every two weeks at all four locations. The limit of detection of the GFM 400 series for oxygen is 0.5%.

### 4.5 Particulates

Airborne particulate matter is made up of a collection of materials of various sizes that range from a few nanometres in diameter to around 100 microns (100  $\mu\text{m}$ ). It consists of a wide range of material from both natural and anthropogenic sources and includes sea salt, soil dust and the products of combustion. Measurements of the concentration of particulates in air are made by recording the mass of particulate matter in one cubic metre of air, using the units micrograms per cubic metre ( $\mu\text{g m}^{-3}$ ) and these are recorded as Total Solid Particulates (TSP), and at particle sizes of less than 10, 2.5 and 1.0 microns (PM<sub>10</sub>, PM<sub>2.5</sub> & PM<sub>1.0</sub> respectively).

Particulates are required by the Environment Agency to be monitored at the site under their permit.

Continuous monitoring of particulates has been carried out at the site by the BGS since January 2016. This has identified the current background concentration of particulates to vary from zero to 135  $\mu\text{g m}^{-3}$  for PM<sub>10</sub>, to 132  $\mu\text{g m}^{-3}$  for PM<sub>2.5</sub> and to 121  $\mu\text{g m}^{-3}$  for PM<sub>1.0</sub>.

GGs will continuously monitor particulates at Monitoring Locations 1A & 1B using a transportable Turnkey Osiris with measurements taken every 10 minutes. This instrument has been issued with the Environment Agency's MCERTS certification and has a resolution to 0.01  $\mu\text{g m}^{-3}$  and a measurement range of 0 to 6,000  $\mu\text{g m}^{-3}$ . The full technical specification of the equipment is provided in the Appendix.

In addition, GGS will locate DustScan passive samplers at all four monitoring locations. The DS100-D combines the DS100 sticky pad directional dust gauge with the DD100 DustDisc settlement gauge. The directional gauge samples fugitive dust in flux from 360° around the sampling head to determine the direction/s from which dust has arisen. The passive settlement gauge samples dust depositing out of the air. The collected dust is measured in terms of AAC and EAC % (established annoyance/nuisance criteria) as an average for the monitoring period. If subsequently required, the collected dust can be characterised in respect of its mass, particle size and chemistry.

# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## 4.6 BTEX

BTEX refers to the chemicals benzene, toluene, ethylbenzene and xylene. These compounds occur naturally in petroleum deposits and are also present in vehicle exhaust fumes and cigarette smoke. BTEX are required by the Environment Agency to be monitored at the site under their permit.

The BGS is not currently measuring background concentrations of BTEX at the site.

GGs will passively sample BTEX using Tenax sorbent tubes located at the four monitoring stations. These tubes will be collected every two weeks and taken to a UKAS accredited laboratory for analysis by thermal desorption and analysis by GC/FID or GC/MS to give a time weighted average. The limit of detection for this technique is variable and depends on the compounds that are present.

## 4.7 Top 10 VOCs

Volatile organic compounds (VOCs) are substances with low boiling points that evaporate from solids or liquids. They occur both naturally and as products used in industrial processes. There are very many different VOC's but one of the most common is formaldehyde which is found in building products and furniture. VOCs are also produced by diesel combustion. As such the top 10 VOC compounds are required by the Environment Agency to be monitored at the site under their permit.

The BGS is not currently measuring background concentrations of VOCs at the site.

GGs will passively sample for the Top 10 VOCs using Tenax sorbent tubes located at the four monitoring stations. These tubes will be collected every two weeks and taken to a UKAS accredited laboratory for thermal desorption and analysis by GC/FID or GC/MS to give a time weighted average. The limit of detection for this technique is variable and depends on the compounds that are present.

## 4.8 Nitrogen Dioxide (NO<sub>2</sub>)

Trace concentrations of nitrogen dioxide occur naturally in the atmosphere from volcanic sources and lightening strikes. It is also a product of combustion and is present in vehicle exhaust fumes and cigarette smoke. Nitrogen dioxide is required by the Environment Agency to be monitored at the site under their permit.

Continuous monitoring of nitrogen dioxide has been carried out at the site by the BGS since January 2016. This has identified the current background concentration of nitrogen dioxide to vary from near zero to 267 ppb.

GGs will continuously monitor nitrogen dioxide at the monitoring stations Locations 1A & 1B using a semi-permanent AQMesh with measurements taken every 10 minutes to provide trends through time. This instrument has a limit of detection of <10 ppb for nitrogen dioxide and a monitoring range of 0-4,000 ppb. The full technical specification of this device is given in the Appendix.

## Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

Passive sampling for nitrogen dioxide will also be undertaken using diffusion tubes at all four locations. These will be exposed at the monitoring station and replaced approximately every 2 weeks before being taken to a UKAS accredited laboratory for analysis to give a time weighted average. The limit of detection for this technique is variable but will be circa  $0.7 \mu\text{g}/\text{m}^3$ .

### 4.9 Nitric Oxide (NO)

Trace concentrations of nitric oxide occur naturally from lightening strikes. It is also a product of combustion and is present in vehicle exhaust fumes. Nitrogen dioxide is required by the Environment Agency to be monitored at the site under their permit.

Continuous monitoring of nitric oxide has been carried out at the site by the BGS since January 2016. This has identified the current background concentration of nitric oxide to vary from near zero to 63 ppb.

GGs will continuously monitor nitric oxide at the monitoring station Locations 1A & 1B using a semi-permanent AQMesh with measurements taken every 10 minutes. This instrument has a limit of detection of <5 ppb for nitric oxide and a monitoring range of 0-4,000 ppb.

Passive sampling for nitric oxide will also be undertaken using diffusion tubes. These will be exposed at all four monitoring stations and replaced approximately every 2 weeks before being taken to a UKAS accredited laboratory for analysis to give a time weighted average. The limit of detection for this technique is variable but will be circa  $2.2 \mu\text{g}/\text{m}^3$ .

### 4.10 Ozone (O<sub>3</sub>)

Ozone occurs naturally in the upper atmosphere and is formed by the action of ultraviolet light and lightening discharges on oxygen. Near ground level it is formed by chemical reactions between the oxides of nitrogen and VOCs in the presence of sunlight. Ozone is a powerful oxidising agent and is an indicator of poor air quality. As such it will also be monitored at the site.

Continuous monitoring of ozone has been carried out at the site by the BGS since January 2016. This has identified the current background concentration of ozone to vary from near zero to 65 ppb.

GGs will continuously monitor ozone at the monitoring stations Locations 1A & 1B using a semi-permanent AQMesh with measurements taken every 10 minutes. This instrument has a limit of detection of <5 ppb for ozone and a monitoring range of 0-1,8000 ppb. The full technical specification of this device is given in the Appendix.

Passive sampling for ozone will also be undertaken using diffusion tubes. These will be exposed at all four monitoring stations and replaced approximately every 2 weeks before being submitted to a UKAS accredited laboratory for analysis to give a time weighted average. The limit of detection for this technique is variable but will be circa  $1.0 \mu\text{g}/\text{m}^3$ .

## Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

### 4.11 Hydrogen Sulphide (H<sub>2</sub>S)

Hydrogen sulphide is a naturally occurring compound found in peaty deposits, volcanic areas and petroleum deposits. At Kirby Misperton hydrogen sulphide is present in the target formation. As such, North Yorkshire County Council require it to be monitored under Planning Condition 25.

The BGS is not currently measuring background concentrations of hydrogen sulphide at the site.

GGs will monitor hydrogen sulphide by installing passive absorbent tubes at all four monitoring stations. These tubes will be collected every two weeks and taken to a UKAS accredited laboratory for analysis by UV/Visible Spectrophotometry to give a time weighted average. The limit of detection for this technique is circa 0.2 µgm<sup>-3</sup>.

### 4.12 Weather Station

In addition to the required parameters, a weather station will be installed at the Ambient Air Quality Monitoring Station Location 1A & 1B to continuously record temperature, atmospheric pressure, wind speed and direction.

# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## 5 Quality Control & Calibration

All monitoring equipment operated by GGS is maintained in accordance with the manufacturer's guidelines. Annual services and calibrations are undertaken when required and routine visual inspections of the equipment are undertaken prior to and during site visits by GGS staff.

GGS operates an Integrated Management System (IMS) that is accredited by QMS International plc as complying with the following international standards:

- BS EN ISO 9001:2008 (Quality Management System);
- ISO 14001:2004 (Environmental Management System), and;
- OHSAS 18001:2007 (Occupational Health and Safety Management System).

All of GGS' monitoring and sampling are carried out to procedures that are subject to independent annual audit.

# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## 6 Reporting

Once the baseline monitoring has been carried out, the results of the continuous monitoring, spot monitoring and laboratory analyses will be reported to the Environment Agency and North Yorkshire County Planning Authority within 28 days from the date of the last samples being collected from site and laboratory results received.

During the on-site operations, regular bi-weekly reports, containing the results of the continuous monitoring, spot monitoring and available laboratory analyses will be submitted to the Environment Agency and North Yorkshire County Planning Authority. The last monitoring results will be submitted within 28 days from date of the last samples being collected.

In addition, with specific reference to methane concentrations, if threshold concentrations, as determined from baseline monitoring carried out prior to well stimulation operations and as agreed with the Environment Agency, are exceeded then the source of the exceedance will be identified and the Environment Agency will be informed within 24 hours of the occurrence.

All monitoring equipment referenced in the submitted reports will be accompanied by valid calibration certificates supplied by the equipment supplier, together with records of GGS calibration testing carried out in line with the company's internal quality assurance procedures.

# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## Appendix – Technical Specifications

### A) TDL 500

#### Technical specifications

<b>Battery Life</b>	- 8 hours at 20°C with all functions on (backlighting, pump on speed 2) - 6 hours at temperatures below 0°C with all functions on (backlight)
<b>Battery Charger</b>	100 to 240 VAC/ 50-60 Hz battery charger for ATEX battery pack
<b>Charge Time</b>	Approximately 14 hours from complete discharge
<b>Response Time, T90</b>	CH4 - 4.5 seconds T10 standards: 2 seconds With suction rod T90: 6 seconds With suction rod T10: < 3.5 seconds
<b>Gases Measured</b>	CH4 by laser spectroscopy
<b>Range</b>	CH4 - 0-10,000 ppm and 0 ppm to 100% gas volume
<b>Typical Accuracy</b>	CH4 detection threshold - 1 ppm
<b>Gas Connection</b>	Quick connect inlet coupling with locking mechanism: suction rod on right side Quick connect gas outlet coupling
<b>Case Seal</b>	IP54
<b>ATEX</b>	II 2G Ex ib IIB T4
<b>CE</b>	94/9/CE directive dated March 23rd 1994
<b>European Standards</b>	Conditions for the ATEX 1ppm to 100% gas volume version



# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## B) Gas Sentinel

# Gas Sentinel®

Transportable, telemetry enabled, continuous multi-gas analyser



### Features

- Continuous gas and flow monitoring
- Certified\*: ATEX, IECEx, MCERTS
- 2 way telemetry, mobile, Wi-Fi, Ethernet and external device connectivity
- Up to 8 user configurable and interchangeable sensors including: CH<sub>4</sub>, CO<sub>2</sub>, O<sub>2</sub>, TVOC, H<sub>2</sub>S and CO
- Measures barometric & borehole pressure, relative humidity and temperature
- Compact transportable design
- User defined alerts
- Long battery life

### Benefits


- Low maintenance
- Low cost of operation
- Versatile remote site monitoring
- Up to 3 months deployment on single charge
- Extended monitoring available via solar charging
- User configurable data collection
- Access data anywhere using standard or bespoke dashboards with Unity® Platform
- Automated reporting functions
- Add third party instruments to telemetry or dashboard

The Gas Sentinel® is a transportable, continuous, multi-gas analyser; certified for hazardous areas with 2-way telemetry capability. It is easy to use for both short term and long term monitoring of landfill, contaminated land and onshore petroleum sites. Versatile remote data acquisition through an intuitive dashboard provides automated reporting for cost effective regulatory compliance.

**CGD Technology Limited**  
Greenheys, MSP, Manchester, M15 6JJ


**Email:** info@cgdt.co.uk  
**Tel:** +44 (0)161 232 7465

# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.



# Technical Specifications

POWER SUPPLY			
Battery type	Lithium-Ion		
Battery life	8hrs to 6 months depending on sampling configuration and conditions. Approximately 500 charge cycles		
Battery charging	12v DC 1.5A supply		
Charge rate	1Ah		
GAS SENSORS			
Gas Sensor Ranges	Gas Type	Range	Typical resolution and accuracy
	CH <sub>4</sub>	0-100%	0.1% v/v or $\pm 10\%$ of reading whichever is the greatest
	CH <sub>4</sub> (High Resolution)	0-5%	0.01% v/v or $\pm 10\%$ of reading whichever is the greatest
	CO <sub>2</sub>	0-100%	0.1% v/v or $\pm 10\%$ of reading whichever is the greatest
	CO <sub>2</sub> (High Resolution)	0-5000 ppm	20ppm or $\pm 10\%$ of reading whichever is the greatest
	O <sub>2</sub>	0-25%	0.1% v/v or $\pm 10\%$ of reading whichever is the greatest
	CO	0-1000 ppm	1ppm $\pm 6$ ppm or $\pm 10\%$ of reading whichever is the greatest
	H <sub>2</sub> S	0-100 ppm	1ppm $\pm 4$ ppm or $\pm 10\%$ of reading whichever is the greatest
	TVOC	0-4000 ppm	1ppm $\pm 5$ ppm or $\pm 10\%$ of reading whichever is the greatest
Typical accuracies	All typical accuracies quoted are after calibration		
Other gases	If you have additional gases of interest, please contact us for further information.		
ENVIRONMENTAL SENSORS			
Environmental Sensor Ranges	Sensor Type	Range	Typical resolution and accuracy
	Gas Flow	0-100 Ltr/hr	0.1ltr/hr $\pm 10\%$ of reading whichever is the greatest
	Temperature	-5°C to +50°C	0.1°C $\pm 0.5$ °C of reading
	Humidity	0-100%RH	1%RH $\pm 1.8$ %RH
	Pressure	800-1200mb	$\pm 1$ mbar
Typical accuracies	All typical accuracies quoted are after calibration		
COMMUNICATIONS			
Gas Sentinel®	Instrument communications is via a radio link to a Telemetry Hub		
Telemetry Hub	Allows connection of multiple Gas Sentinel® Instruments to a single Cellular SIM or Ethernet connection		
Typical accuracies	All typical accuracies quoted are after calibration		
<b>Important notes:</b> The information in this document is correct at the time of generation. We reserve the right to change part or all of the information. *results pending			




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# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## C) Turnkey Osiris



Feature	Description	TOPAS	OSIRIS	DUSTMATE
Standard inlet	TSP (1mm stainless mesh)	✓	✓	✓
Heated inlet	Heating to 60°C	✓	✓	•
Detector	Turnkey laser nephelometer	✓	✓	✓
Environmental mode	TSP, PM10, PM2.5, PM1.0	✓	✓	✓
Workplace mode	Inhalable, thoracic, respirable	✓	✓	✓
Measurement range	0 to 6000 micrograms per cubic metre	✓	✓	✓
Detection limit	0.01 micrograms per cubic metre	✓	✓	✓
Indicator range	0 to 60mg/m <sup>3</sup> without particle sizing	✓	✓	✓
Particle size range	0.5 to 20 micron diameter	✓	✓	✓
Particle counting mode	Three size channels in particle per cc	✓	✓	✓
Flow rate	600cc per minute	✓	✓	✓
Reference filter	25mm diameter GFA circle	✓	✓	✓
Operating temperature	-5°C to +50°C	✓	✓	✓
Security	Password protection	✓	✓	✓
Alarm	Siren, text to cellular phone, visual beacon and email	✓	✓	✗
Display	Two line alphanumeric with backlight	✓	✓	✓
Data storage	Internal with separate battery backup	128k byte	128k byte	32k byte
Averaging period	1 second to 4 hours	✓	✓	✓
Battery	Sealed lead acid, rechargeable	n/a	Internal 6v 2.8 AH	Belt pack 6v 1.2 AH
Sampling current drain	Including heated inlet and backlight	1.2A	1.2A	200mA (without heated inlet)
External power pack	80 to 260v AC input, weatherproof	•	•	✗
Meteorological inputs	Wind speed and direction, rainfall, temperature and humidity	✓	✓	✗
Other logging inputs	Two 0 to 5 volt analogue inputs	✓	✓	✗
RS232 I/O	9600 baud via PC-link	✓	✓	✓
Telemetry I/O	1200 baud opto isolated	✓	✓	✗
Analogue output	0 to 4 volt analogue of TSP or PM10 channel, 12 bit resolution	•	•	✗
Wall or lamppost box	Lockable steel	✓	✓	✗
Case protection	To IP66 (excluding inlet and exhaust)	✓	✓	Carry case
Dimensions	External dimensions in mm	400 x 300	260 x 160 x 150	160 x 100 x 100
Weight	Instrument and enclosure approximate weight in kg	12kg	11.8kg	1.2kg
Power options	Solar, wind, mains and battery	✓	✓	Mains and battery only

✓ Fitted as standard   ✗ Not available   • Available as option

1-2 Dalby Court, Gadbrook Business Centre, Northwich, Cheshire. CW9 7TN



# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## E) GFM 400 Series

Feature	Method / Type	Range	Resolution
Methane	Infrared	0 - 100%v/v	0.1%
Lower Detection Limit (LEL)	Infrared	0 - 100%v/v	0.1%
Carbon Dioxide	Infrared	0 - 100%v/v	0.1%
Oxygen	Electrochemical	0 - 25%v/v	0.1%
Hydrogen Sulphide	Electrochemical	0 - 5000ppm	1ppm
Carbon Monoxide#	Electrochemical	0 - 2000ppm	1ppm
Atmospheric Pressure	Absolute Pressure Sensor	800 - 1200mb	1mb
Differential Pressure	Thermal Dissipation	±1250Pa	0.1Pa
Temperature	Bi-metal	-10°C to +100°C	1°C
Flow	Thermal Dissipation	-60 – 100 l/hr	0.1l/hr

GFM 400 series specification

# The GFM435 carbon monoxide range is 0 – 5000ppm



# Ambient Air Quality Monitoring Plan, Kirby Misperton A Wellsite, KM8 Production Well.

## F) GFM 100 Series

		<u>GFM100</u>	<u>GFM110</u>	<u>GFM130</u>	<u>GFM150</u> <u>IAQ</u>
<b>Common features</b>		Single channel only	One I/R and up to 2 gas channels	1 to 7 gas capability	One I/R, 2 extra expansions. Temp & humidity inc.
<b>Carbon dioxide infra red reading range</b>		Choose from ONE (1) of the below	Choose ONE I/R and UP TO TWO (2) of the below	Choose from UP TO SEVEN (7) of the below NOTE: Only 1 I/R	
0 – 10000 ppm		✓	✓	✓	✓
0 – 10%		✓	✓	✓	x
0 – 60%		✓	✓	✓	x
0 – 100%		✓	✓	✓	x
<b><u>Expansions available</u></b>					
Oxygen	0-25%	✓	✓	✓	✓
CO	0-50 ppm	✓	✓	✓	✓
H2S	0-200 ppm	✓	✓	✓	x
H2S	0-1500 ppm	✓	✓	✓	x
SO2	0-20 ppm	✓	✓	✓	x
NO	0-250 ppm	✓	✓	✓	x
NO2	0-20 ppm	✓	✓	✓	x
CL1	0-10 ppm	✓	✓	✓	x
HCN	0-100 ppm	✓	✓	✓	x
NH3	0-50 ppm	✓	✓	✓	x
Photo ionisation cell	0-2000 ppm isobutylene	✓	x	✓	✓
Data storage and download software		x	✓	✓	✓
ATEX certified option		x	x	✓	x

### EXAMPLES

GFM100 0-10000ppm CO2:

GFM110 0-60% CO2 + 0-25% O2 + Data storage:

GFM110 0-100% CO2 + 0-25% O2 + 0-50ppm CO:

### NOTES

GFM100 and GFM110 range available November 2006

GFM130 available January 2007

GFM150 available April 2007

GGs GFM130 Equipped with 0-10,000ppmv CO2 (1ppm resolution and ~100ppm accuracy)

For: Third Energy UK Gas Ltd.

Ref No.: GGS1197 Ambient Air Quality Monitoring Plan

Date: 18/07/2017

## APPENDIX 2 – GROUNDWATER MONITORING PLAN

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## **BASELINE WATER QUALITY DATA**

### **KIRBY MISPERTON A WELLSITE, NORTH YORKSHIRE**



For

Third Energy UK Gas Limited  
Knapton Generating Station  
East Knapton  
Malton  
North Yorkshire  
YO17 8JF

By

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Revision	Details	Completed by	Date	Checked by	Date
REV01	1 <sup>st</sup> Draft	PH	05/10/2016	JD	06/10/2016
REV02	2 <sup>ND</sup> Draft	PH	07/10/2016	JD	07/10/2016
REV03	Final Draft	PH	21/10/2016	JD	24/10/2016
REV04	Final	PH/DB	03/11/2016	JD	04/11/2016
REV05	Re-issue following EA discussion	JS	13/07/2017	PH	14/07/2017
REV06	Re-issue following EA discussion	JS	05/09/2017	PH	08/09/2017

## BASELINE WATER QUALITY DATA

### KIRBY MISPERTON A WELLSITE, NORTH YORKSHIRE

## 1 INTRODUCTION

### 1.1 Background

Third Energy UK Gas Limited (Third Energy) is proposing to hydraulically fracture an existing hydrocarbon production well (KM8) at Kirby Misperton A Wellsite, North Yorkshire ("the KMA wellsite").

The KM8 well was constructed in 2013 to a depth of 3099m true vertical depth (TVD) below ground level. The KM8 well is a vertical well and targets the Carboniferous Bowland Shale Formation, at depths of between c. 2000 and 3100 m TVD. The proposal is to hydraulically fracture the well at five intervals between approximately 2,123m and 3,044m TVD to enhance the production of natural gas (methane) from the target strata.

The location of the KMA Wellsite is shown on Figure 1.

### 1.2 Permit Conditions

A mining waste and groundwater activity permit (Ref. EPR/DB3002HE) was issued by the Environment Agency for the hydraulic fracturing operation in April 2016 [Ref. 1]. The permit includes five pre-operational measures (PO1 – PO5). PO3 states:

*At least 4 weeks prior to commencement of permitted activities the operator shall submit to the Environment Agency for approval an updated Emissions Monitoring Plan (EMP) which will include, but is not limited to:*

- *Complete details of the baseline air quality study undertaken prior to activities commencing; and details of any changes made to the ambient air monitoring programme proposed,*
- *Complete details of the baseline surface water and groundwater study undertaken prior to activities commencing; and details of any changes made to the surface water and groundwater monitoring programme proposed. Baseline monitoring shall include as a minimum the parameters listed in table S3.5; and the locations, depth, construction method of the monitoring boreholes,*
- *The plan should also address the requisite surveillance requirements to monitor groundwater both pre-operation and over the lifetime of the activities authorised by this permit,*
- *Complete details of the surface water management procedures, and related process monitoring,*

*and shall obtain the Environment Agency's written approval to the updated EMP.*

### 1.3 Purpose of this Report

This report provides the details of the surface water and groundwater monitoring carried out by Third Energy to date and presents all the data collected since surface water and groundwater monitoring began in January 2015. The report also makes reference to independent water quality monitoring that is also being carried out by the British Geological Survey (BGS) in the Vale of Pickering.

## 2 SCHEME OF MONITORING

### 2.1 Overview

#### 2.1.1 Initial Scheme of Monitoring

An initial scheme of surface water and groundwater monitoring was developed for the KMA Wellsite in January 2015.

The scheme was developed with advice from the Environment Agency to allow baseline data to be collected prior to the construction of groundwater monitoring boreholes at the KMA Wellsite, which (at that time) were subject to a planning application process and the issuing of the mining waste and groundwater activity permit (“the environmental permit”) [Ref. 1].

The scheme was developed on the basis of a comprehensive water features survey to identify suitable surface water and groundwater features within approximately 2km of the KMA Wellsite, which were subsequently monitored on a monthly basis. The 2km survey radius was based on an assessment of the fracture propagation from the borehole [Ref. 2]

The development of the initial scheme of monitoring, including data obtained from the first three sampling rounds, is summarised in a report prepared by Envireau Water [Ref. 3], which was submitted to the Environment Agency as a supporting document to the environmental permit application.

As described in Ref. 2, all the groundwater features identified for monitoring are associated with either the Superficial (Quaternary) Deposits and/or the underlying Kimmeridge Clay Formation, down to a maximum depth of ~60m below ground level (bgl). The water features surveys identified no features, which could be incorporated into a monitoring network, that were associated with the Corallian limestone aquifer that is present beneath the Kimmeridge Clay Formation. A more detailed description of geology is presented in Ref. 3.

#### 2.1.2 Monitoring boreholes at the KMA Wellsite

Planning permission for the construction of five (5) groundwater monitoring boreholes at the KMA Wellsite was granted in September 2015. The boreholes were constructed in November 2015, as follows:

- Three (3) boreholes (“the shallow boreholes” BHA - C) targeting the superficial deposits / weathered zone of the Kimmeridge Clay Formation.
- One (1) borehole (“the intermediate borehole” BHD) targeting the un-weathered Kimmeridge Clay Formation/Amptill Clay Formation (Ancholme Group).
- One (1) borehole (“the deep borehole” BHE) targeting the top ~30m of the Corallian Group

The full, as-built construction details of the KMA Wellsite monitoring boreholes are summarised in a report prepared by Envireau Water [Ref. 4]. The monitoring boreholes have been equipped with dedicated permanent low velocity bladder pumps for water sampling and have been sampled since January 2016.

### 2.1.3 Environmental permit

The environmental permit [Ref. 1] was issued for the hydraulic fracturing operation in April 2016 and requires monitoring of the five groundwater monitoring boreholes at the KMA Wellsite and nine offsite monitoring locations.

## 2.2 Monitoring Locations

The locations of the groundwater monitoring boreholes at the KMA Wellsite (BHA – BHE) and the offsite surface water and groundwater monitoring points are shown on Figure 1.

Summary details of the monitoring locations, including the depth and construction method of the monitoring boreholes are provided in Tables A1 – A3 in Appendix A.

## 2.3 Monitoring Frequency

### 2.3.1 Offsite Water Features

Water sampling has been carried out on a monthly basis at offsite monitoring locations.

### 2.3.2 Monitoring boreholes at the KMA Wellsite

The monitoring boreholes at the KMA Wellsite (BHA – BHE) have been sampled on a monthly basis since they were constructed, and incorporated into the scheme of monitoring in January 2016.

## 2.4 Sampling Methods

Water samples have been collected from the various surface water and groundwater features with reference to relevant parts of BS ISO 5667 (Water Quality Sampling). The sampling techniques are described in a separate sampling protocol that has been prepared by Envireau Water [Ref. 5]. During each sampling round, quality assurance samples, comprising at least one blank (distilled water) and one duplicate sample, were collected and submitted to the laboratory.

## 2.5 Analytical Parameters

Prior to the issue of the environmental permit, water samples were analysed in the field and/or laboratory for the following parameters:

- pH, electrical conductivity (EC), major ions, alkalinity, dissolved metals
- Total dissolved hydrocarbons
- Dissolved methane (groundwater features only)

The environmental permit requires water samples to be analysed for a more extensive range of organic and inorganic substances, including stable isotope (<sup>13</sup>C) analysis. The required suite of analysis is reproduced in Appendix B and represent the full suite of analysis required by the Environment Agency.

## 2.6 Analysis Methods

Samples have been submitted to two UKAS accredited laboratories during the baseline water sampling undertaken to date; ESG Environmental Chemistry and Jones Environmental Laboratory. Samples were submitted to University of Durham for stable isotope analysis only. Laboratory submission details are provided in Table 1.

**Table 1 Laboratory Submission Details**

Sampling Rounds	Sampling Dates	Laboratory Submission Details
1 to 14	11 February 2015 to 17 February 2016	ESG Environmental Chemistry, Bretby Business Park, Ashby Road, Burton-on-Trent, Staffordshire, DE15 0YZ
15 to 21	22 March 2016 to 15 September 2016	Jones Environmental Laboratory, Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA
15 to 18	22 March 2016 to 16 June 2016	Department of Earth Sciences, University of Durham, Science Laboratories, South Road, Durham, DH1 3LE

Summary details of the analysis methods used at ESG Environmental Chemistry and Jones Environmental Laboratory are provided in Appendix C. The change from the ESG to the Jones laboratory was based on the requirements to analyse a more extensive suite of organic parameter, as required by the permit. The method used by University of Durham for stable isotope ( $^{13}\text{C}$ ) analysis was based on Roberts and Shiller [Ref. 6].

Field data (pH, temperature, dissolved oxygen, redox potential, electrical conductivity) were also collected at each sample location during each sampling round using an In-Situ smarTroll multiparameter handheld system.

During each sampling round, at least one blank (distilled water) and one duplicate sample was included in the laboratory analysis, as a check against the laboratory methods and in accordance with good practice.

## 2.7 BGS Baseline Survey

The British Geological Survey (BGS) are carrying out an independent programme of baseline water quality monitoring in the Vale of Pickering. The BGS monitoring network comprises 10 surface water and 24 groundwater features; most of which are located within approximately 10 km of the KMA Well site. The BGS has also installed a set of new groundwater monitoring boreholes close to the KMA Well site. These include boreholes constructed to target groundwater within the Superficial Deposits and the Corallian Limestone.

The BGS are collecting water samples on a monthly basis and carrying out field and/or laboratory analysis for the following parameters (where possible):

- temperature, pH, conductivity, redox potential
- major ions and trace elements
- dissolved gases (oxygen, carbon dioxide, methane, nitrogen, radon)
- organic compounds
- stable isotopes of water and inorganic carbon

- groundwater 'age' indicators (chlorofluorocarbons)
- other naturally occurring radioactive materials (e.g. radium)

Details of the BGS baseline programme and links to data and key publications are available through the BGS website (<http://www.bgs.ac.uk/research/groundwater/shaleGas/monitoring/waterQualityYorkshire.html>).

### 3 BASELINE DATA

#### 3.1 Availability

Third Energy have carried out twenty-one (21) baseline water sampling rounds on an approximate monthly basis between 11 February 2015 and 15 September 2016. A table summarising the dates of the water sampling rounds and the samples taken at each monitoring location is provided in Appendix D.

The KMA Monitoring Boreholes (BHA to BHE) were added to the scheme of monitoring following the completion of drilling and installation of dedicated low velocity pumping equipment. The boreholes were first sampled in March 2016 and have been included in seven (7) consecutive monthly sampling rounds to date.

An additional surface water monitoring location was added at Sugar Hill Drain (S4), which is upstream of the KMA Wellsite and monitoring point S1, also on Sugar Hill Drain. The Sugar Hill Drain runs along the western boundary of the KMA wellsite. Sampling commenced at monitoring point S4 in October 2015. Over the course of the monitoring period there have been occasions where there has been insufficient water at the surface water monitoring points to take water samples. The dates and locations of these are provided in the table in Appendix D.

#### 3.2 Results

The results from the twenty-one (21) baseline water sampling rounds have been tabulated and are provided in the data CD in Appendix E. The full laboratory test certificates are presented in Appendix F.

#### 3.3 Trends

Selected chemical indicators have been plotted graphically to illustrate the trends in water chemistry across the monitoring period. The indicators include major ions and other minor constituents and have been chosen to align with the BGS baseline data that is currently available in a graphical format through the BGS website. It should be noted that the charts present selected indicator analytes and not the full suite of analytes, simply to make presentation of a manageable size for a summary report. The full list of analytes and their values are presented in the Appendix E & F.

Surface water data are presented on Figure 2 and groundwater data are presented on Figures 3a, 3b and 3c. Data have also been presented as a Piper diagram and the resulting chart is presented on Figure 4. The Piper diagram is a common presentation, used to plot the relative proportions (in milliequivalents per litre) of the major cations and anions ( $\text{Na}^+$ ,  $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$ ,  $\text{K}^+$ ,  $\text{Cl}^-$ ,  $\text{SO}_4^-$  and  $\text{HCO}_3^-$ ) in a water sample. The water sample depths are illustrated on the generalised vertical section on Figure 5.

##### 3.3.1 Summary of Surface Water Data

The major ion chemistry of the surface water samples has remained consistent during the monitoring period, as shown on Figure 2.



In general, Ackland Beck (S3) has the highest concentrations of calcium, sodium, sulphate and chloride; Costa Beck (S2) has the lowest concentrations; and the concentrations observed at Sugar Hill Drain (S1 and S4) sit between those from Ackland Beck and Costa Beck. Nitrate concentrations range up to about 30 mg/l (as NO<sub>3</sub><sup>-</sup>).

The surface waters tend to have rather variable pH and alkalinity. The field pH typically falls in the range 7 – 8.7, with laboratory alkalinities typically in the range 3 – 5 meq/l. It is likely that the variability reflects responses to rainfall and surface run-off. Ackland Beck (S3) exhibits slightly higher pH and alkalinity than the other streams, with pH typically in excess of 7.8 and laboratory alkalinity in the range 4.4- 6.3 meq/l.

The results for iron ('dissolved' iron, using laboratory parlance) show that concentrations are fairly consistent from 100 to 200 µg/l for all monitoring points between February 2015 and January 2016. There is a peak in concentration at around 1000 µg/l at Sugar Hill Drain upstream and downstream (S1 and S4) in February 2016. The peak in iron is observed at both upstream and downstream monitoring points and is therefore not attributed to activities at the KMA Wellsite.

The full set of results from Sugar Hill Drain upstream and downstream of the KMA wellsite (S1 and S4) presented in Appendix E & F are very similar, which is expected given their close proximity. It also demonstrates that there is no observable impact on the Sugar Hill Drain from activities at the KMA Wellsite during the monitoring period.

From March 2016, there is a small but observable increase in the iron concentrations reported at the majority of the monitoring points, which is attributed to the change in the laboratory requirements for on-site filtering. Since March 2016, water samples have been filtered and acidified in the field to ensure consistency of measurements.

### 3.3.2 Summary of Groundwater Data

The major ion chemistry of the ground water samples has remained consistent across the monitoring period. Again there is a modest apparent change in iron concentrations from March 2016, probably ascribable to differing laboratory filtration protocols. Selected indicator analytes are shown on Figures 3a, 3b and 3c.

#### *Superficial Deposits / Weathered Kimmeridge Clay*

The major ion data indicate that the boreholes targeting the superficial deposits can be divided into three main groups: the KMA Wellsite boreholes (BHA, BHB and BHC), the borehole at The Villa (G3) and the remaining offsite boreholes (G2 and G4 to G6). The main differences in water chemistry are that, in general:

- The KMA Wellsite boreholes have higher concentrations of calcium, chloride, sulphate and iron, and lower concentrations of sodium and oxygen.
- The borehole at The Villa (G3) has higher concentrations of sodium and methane, somewhat elevated chloride and lower concentrations of calcium and iron.
- The remaining offsite boreholes have a very similar composition with lower concentrations of calcium, chloride and sulphate.

The boreholes in superficial deposits / weathered Kimmeridge Clay typically exhibit laboratory alkalinities in the range 7 to 10 meq/l (i.e. higher than surface waters), although borehole G3 at The Villa exhibits typical alkalinities of 12 to 13 meq/l. Boreholes G2 to G6 typically yield groundwaters with field pH in the range 7 to 8 (occasionally exceeding 8). The on-site boreholes BHA to BHC yield water with lower field pH, in the range 6.6 to 7.3.

### *Kimmeridge Clay*

The major ion data shows that the water from the borehole at Elm Tree Farm (G1) is more mineralised than the water from the intermediate borehole at the KMA Wellsite (BHD). In general, the water at Elm Tree Farm has the higher concentrations of the key chemical indicators, the most notable difference being the concentration of sulphate, which is at least three (3) times greater at Elm Tree Farm than at BHD at the KMA wellsite.

As regards pH, the water from G1 exhibits a typical range of around 7.2 to 8 (field pH) and a laboratory total alkalinity of 12 to 15 meq/l. BHD exhibits a typical field pH range of 7.7 to 8.1 and a laboratory total alkalinity of around 12 meq/l.

### *Corallian Group*

The Corallian Group borehole (BHE) at the KMA Wellsite has a relatively stable concentration across the monitoring period. The main differences between the water composition from the Corallian Group and the other monitoring points is that the concentrations of chloride and methane are much higher, being over six (6) times greater than the highest concentrations from the other monitoring points. The water has a high (alkaline) field pH of 9.5 to 11 and a typical total alkalinity of 10 to 11 meq/l. It is noteworthy that the water is very poor in calcium and magnesium (< 1 mg/l of each): this is most likely due to the high pH having caused these elements to precipitate out as carbonate minerals.

The very low sulphate and oxygen concentrations in the groundwater at BHE suggest highly reducing conditions. The very high methane concentrations confirm the very reducing nature of the water. There is thus a large contrast between the moderately brackish, highly reducing, sulphate-poor Corallian water and the sulphate rich, fresher, generally more oxidising waters of the superficial deposits.

### 3.3.3 Piper Diagram

The Piper diagram on Figure 4 illustrates the major ion composition of the water samples and indicates that the water from the monitoring points can be split into four main groups:

- The surface water monitoring points (S1 to S4) and the KMA Wellsite superficial deposits boreholes (BHA to BHC) have a very similar composition and can be described as calcium-bicarbonate type, which is indicative of reasonably fresh water from shallow systems. The boreholes have a slightly higher sulphate concentration than the surface water monitoring points, which is expected to originate from oxidation of sulphide minerals or dissolution of secondary sulphate minerals in the clay horizons encountered in the boreholes.
- The offsite superficial deposits/weathered Kimmeridge Clay boreholes (G2 to G6) and the Kimmeridge Clay borehole at the KMA Wellsite (BHD) have a sodium-bicarbonate type composition. The difference in composition indicates that the boreholes are targeting different (deeper) water bearing strata in comparison to the superficial deposits. This difference in composition suggests that the boreholes are drawing on deeper, more hydrochemically mature water, in comparison with the onsite superficial deposits boreholes. The chemical signature may reflect cation exchange processes or other preferential sodium accumulation processes.
- Groundwater from the Kimmeridge Clay borehole at Elm Tree Farm (G1) has a higher sulphate concentration than the offsite superficial boreholes and can be described as having a sodium-sulphate type

composition. The source of the sulphide is likely to be either oxidation of sulphide minerals in the clay, or dissolution of secondary sulphate minerals. Overall, the water from the borehole is more mineralised.

- Groundwater from the Corallian Group borehole (BHE) has a higher chloride concentration than the other monitoring points and can be described as having a sodium-chloride type composition. The water has a relatively high mineralisation and salinity, which is indicative of the deep and confined nature of the Corallian limestone at this location. The low sulphate and oxygen concentrations, coupled with the elevated dissolved methane content, suggest that the water is highly reducing in nature.

#### 3.3.4 Hydrocarbons including Methane

A key aspect of the baseline water quality programme is the analysis of dissolved hydrocarbons, including methane. Results from the water sampling carried out by Third Energy are presented in Appendix E & F by carbon banding. Dissolved methane has been analysed in all groundwater samples and isotopic methane analysis has been carried out on four sets of samples between March 2016 and June 2016 to investigate methane provenance.

Dissolved methane concentrations in the groundwater samples from boreholes targeting the superficial deposits and Kimmeridge Clay range between 1 µg/l to 3 mg/l. It would appear that the higher concentrations are from the deeper boreholes. Methane concentrations in the Corallian borehole at the KMA Wellsite (BHE) are in the region of 60 mg/l. The highest values should be treated with some caution as they are outside the calibration limits of the analytical equipment; however, concentrations are clearly higher in the confined Corallian than in any of the other monitoring boreholes.

Concentrations of dissolved ethene, ethane, propane and butane were generally below the laboratories' limits of analytical detection, with the exception of the Corallian borehole (BHE), where ethane concentrations of around 8-10 µg/l were recorded.

The results of the methane isotope analysis (Appendix E) exhibit a significant degree of variation. Although alternative explanations are plausible, the majority of methane isotopic signatures suggest that the methane has a thermogenic provenance, i.e. derived from the breakdown ("cracking") of organic matter (kerogens) at high temperature and pressure, probably at depth. It should be noted, however, that some of the methane isotopic signatures from BHE are isotopically "light" and may be ascribable to a biogenic origin.

Aside from light hydrocarbons (methane to butane; C1-C4) discussed above, the results show that low concentrations of heavier dissolved hydrocarbons (often referred to as petroleum hydrocarbons TPH) have been observed in some of samples from the surface water and groundwater monitoring points during the period of monitoring. However, since March 2016 and the change in laboratory, there have been no detections of the heavier petroleum-range dissolved hydrocarbons at any of the monitoring locations.

#### 3.3.5 Micro-constituents

Appendix F also provides data on a number of micro-constituents. The reported values are consistent between sampling rounds and monitoring locations. Low concentrations of sodium persulphate and anionic surfactants have been detected during some sampling rounds in the KMA Wellsite monitoring boreholes but have not been analysed at offsite locations.

### 3.4 Comparison of Third Energy Baseline Data with BGS Baseline Data

The data collected across the monitoring period has been compared against the data collected by the BGS as part of their Baseline Survey within the Vale of Pickering.

The major ion data for the surface water features and the superficial deposits/Kimmeridge Clay monitoring locations have been plotted as boxplots on Figure 6 for all of the KMA monitoring rounds, together with the BGS baseline data from July 2016. The boxplots illustrate the range of parameter concentrations, with the “box” showing the central 50% of the data, with a blue line at the median value. The whiskers show the upper and lower 25% of the data range.

The boxplots illustrate the range of parameter concentrations. Figure 6 demonstrates that the results obtained from the KMA monitoring rounds for the surface waters and the superficial deposits correspond with the BGS data.

Methane data for the superficial deposits/Kimmeridge Clay monitoring locations has been plotted as charts on Figure 7 for all of the KMA monitoring rounds and compared against available BGS baseline data. Again, there is a good correlation between the data collected by Third Energy and the BGS.

The BGS data currently available for the Corallian Group in the Vale of Pickering is primarily from the unconfined Corallian on the margins of the Vale of Pickering. At this stage, it is not therefore possible to compare these data to the results from the Corallian borehole at the KMA Wellsite.

## **4 SUMMARY**

Third Energy has collected over 18 months of baseline water quality data from a range of surface water and groundwater features at and close to the KMA Wellsite. There is a good correspondence between the Third Energy data and the data that are being collected by the BGS as part of their own baseline water quality monitoring programme.

The baseline data shows clear chemical signatures for waters from different provenances; and monitoring points can be grouped together on this basis.

There have been some detections of trace dissolved components (e.g. sodium persulphate and anionic surfactants) in groundwater from the monitoring boreholes at the KMA wellsite. Further sampling and analysis will be required to ascertain if these components are also present at off-site monitoring locations.

There is a large range of dissolved methane concentrations across the monitoring points. Although the methane isotopic results are not unequivocal, they predominantly suggest a thermogenic origin. The highest concentration of dissolved methane (around 60 mg/l) is found in the Corallian borehole (BHE), along with typically c. 8-10 µg/l dissolved ethane.

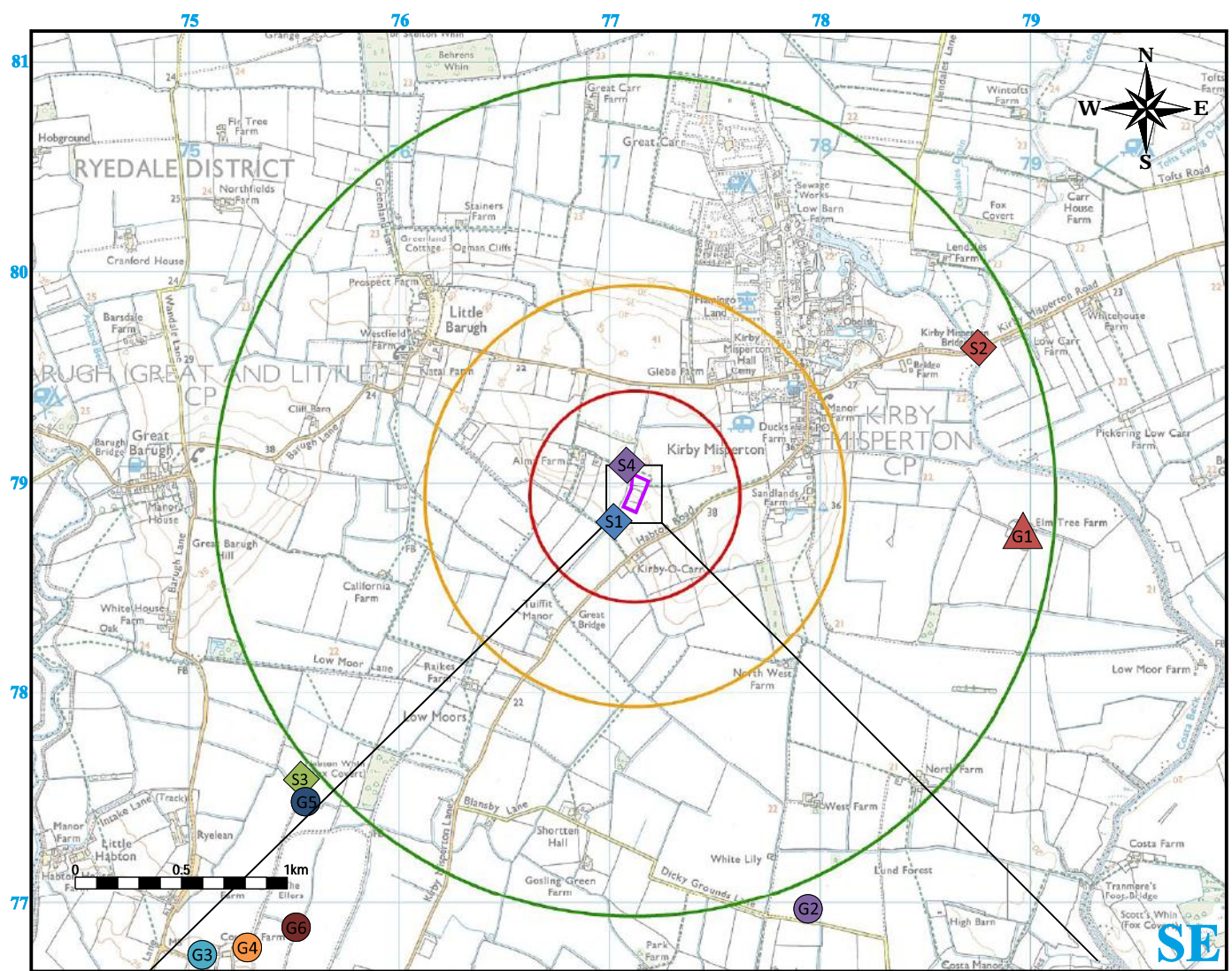
Low concentrations of heavier dissolved hydrocarbons have been observed in some of the samples from the surface water and groundwater monitoring points during the period of monitoring but there have been no detections since March 2016.

**Envireau Water**  
**08/09/2017**

## 5 REFERENCES

- Ref.1 Kirby Misperton A Wellsite, Permit number EPR/DB3002HE. Environment Agency, 11/04/16.
- Ref.2 KM8 – Fracture Propagation. Technical Note prepared by Envireau Water, November 2015.
- Ref.3 Baseline Water Quality, KM8 Well, Kirby Misperton A Wellsite, North Yorkshire. Prepared by Envireau Water for Third Energy UK Gas Ltd, May 2015.
- Ref.4 As Built Construction Report, KM8 Well, Kirby Misperton A Wellsite, North Yorkshire. Prepared by Envireau Water for Third Energy UK Gas Ltd, July 2016. Reissued September 2017.
- Ref.5 Groundwater and Surface Water Sampling Protocol. Prepared by Envireau Water for Third Energy UK Gas Ltd, October 2016.
- Ref.6 Roberts H. M. and Shiller A.M., 2015. Determination of dissolved methane in natural waters using headspace analysis with cavity ring-down spectroscopy. *Analytica Chimica Acta*, 856:68-73.

## **FIGURES**



Scale 1 : 30,000 (at A3)

## KEY

- KMA Wellsite boundary
- 500 m Radius
- 1 km Radius
- 2 km Radius

## Monitoring Points:

### Surface Waters:

- ◆ S1 Sugar Hill Downstream
- ◆ S2 Costa Beck
- ◆ S3 Ackland Beck
- ◆ S4 Sugar Hill Upstream

### Superficial Deposits

- G2 West Farm
- G3 The Villa
- G4 Coultas Farm
- G5 Habton Whin
- G6 The Ellers

### Kimmeridge Clay:

- ▲ G1 Elm Tree Farm

## KMA Wellsite

## Monitoring Points:

### Superficial Deposits:

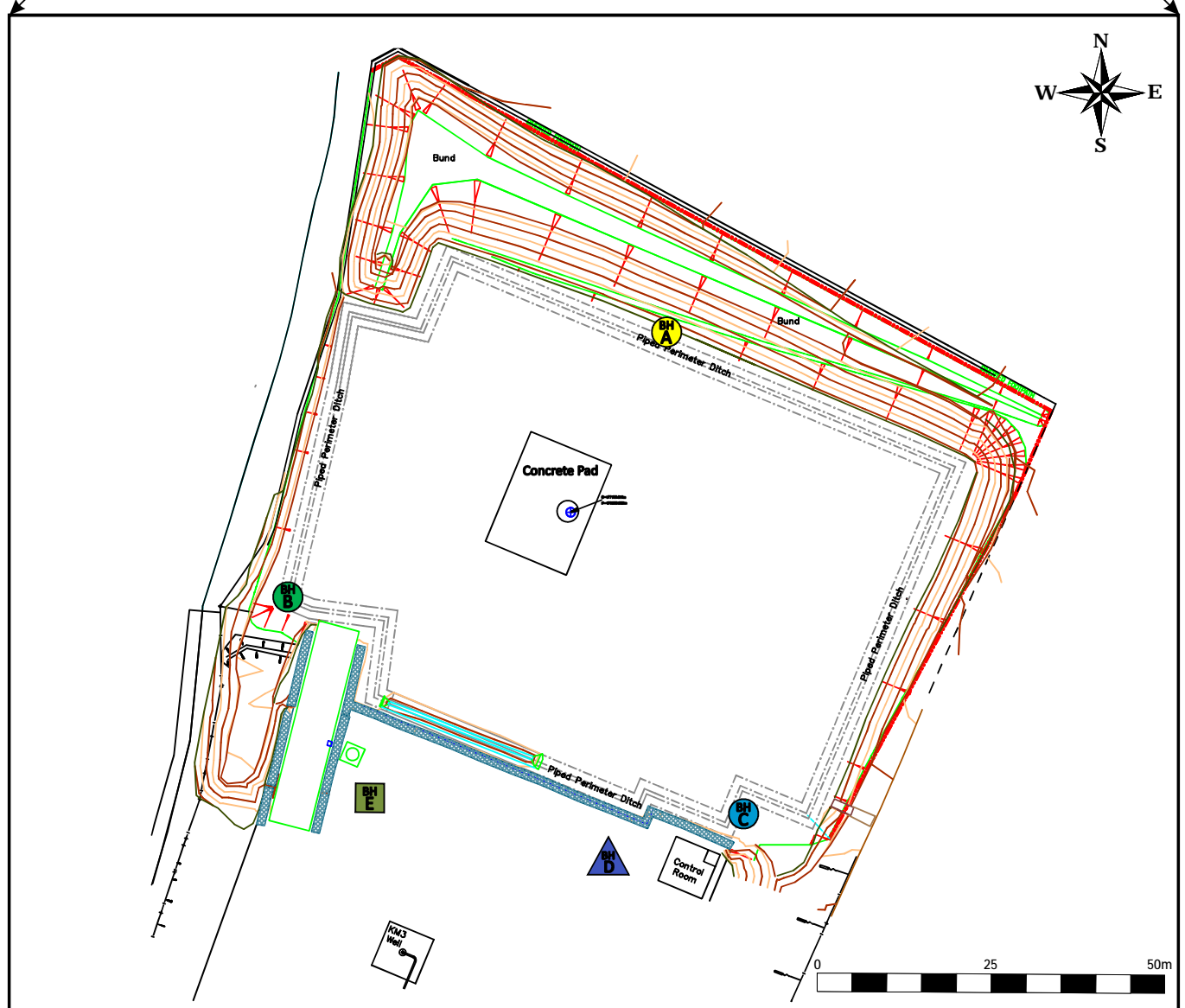
- BH A Borehole A
- BH B Borehole B
- BH C Borehole C

### Kimmeridge Clay:

- ▲ BH D Borehole D

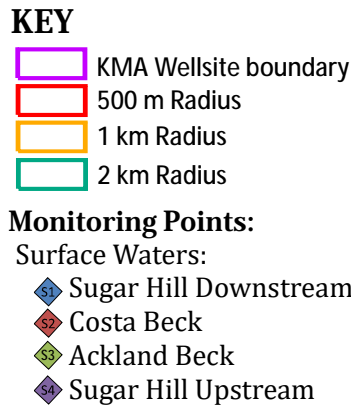
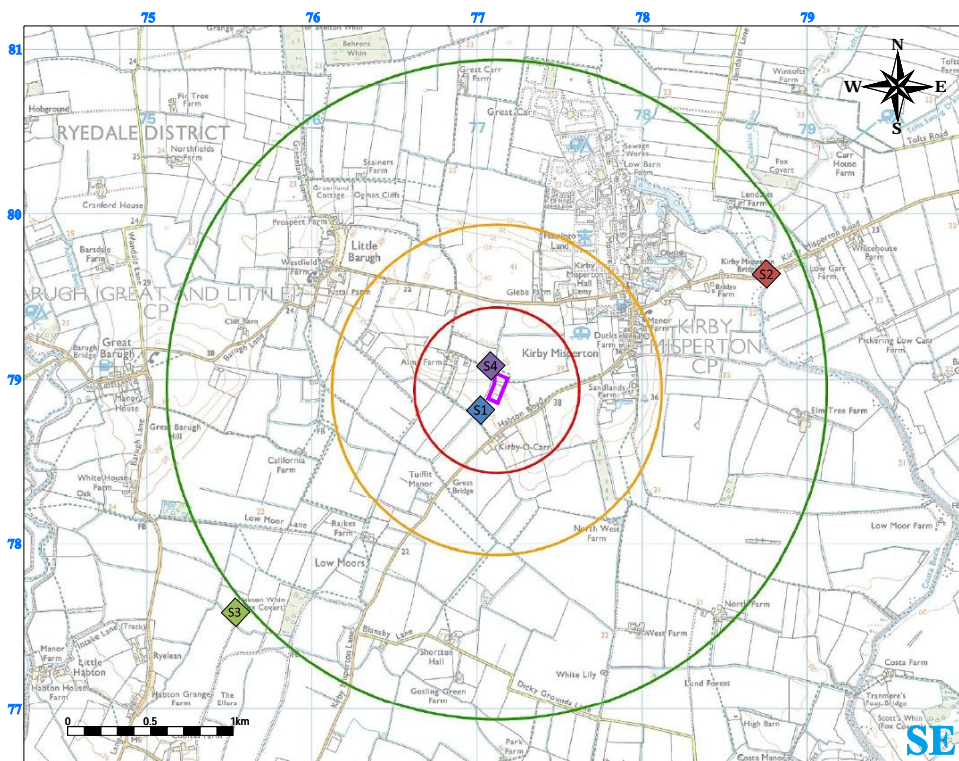
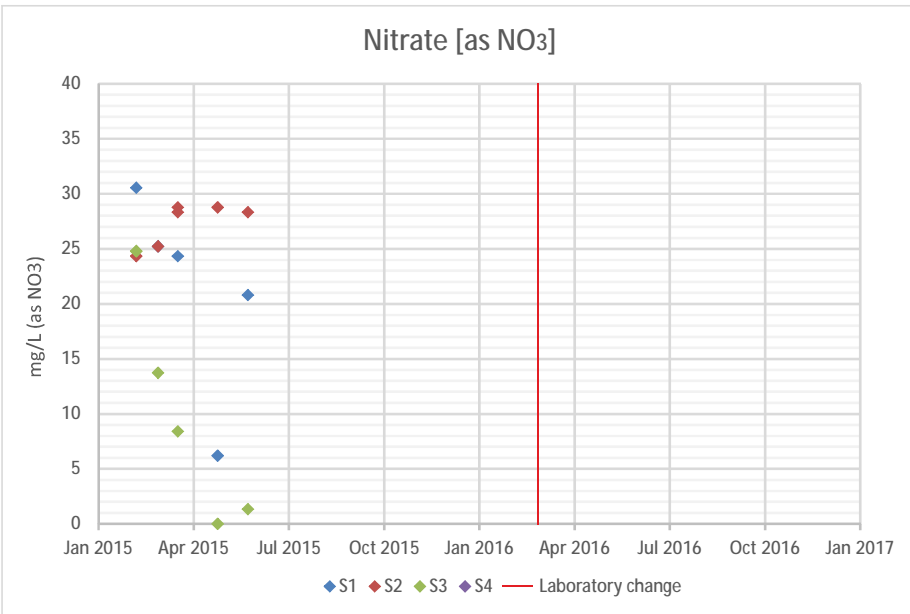
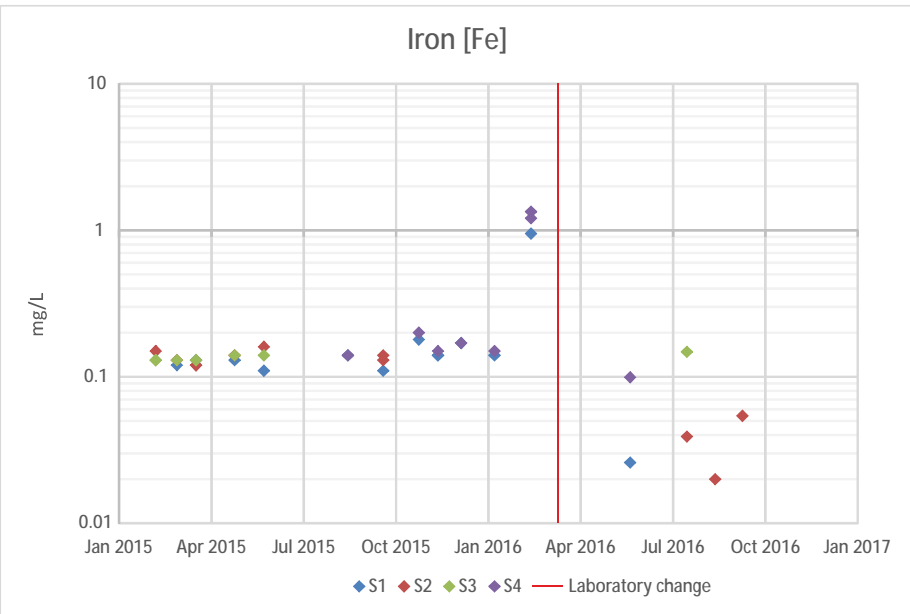
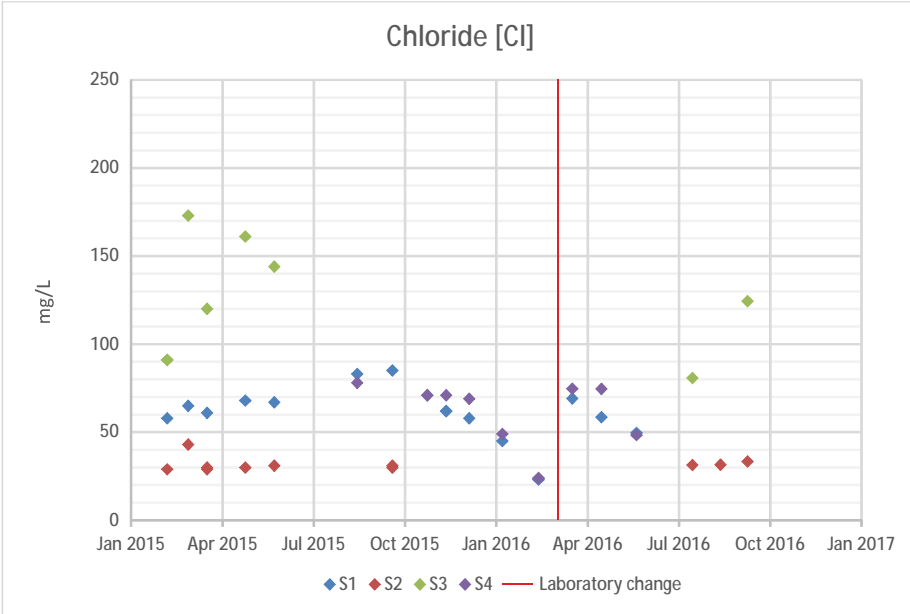
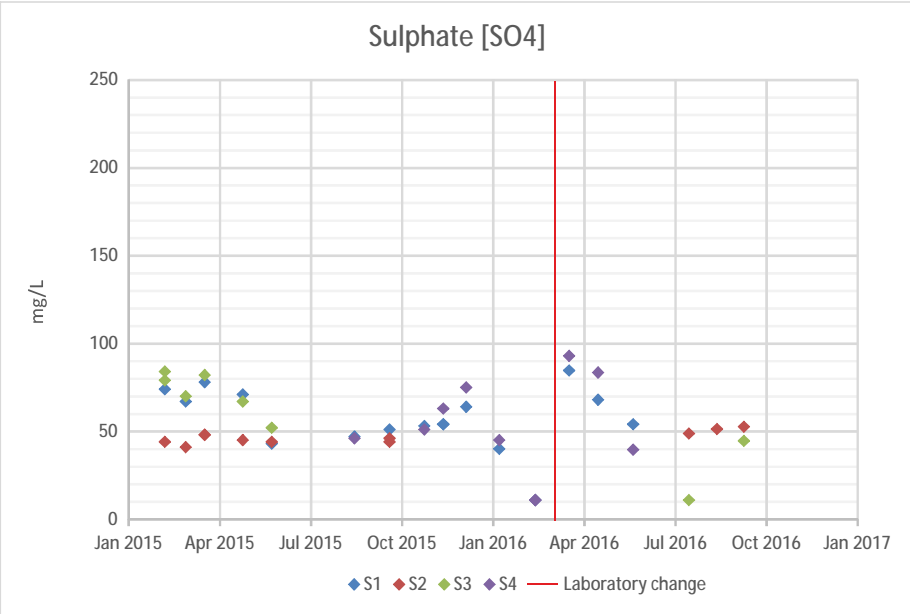
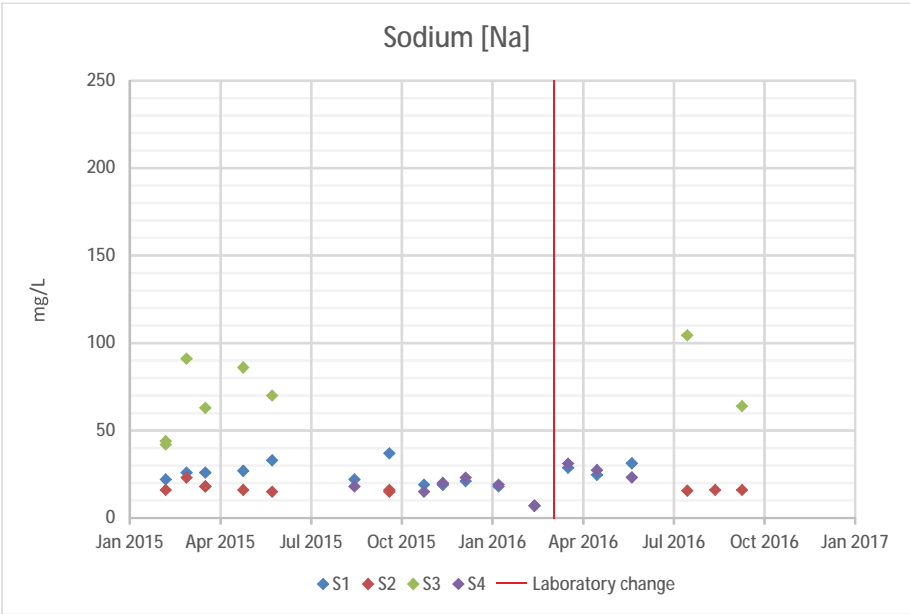
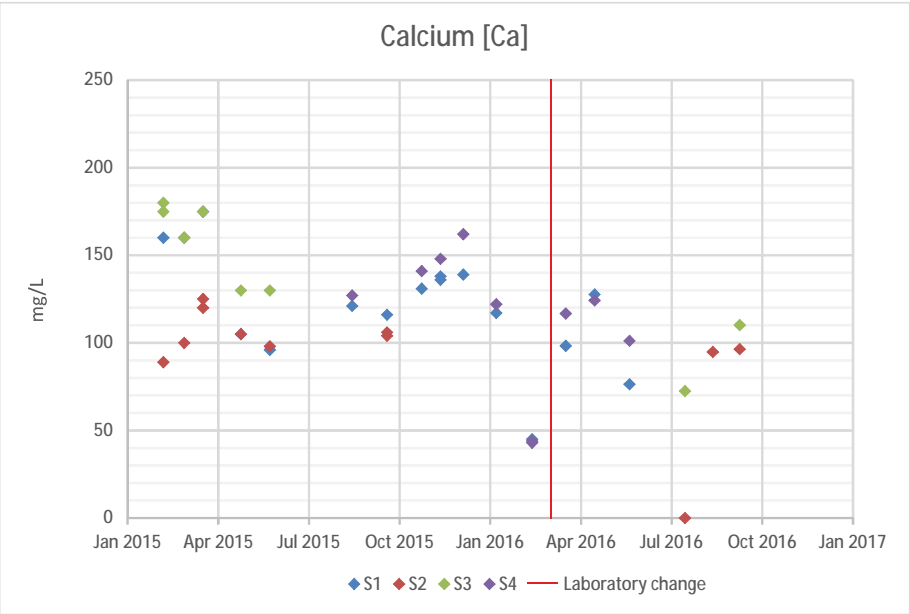
### Corallian Group:

- BH E Borehole E



Scale 1 : 1,000 (at A3)

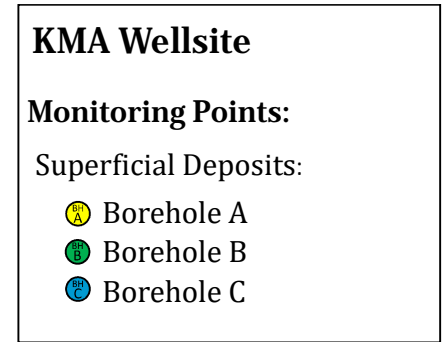
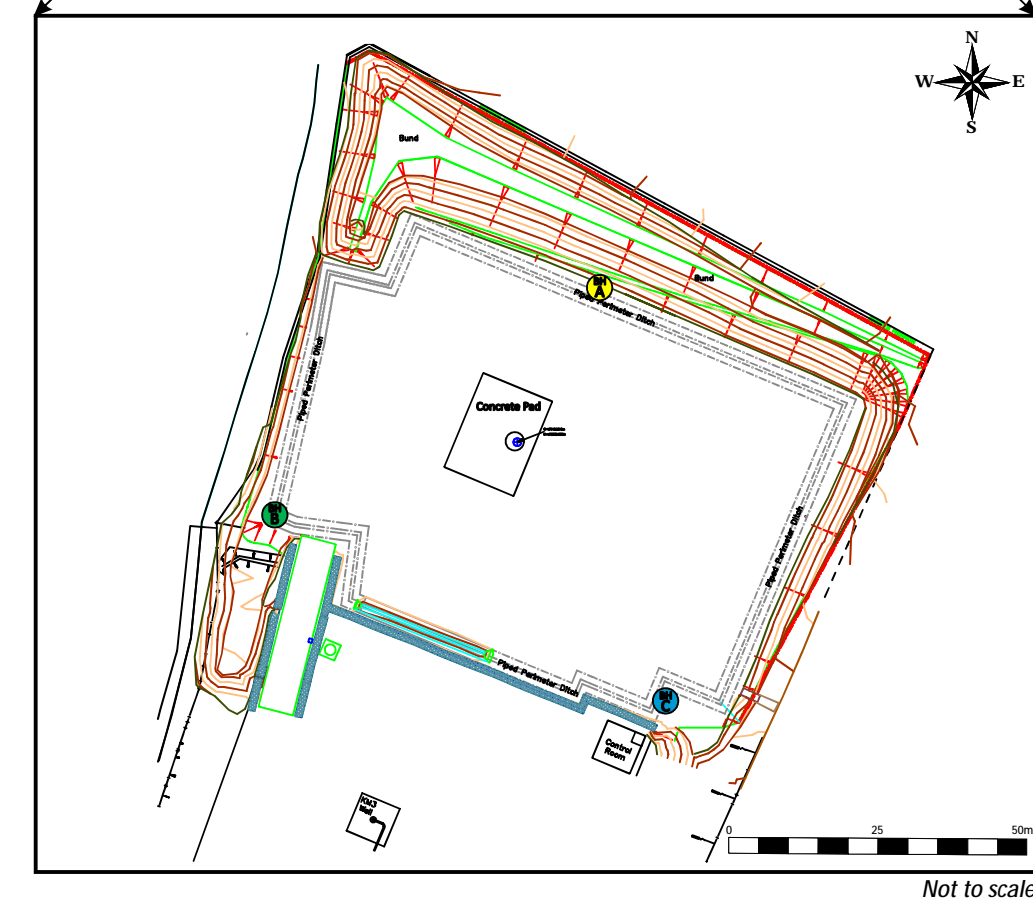
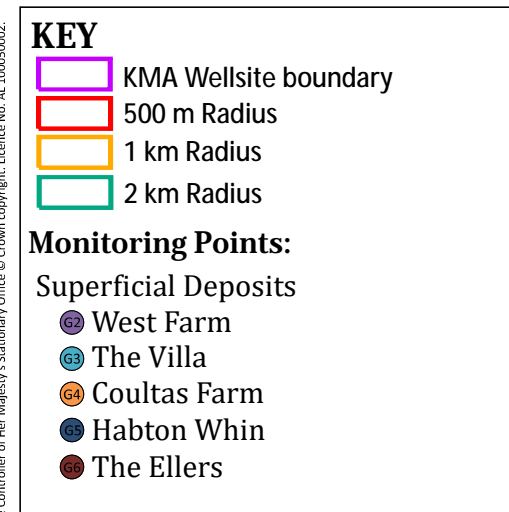
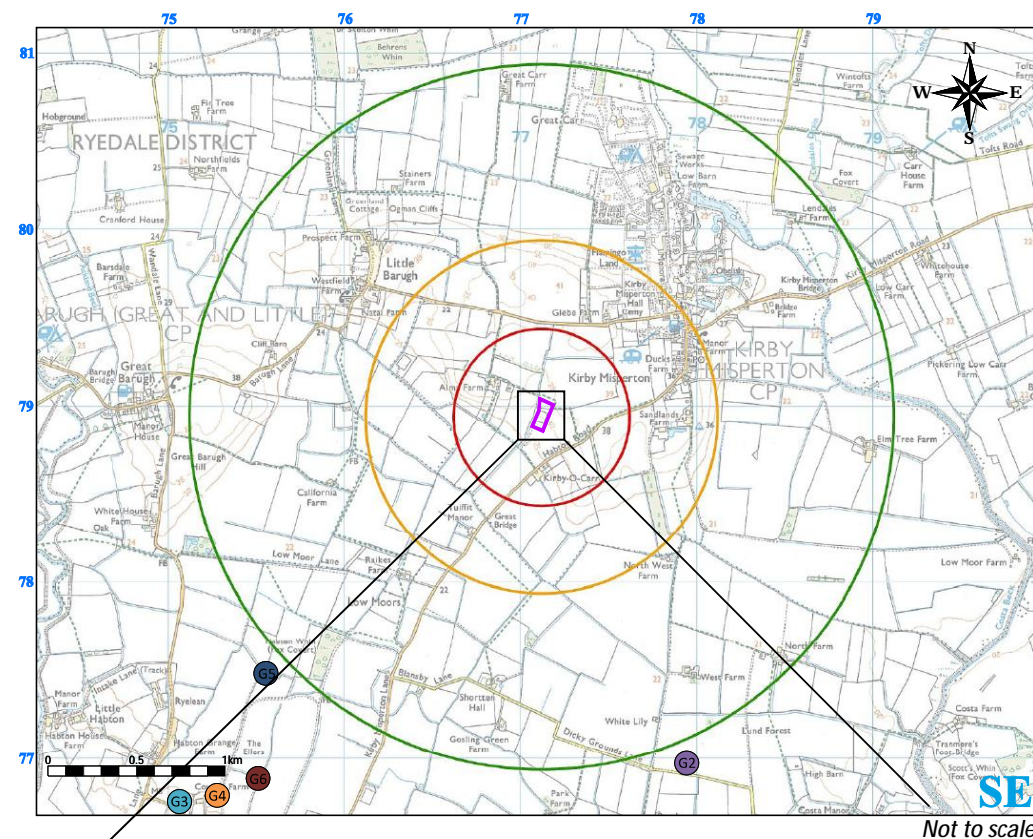
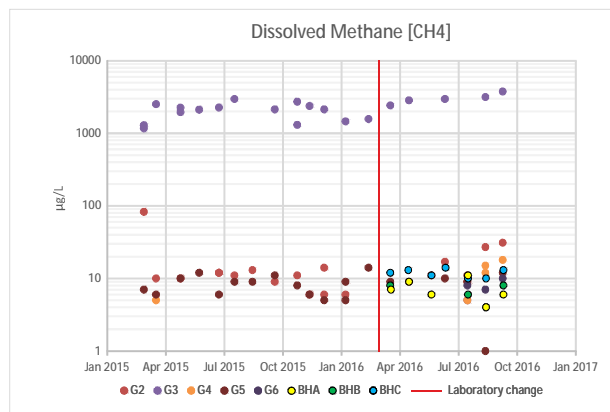
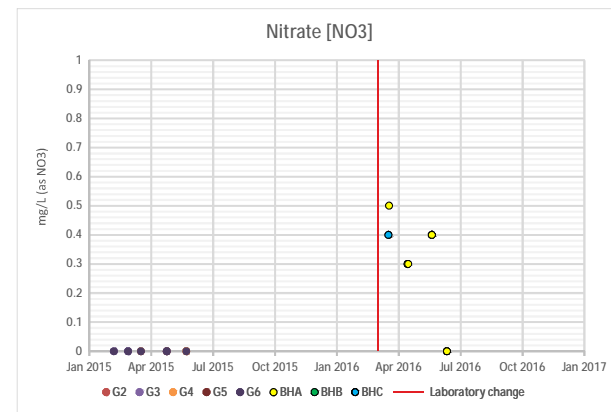
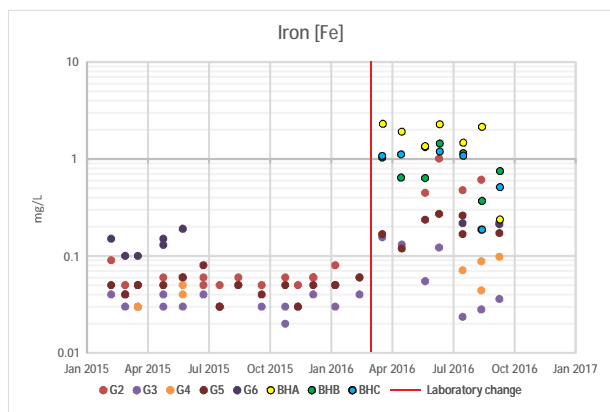
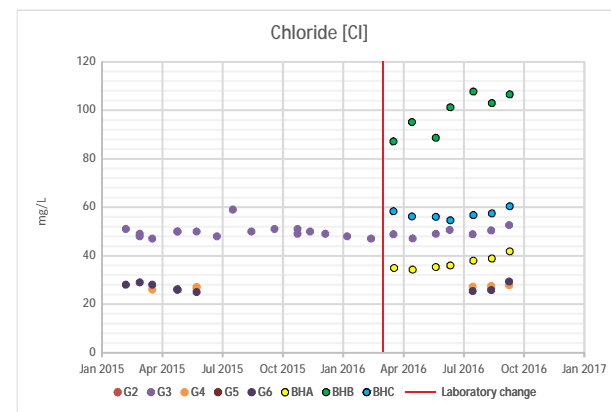
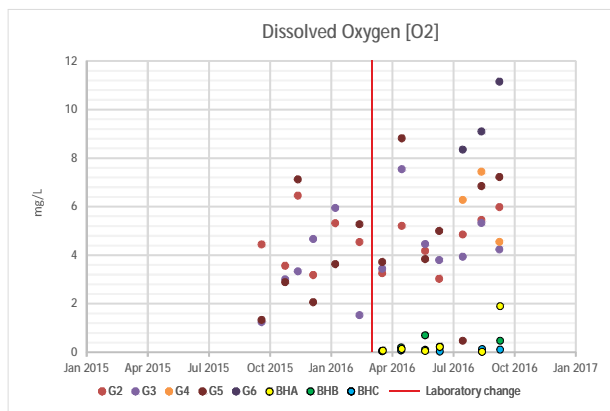
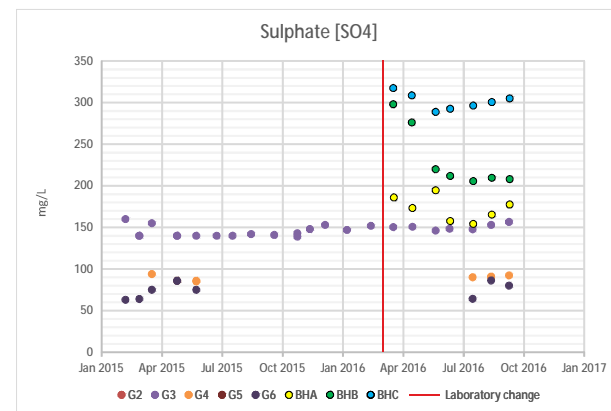
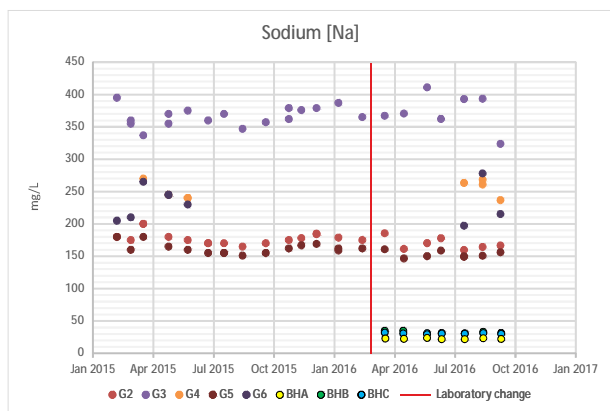
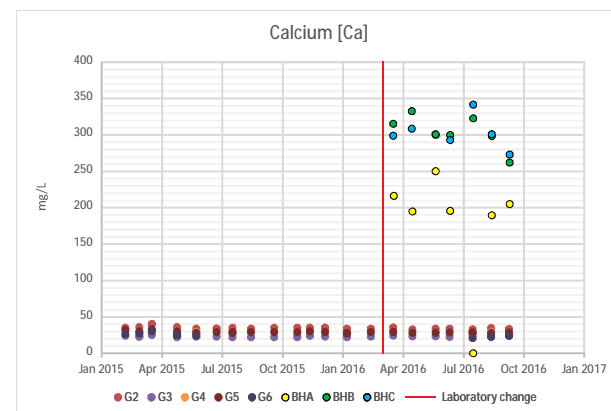


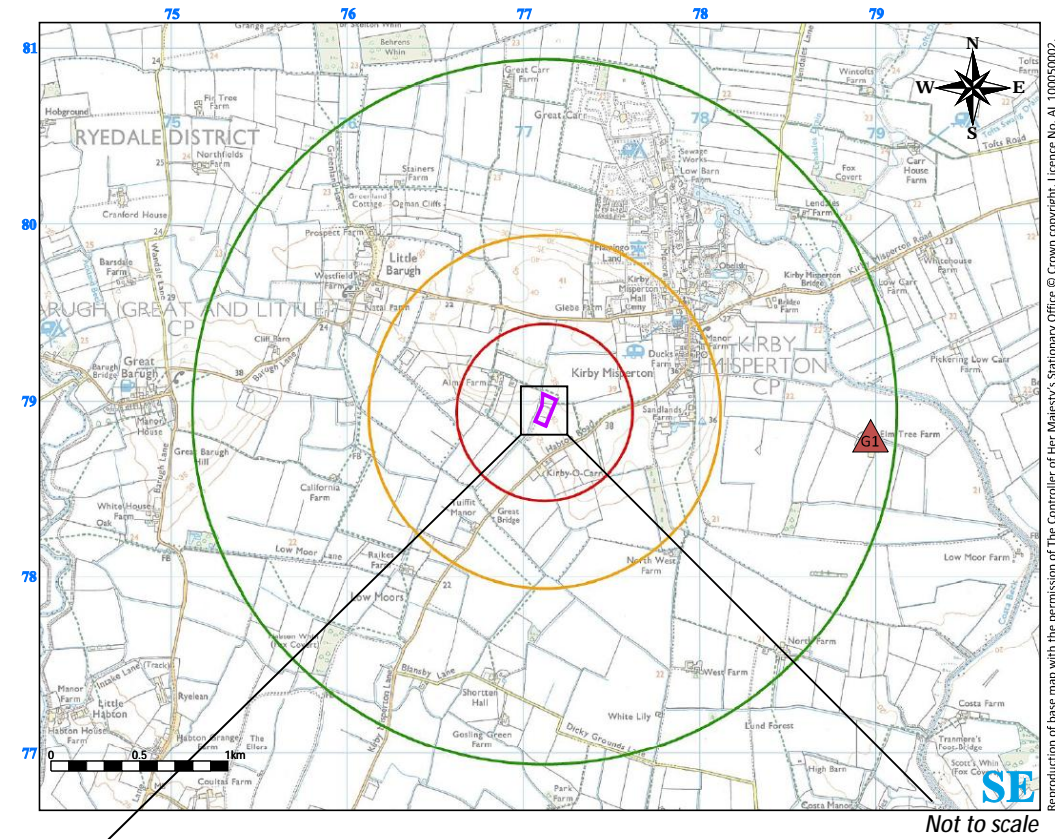
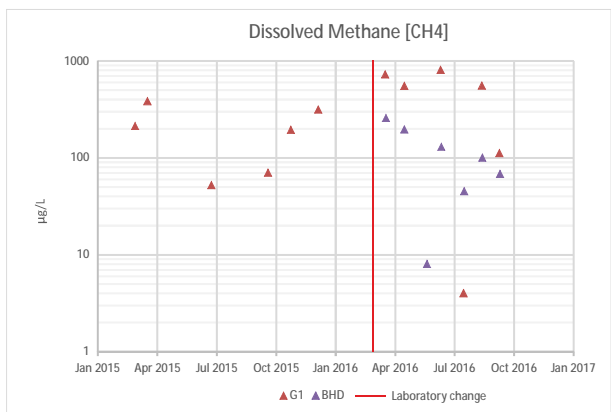
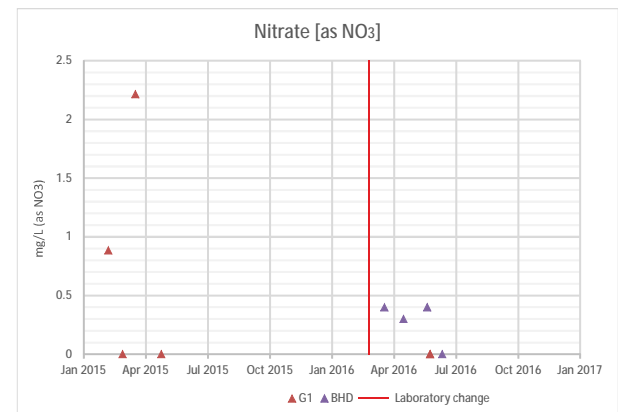
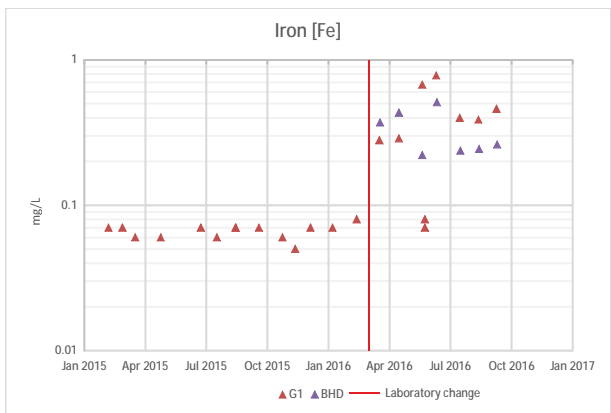
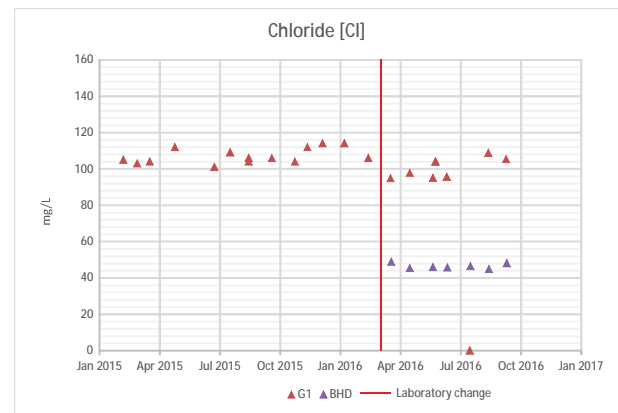
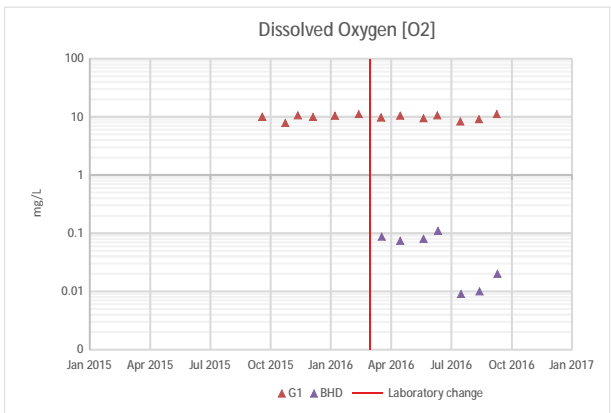
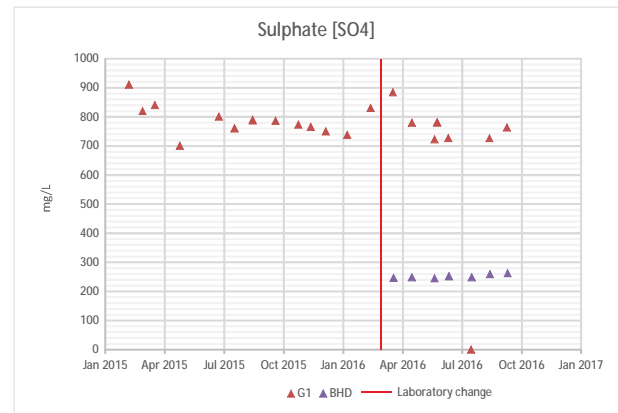
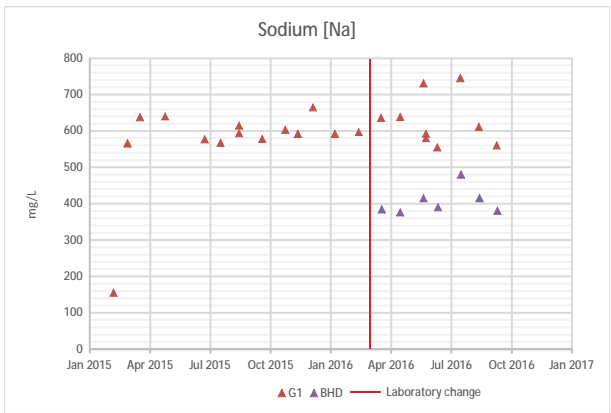
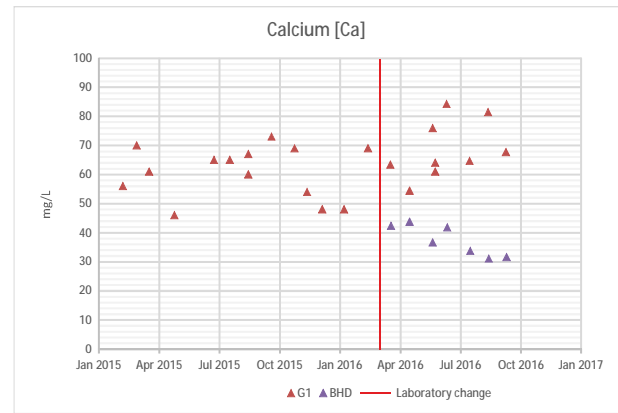


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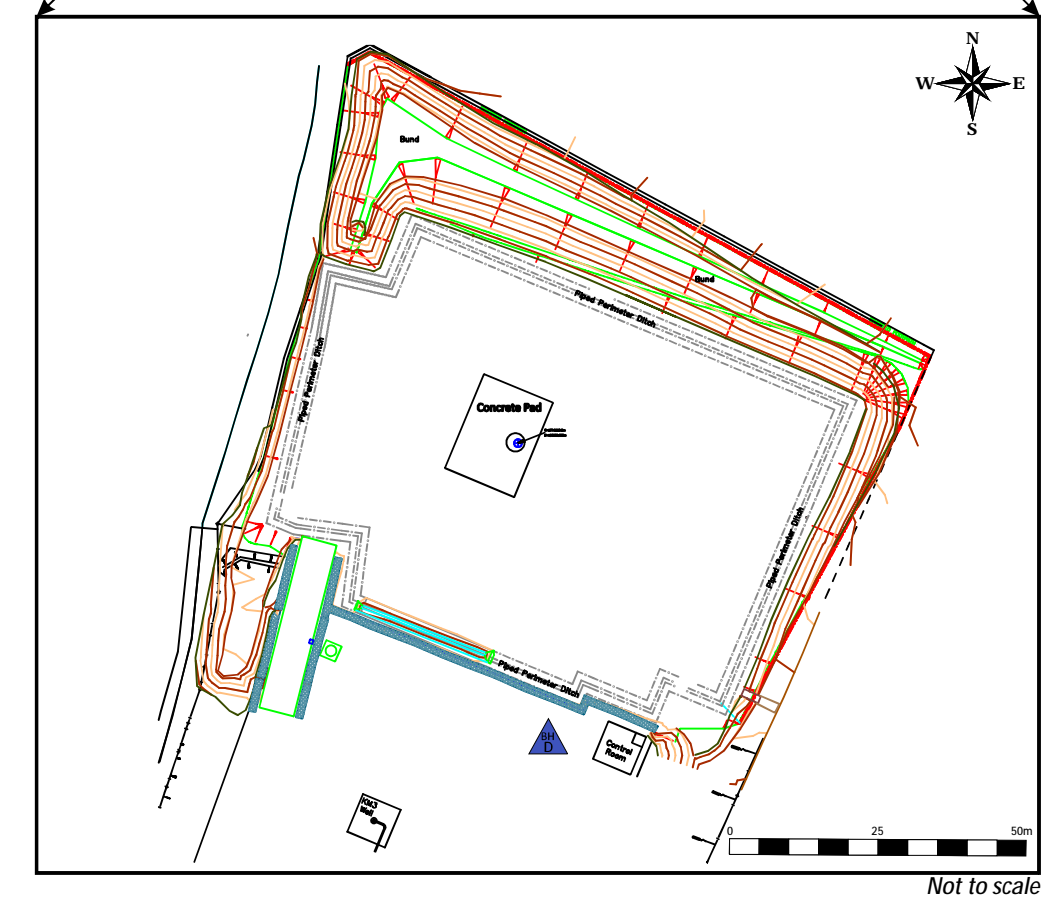
**KEY**

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- 500 m Radius
- 1 km Radius
- 2 km Radius

**Monitoring Points:**

Kimmeridge Clay:

- Elm Tree Farm



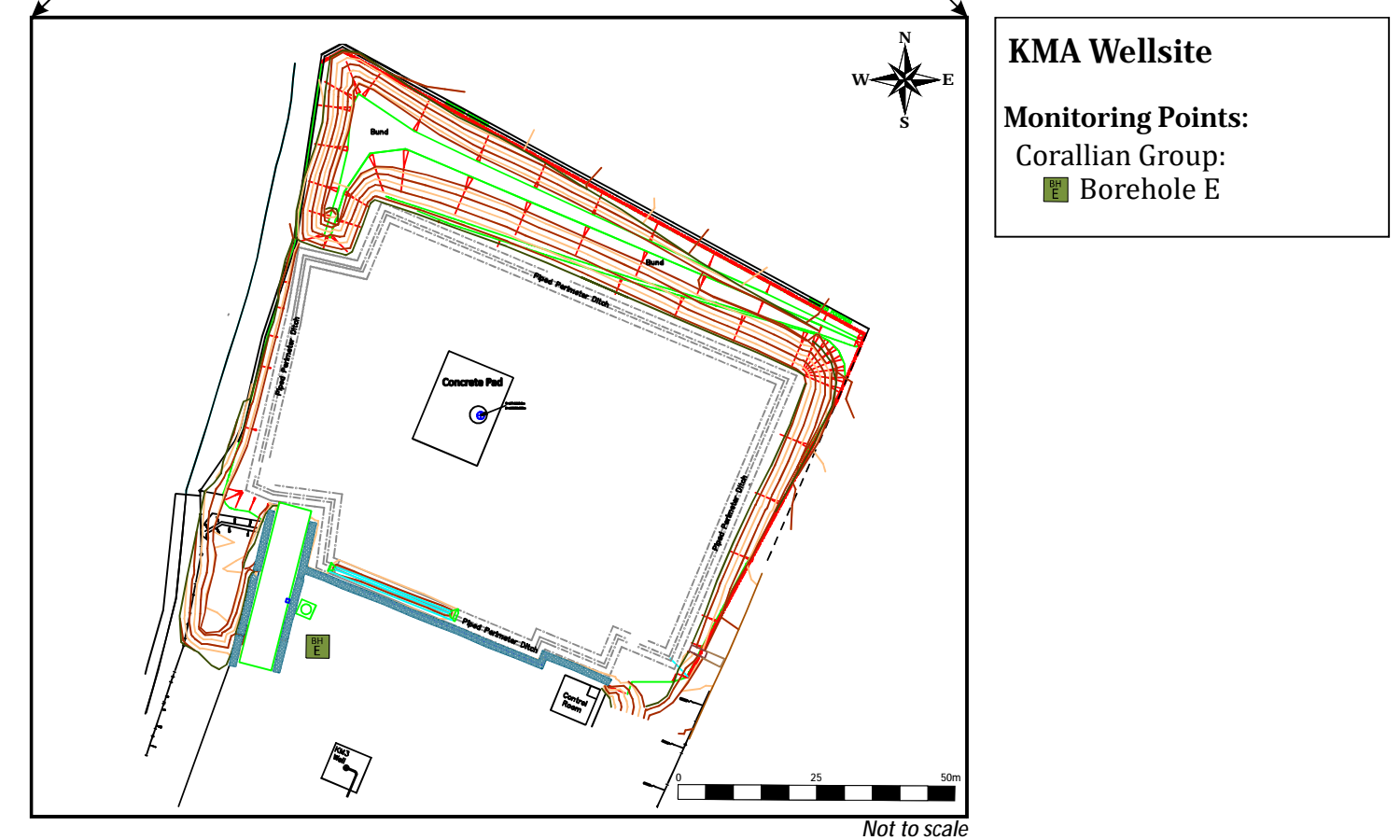
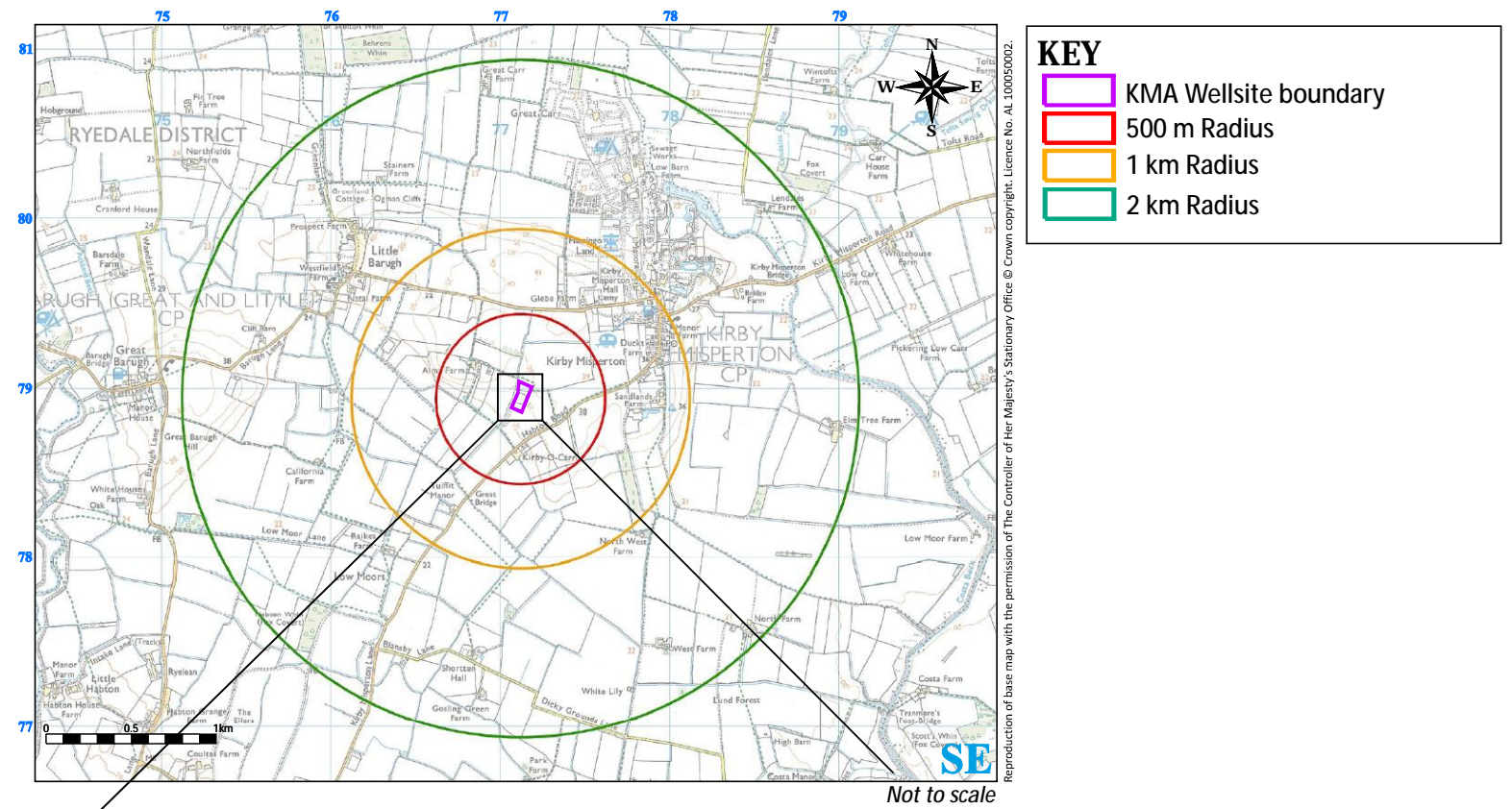
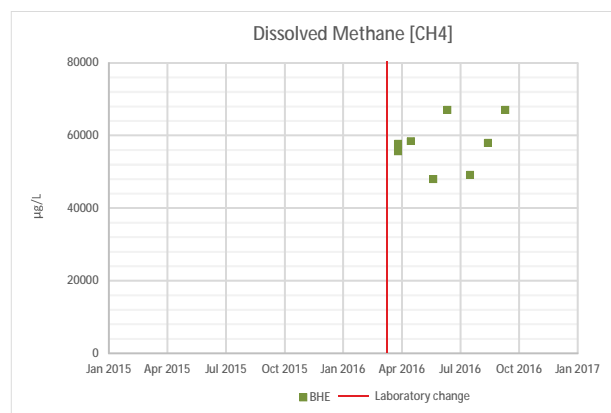
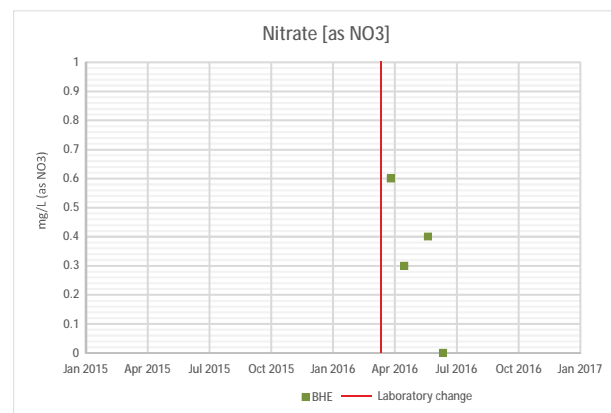
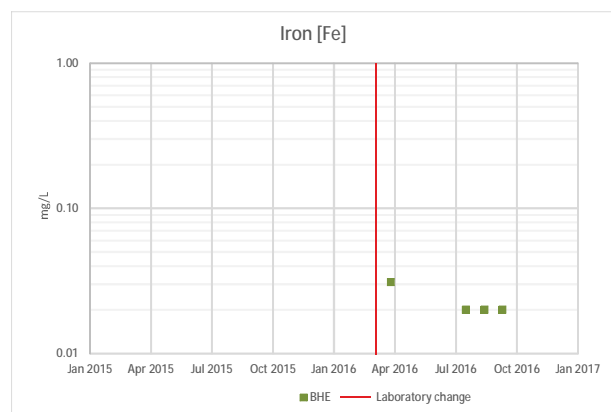
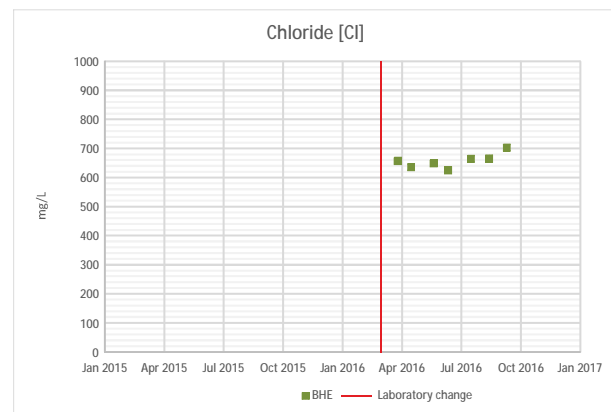
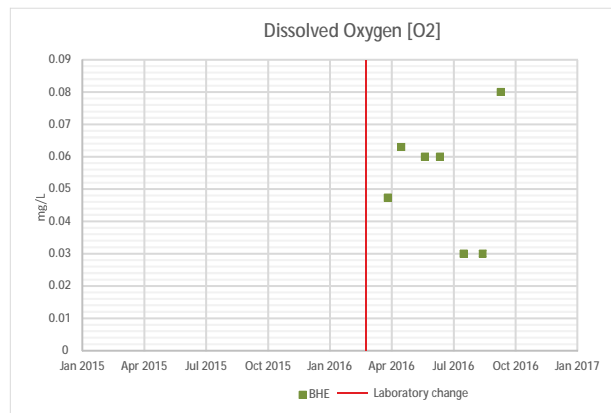
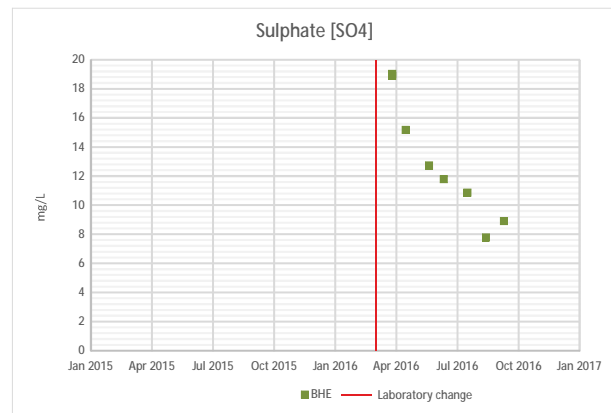
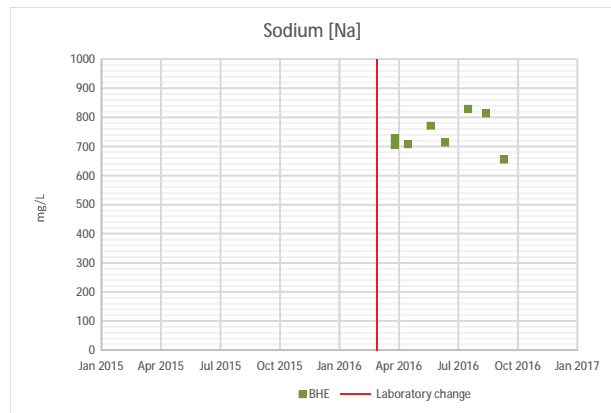
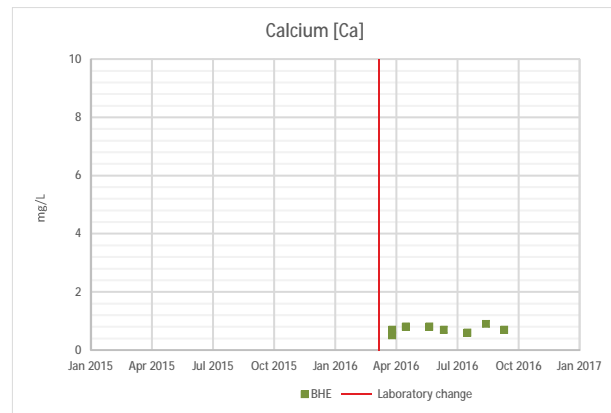
**KMA Wellsite**

**Monitoring Points:**

Kimmeridge Clay:

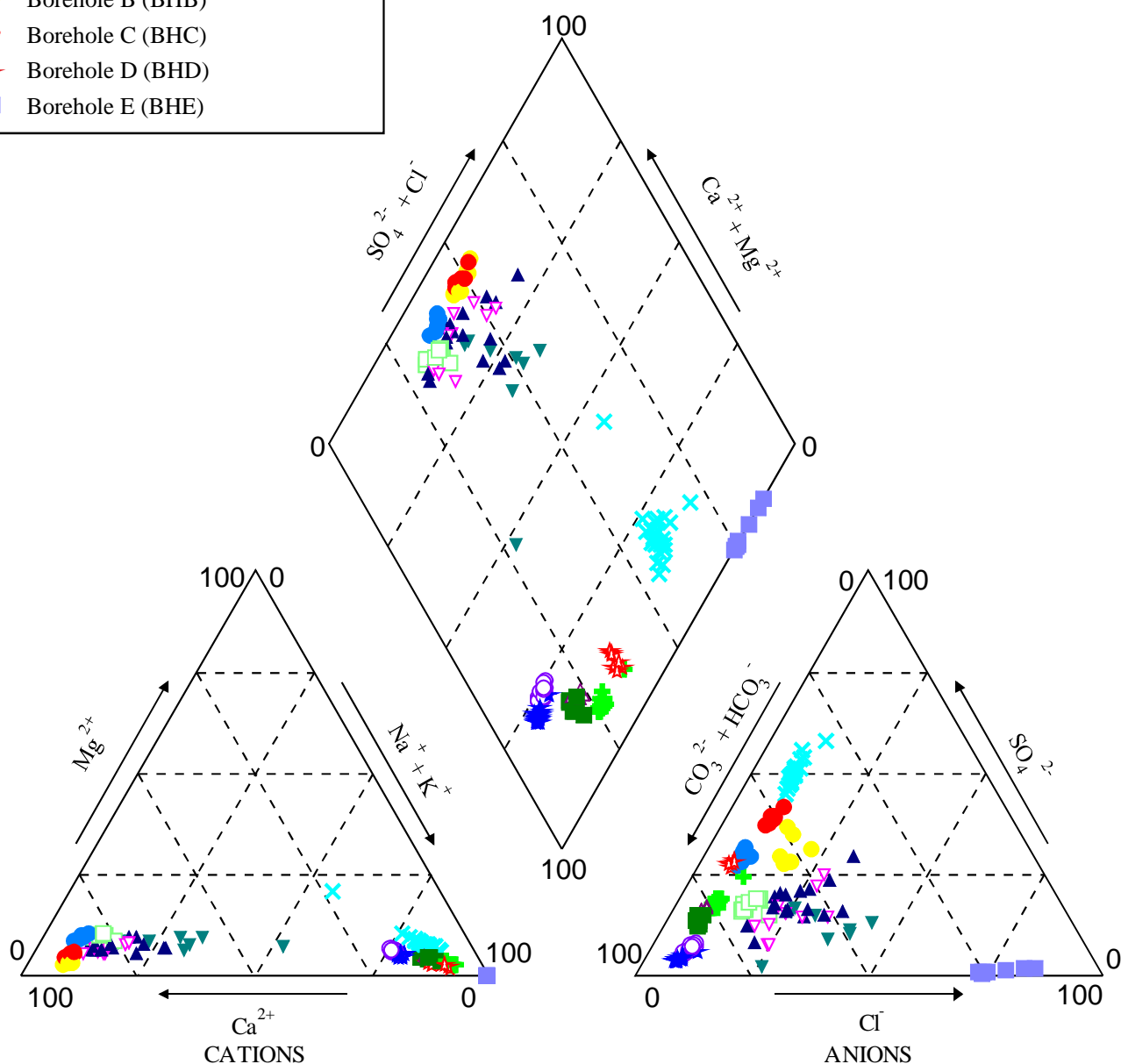
- Borehole D





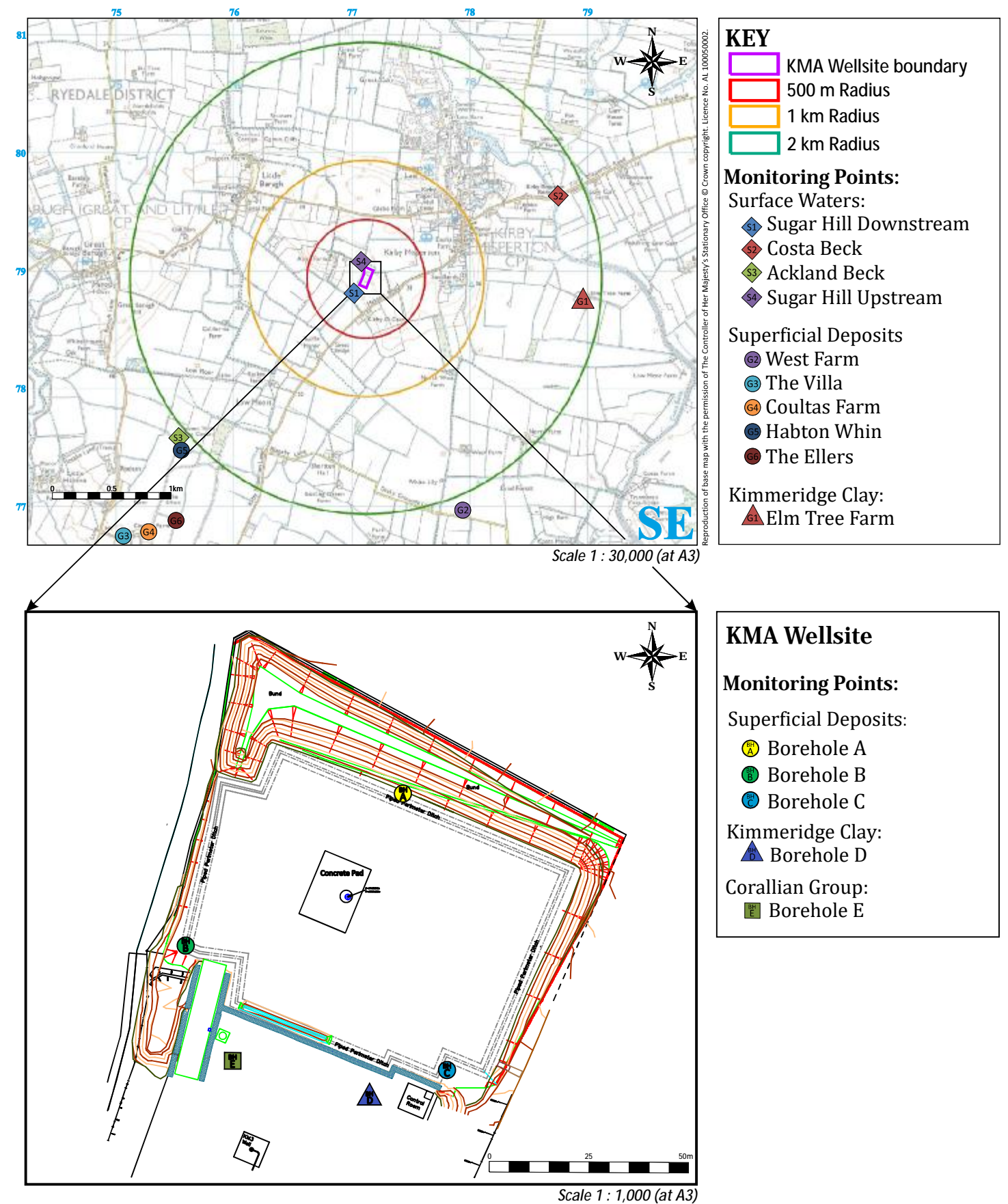
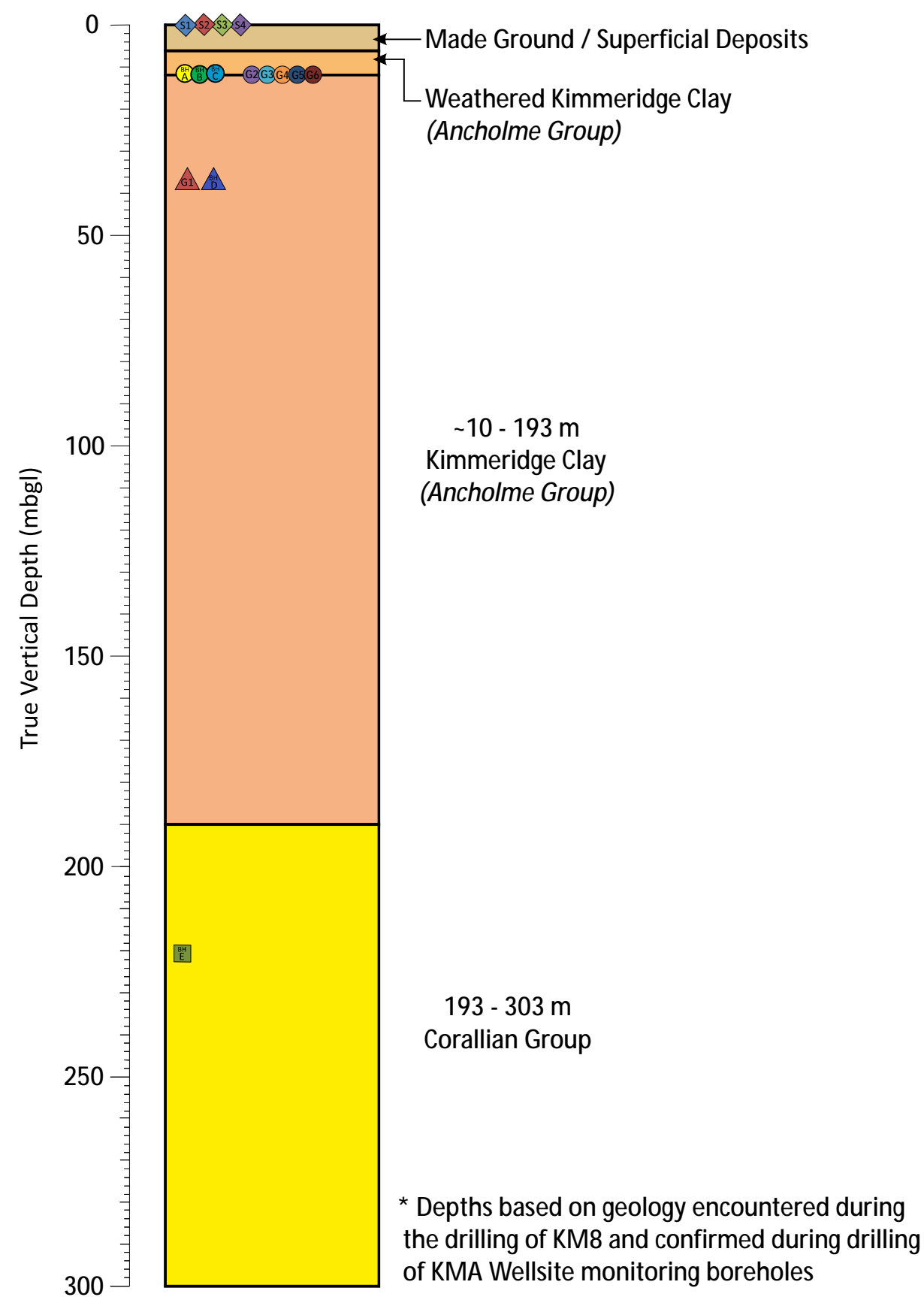
## KEY

- ▲ Sugar Hill Drain Downstream (S1)
- Costa Beck (S2)
- ▼ Ackland Beck (S3)
- ▽ Sugar Hill Drain Upstream (S4)
- ✕ Elm Tree Farm (G1)
- West Farm (G2)
- ✚ The Villa (G3)
- △ Coultas Farm (G4)
- ★ Habton Whin (G5)
- The Ellers (G6)
- Borehole A (BHA)
- Borehole B (BHB)
- Borehole C (BHC)
- ★ Borehole D (BHD)
- Borehole E (BHE)



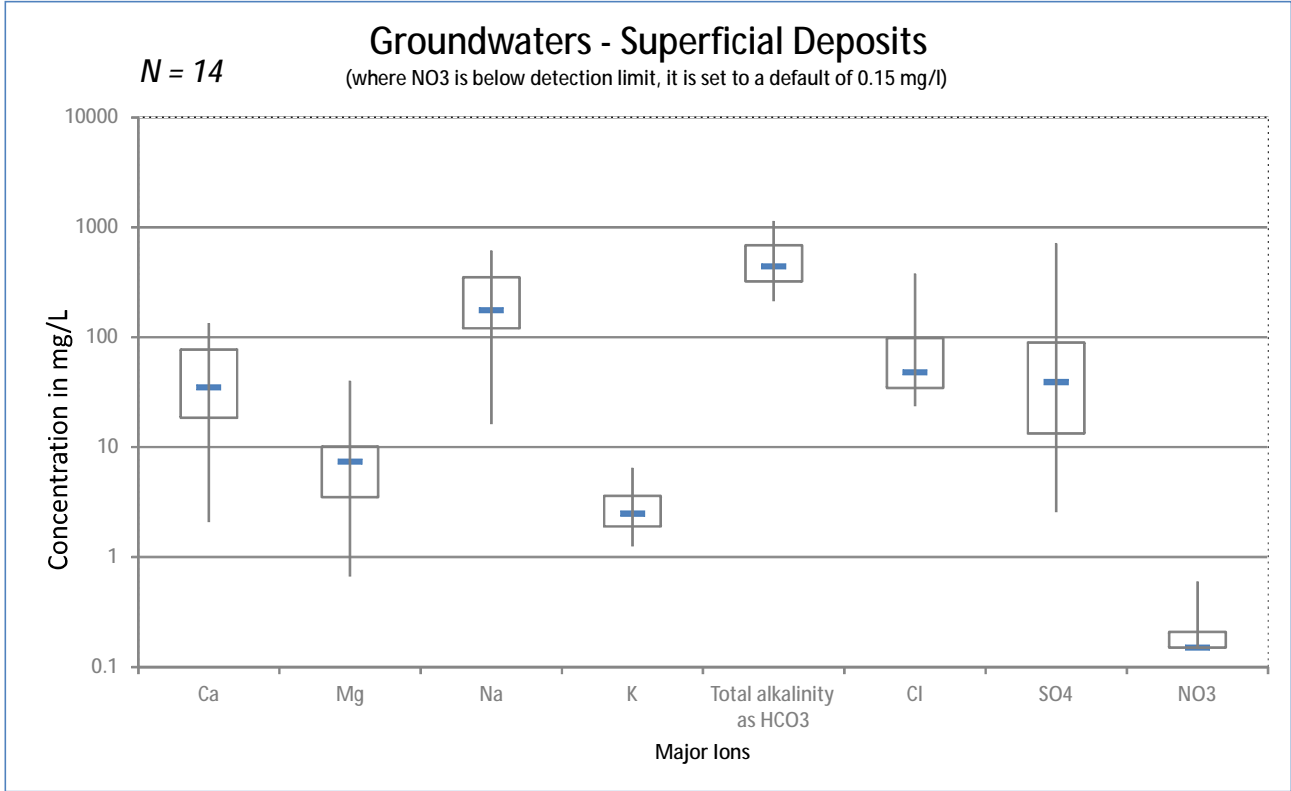
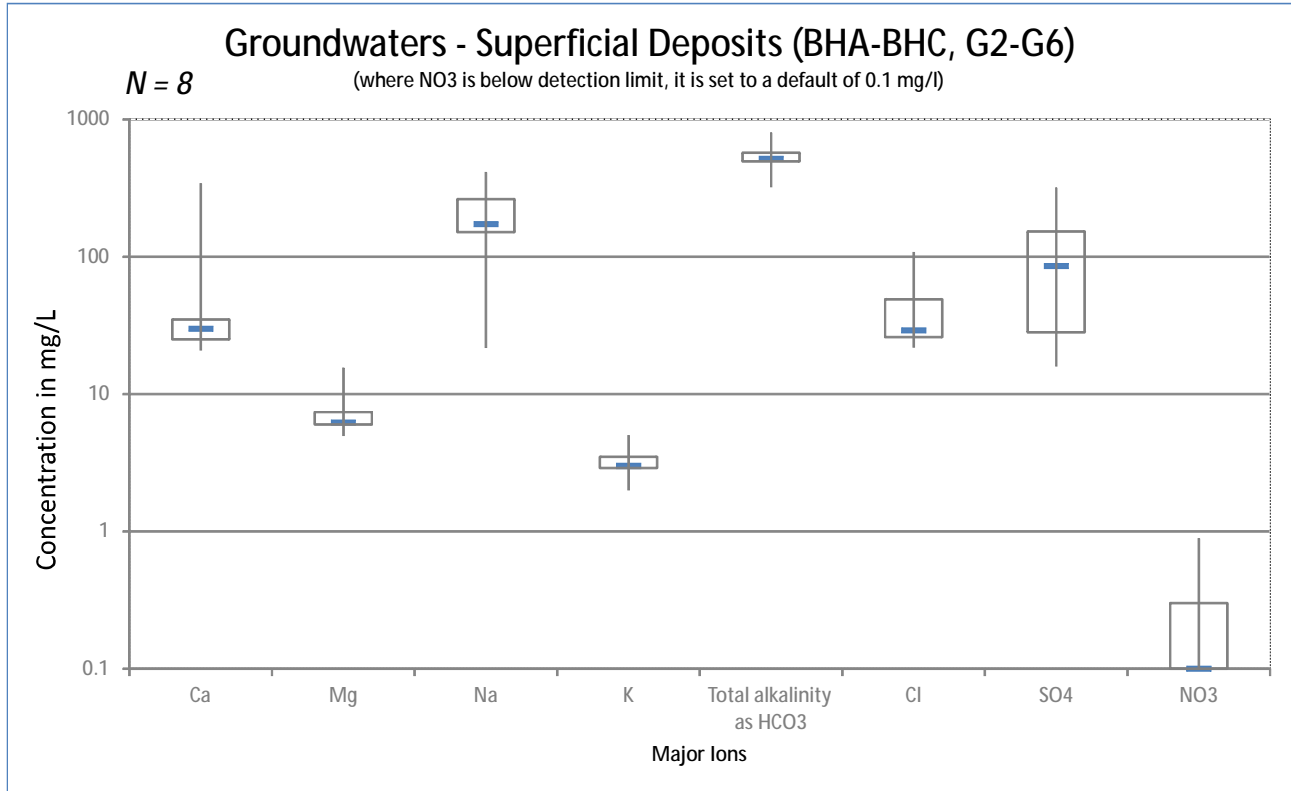
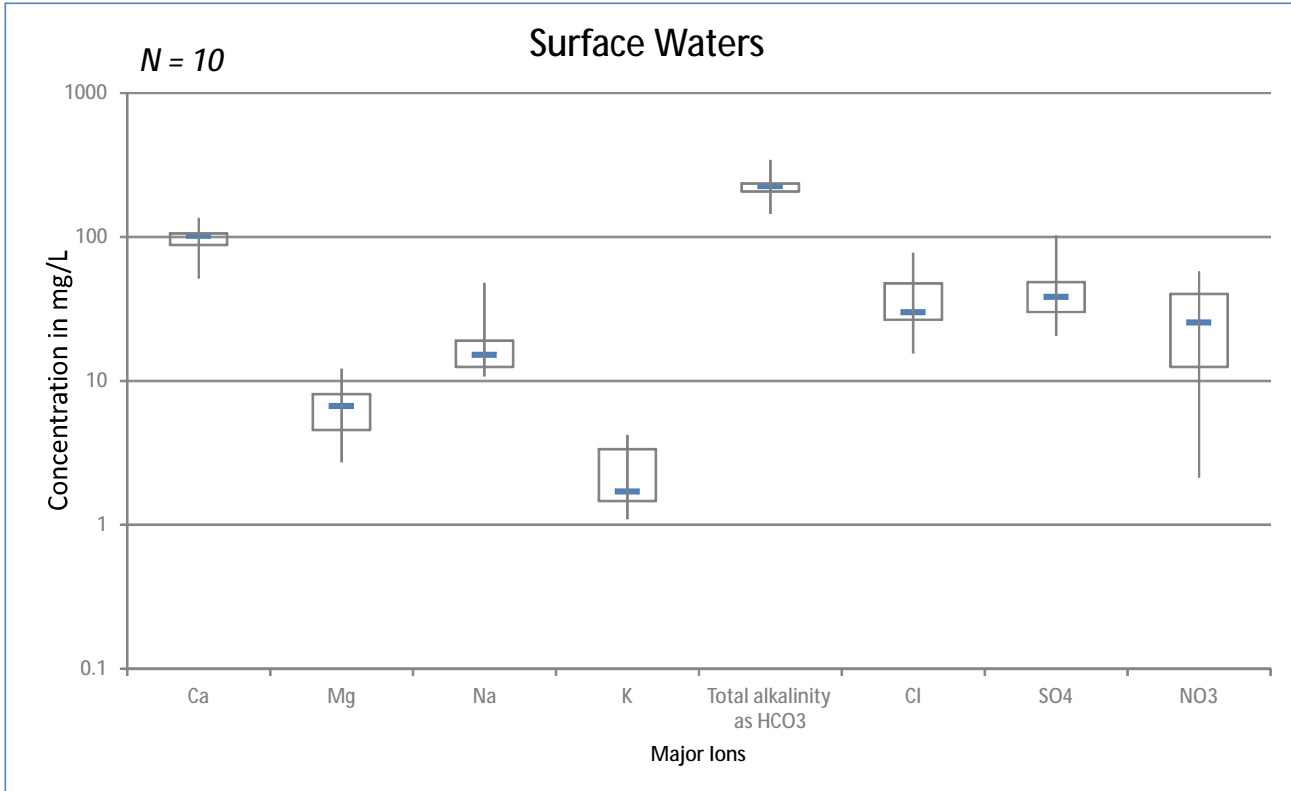
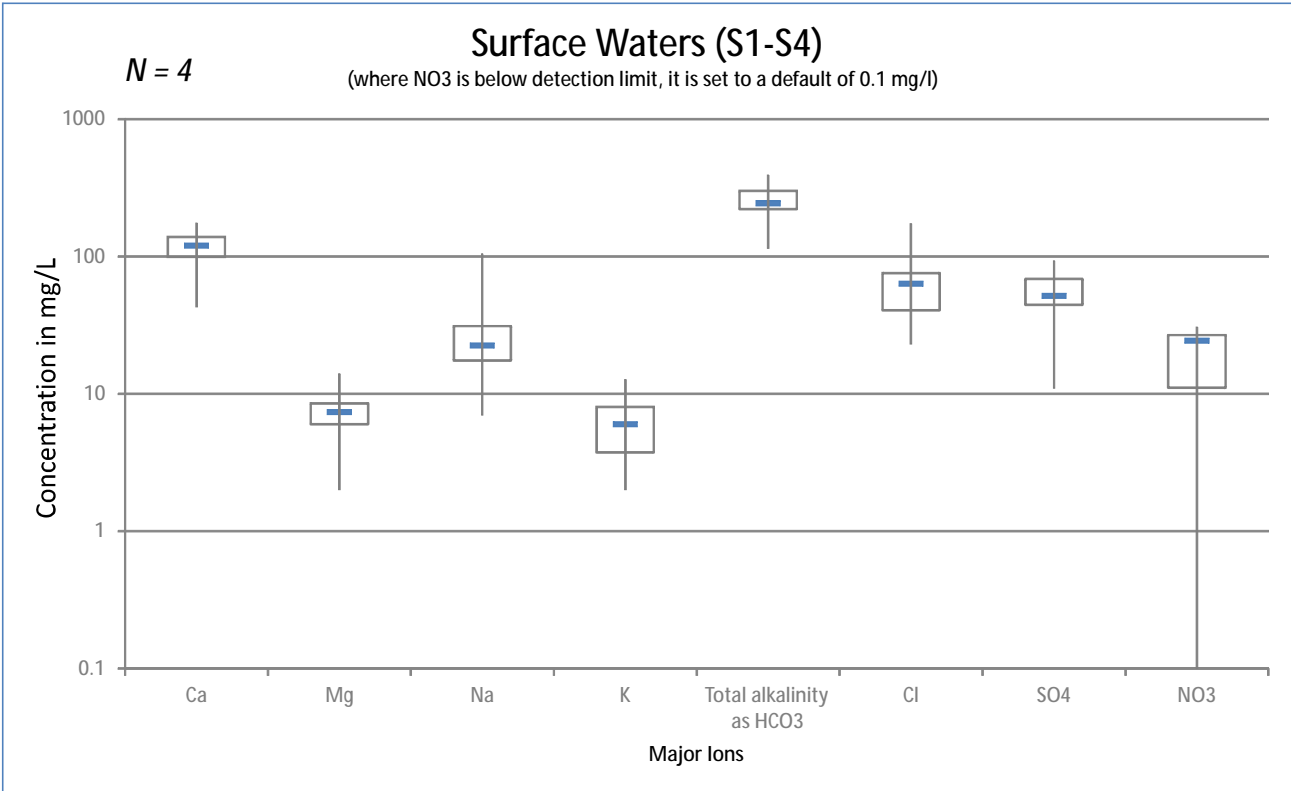
The Piper diagram is a common presentation, used to plot the relative proportions (in milliequivalents per litre) of the major cations and anions (Na<sup>+</sup>, Ca<sup>++</sup>, Mg<sup>++</sup>, K<sup>+</sup>, Cl<sup>-</sup>, SO<sub>4</sub><sup>=</sup> and HCO<sub>3</sub><sup>-</sup>) in a water sample





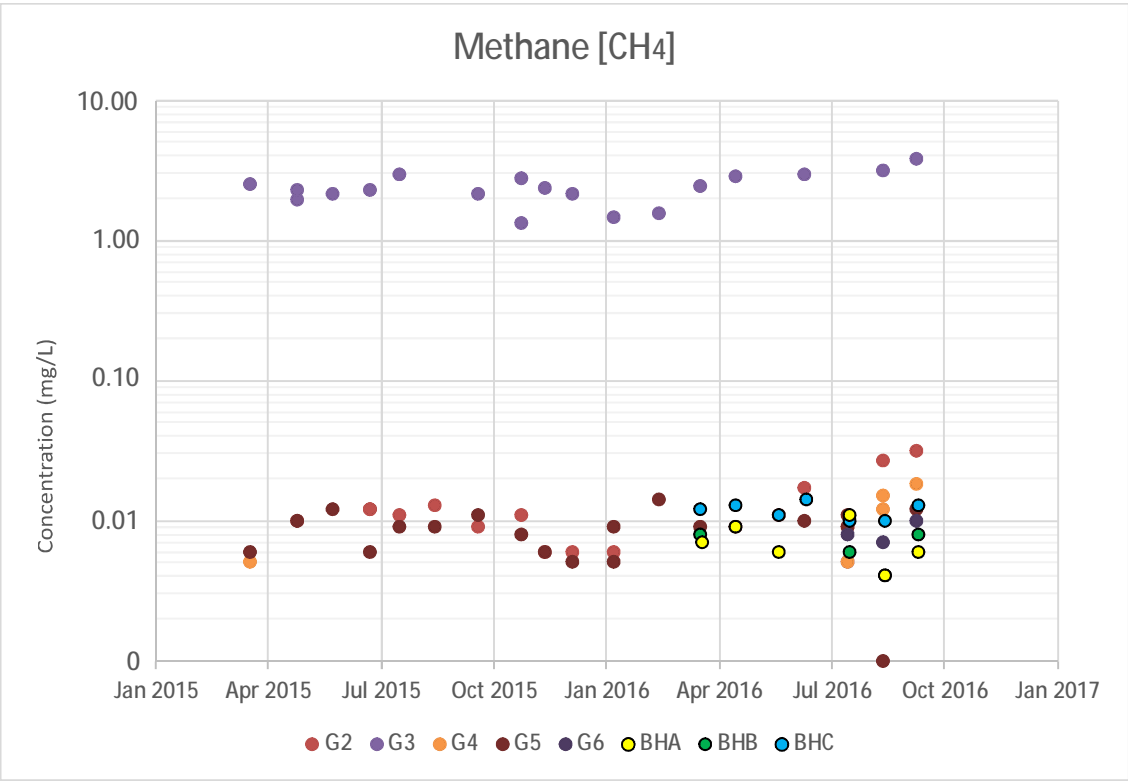
Envireau Water Data from February 2015 - September 2016

BGS Data from September 2015

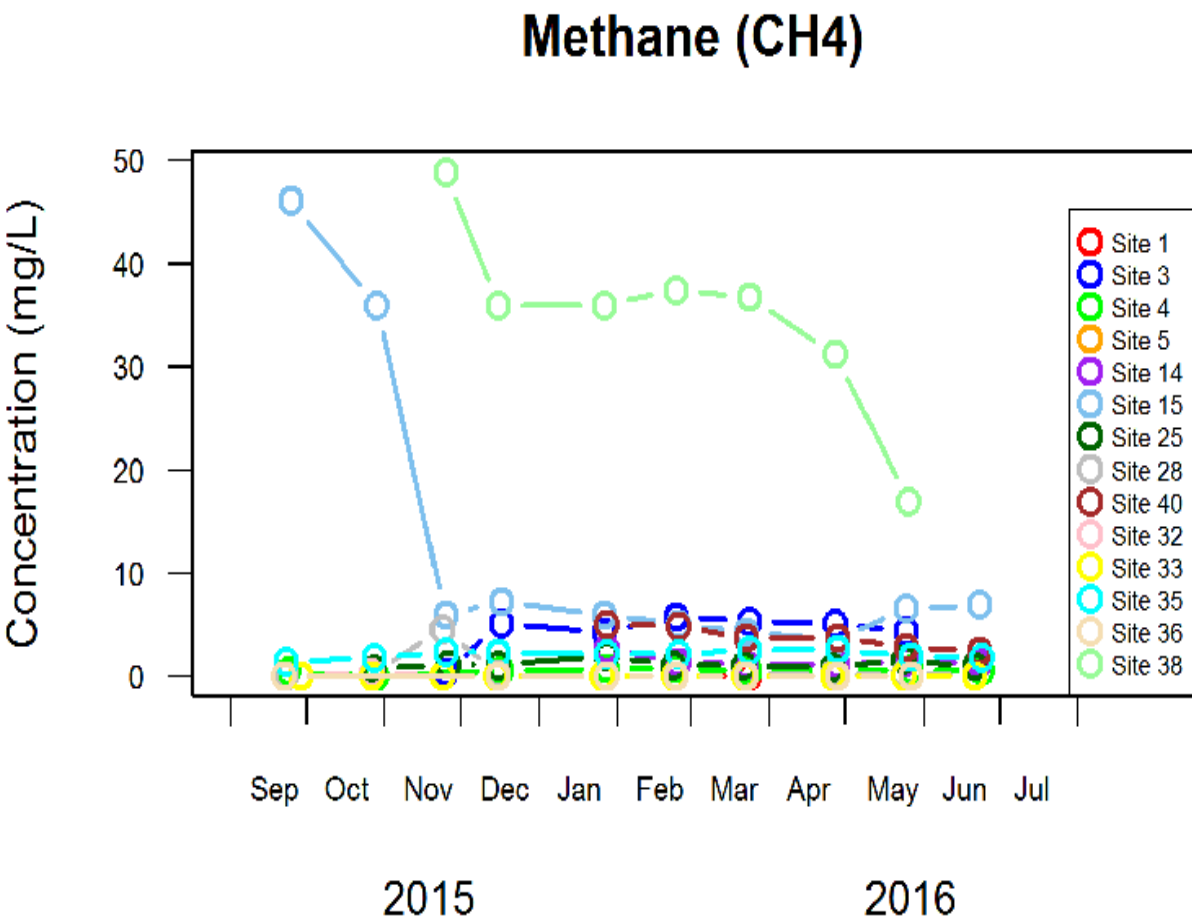


"The boxplots illustrate the range of parameter concentrations, with the "box" showing the central 50% of the data, with a blue line at the median value. The whiskers show the upper and lower 25% of the data range."

Envireau Water Data from February 2015 - September 2016



BGS Data from September 2015 - June 2016



## **APPENDIX A**

### **Monitoring Locations**



**Table A1      Surface Water Monitoring Locations**

<b>Name</b>	<b>Monitoring Point</b>	<b>National Grid Reference</b>	<b>Ground Elevation (mAOD)</b>	<b>Description</b>
Sugar Hill Drain Downstream	S1	SE 76995 78777	23	Stream, part of a large field drainage system. Located on low permeability Glacial Till, Lacustrine deposits and the Kimmeridge Clay (Ancholme Group). Drains towards Ackland Beck and Costa Beck. Monitoring point located to the south of the KMA Wellsite.
Costa Beck	S2	SE 78730 79637	22	Medium sized river flowing in a south-easterly direction.
Ackland Beck	S3	SE 75701 77456	22	Small sized river flowing in a south-easterly direction.
Sugar Hill Drain Upstream	S4	SE 77106 79054	29	Stream, part of a large field drainage system. Located on low permeability Glacial Till, Lacustrine deposits and the Kimmeridge Clay (Ancholme Group). Drains towards Ackland Beck and Costa Beck. Monitoring point located to the north of the KMA Wellsite.

**Table A2      Offsite Groundwater Monitoring Locations**

Name	Monitoring Point	National Grid Reference	Ground Elevation (mAOD)	Construction Details		
				Target Formation <sup>1</sup>	Borehole Depth (mbgl) <sup>1</sup>	Screened Interval (mbgl)
Elm Tree Farm	G1	SE 78957 78755	22	Kimmeridge Clay (un-weathered)	36.6	18 – 36
West Farm <sup>2</sup>	G2	SE 78015 77462	22	Superficial Deposits/ Kimmeridge Clay (weathered)	24.4	Unknown
The Villa	G3	SE 75099 76592	25	Kimmeridge Clay (weathered/ un-weathered)/ Corallian Group	~50 <sup>3</sup>	Unknown <sup>3</sup>
Coultas Farm	G4	SE 75209 76743	25	Kimmeridge Clay (weathered/ un-weathered)/ Corallian Group	~50 <sup>3</sup>	Unknown <sup>3</sup>
Habton Whin	G5	SE 75705 77454	22	Superficial Deposits/ Kimmeridge Clay (weathered)	4.65	Unknown
The Ellers	G6	SE 75491 76868	23	Superficial Deposits/ Kimmeridge Clay (weathered)	21.3 <sup>4</sup>	Unknown

Notes:    1. Based on Envireau Water's interpretation of available borehole construction, geological and other data.  
              2. The sample point at West Farm is 500m north of the borehole.  
              3. No construction data available. Anecdotal information suggests the boreholes are in the region of 50m deep and target the Kimmeridge Clay (Ancholme Group).  
              4. Borehole is no longer observable. Information from landowner suggests it is located beneath the pond at The Ellers and is uncapped (feeds the pond).  
              mbgl: metres below ground level  
              mAOD: metres above Ordnance Datum

**Table A3      Onsite Groundwater Monitoring Locations**

Name	Monitoring Point	National Grid Reference	Ground Elevation (mAOD)	Construction Details		
				Target Formation <sup>1</sup>	Borehole Depth (mbgl)	Screened Interval (mbgl)
Borehole A	BHA	SE 77153 79025	32	Superficial Deposits/ Kimmeridge Clay (weathered)	11.5	8.0 to 11.0
Borehole B	BHB	SE 77099 78989	32	Superficial Deposits/ Kimmeridge Clay (weathered)	11.5	8.0 to 11.0
Borehole C	BHC	SE 77162 78964	32	Superficial Deposits/ Kimmeridge Clay (weathered)	11.5	8.0 to 11.0
Borehole D	BHD	SE 77132 78963	29	Kimmeridge Clay (un- weathered)	38.0	25.0 to 37.0
Borehole E	BHE	SE 77110 78969	29	Corallian Group	222.0	Open hole from 192.6 to 222.0

Notes:    1. Based on Envireau Water's interpretation of available borehole construction, geological and other data.  
               mbgl: metres below ground level  
               mAOD: metres above Ordnance Datum

## **APPENDIX B**

### Analytical Parameters

Parameters listed for analysis in the 'Permit for mining waste and groundwater activities' issued by the Environment Agency, April 2016:

- Methane
- Acrylamide
- Alkalinity as CaCO<sub>3</sub>
- Ammoniacal Nitrogen as N
- Arsenic
- Aluminium
- Antimony
- Barium
- Beryllium
- BOD (settled)
- Boron
- Bromide
- $\delta^{13}\text{C}-\text{CH}_4$
- $\delta^{13}\text{C}-\text{CO}_2$
- Cadmium
- Calcium
- Carbon Dioxide
- Chloride
- Chromium (total)
- Cobalt
- COD (Settled)
- Copper
- Dissolved Butane
- Dissolved Propane
- Dissolved Ethane
- Dissolved Methane
- Fluoride
- Iron (total)
- Lead
- Lithium
- Magnesium
- Manganese
- Mercury
- Nickel
- Nitrate as NO<sub>3</sub>
- Nitrite as NO<sub>2</sub>
- Oxygen Reduction Potential
- pH
- Potassium
- Salinity
- Selenium
- Silver
- Sodium
- Strontium
- TPH (including Benzene, DRO (nC10 to nC24), GRO (nC5 to nC10), m/p Xylenes, o Xylene, MTBE, Toluene, Xylene, Ethylbenzene)
- Total Dissolved Solids
- Total Suspended Solids
- Vanadium
- Zinc
- Fracture fluid additives:
  - Acetic acid;
  - Aluminium sulphate;
  - Aluminium sulphate octadecahydrate;
  - Citric acid triethyl ester;
  - Hemicellulase enzyme;
  - Maltodextrin;
  - Potassium chloride;
  - Sodium bicarbonate;
  - Sodium carboxymethyl cellulose; Sodium chloride;
  - Sodium gluconate;
  - Sodium lauryl sulphate;
  - Sodium persulphate;
  - Sorbitan monododecanoate;
  - poly (oxy1,2-ethanediyl); Sulphuric acid
- Other chemical inventory:
  - Triacine;
  - Glycine;
  - Formaldehyde;
  - Ammonium Bisulphate;
  - Ethylene glycol;
  - Hydrochloric acid;
  - Sodium hydroxide;
  - 2-ethylhexyl zinc dithiophosphate

## **APPENDIX C**

### Analysis Methods

Environmental Scientifics Group (ESG) Ltd.

Analysis Methods

Matrix	MethodID	Analysis Basis	Method Description
Water	Calc HD	As Received	Calculation based on Dissolved metals analysis by ICPOES
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	GROHSA	As Received	Determination of Total Gasoline Range Organics Hydrocarbons (GRO) by Headspace FID
Water	ICPMSW	As Received	Direct quantitative determination of Metals in water samples using ICPMS
Water	ICPMSWT	As Received	Determination of Total Metals in water samples using nitric acid digestion and ICPMS quantitation
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	ICPWATVART	As Received	Determination of Total Metals in water samples using nitric acid digestion and ICPOES quantitation
Water	ISEF	As Received	Determination of Fluoride in water samples by Ion Selective Electrode (ISE)
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	SubCon*	*	Contact Laboratory for details of the methodology used by the sub-contractor.
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM17	As Received	Titration with Sodium Hydroxide to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Where individual results are flagged see report notes for status.



Jones Environmental Laboratory (JEL)

Analysis Methods

JE Job No: 16/10466

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Gravimetric determination of Total Dissolved Solids/Total Solids based on BS 1377-3:1990 and BSEN 15126	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			

JE Job No: 16/10466

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

JE Job No: 16/10466

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM59	As received solid samples are extracted with water in a 1:1 water to solid ratio using end over end.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				

## **APPENDIX D**

### Sampling Dates

**Table D Water Sampling Round Dates**

	Sampling Round / Date																				
Monitoring Point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	11/02/ 2015	04/03 /2015	23/03 /2015	30/04 /2015	29/05 /2015	29/06 /2015	23/07 /2015	20/08 /2015	24/09 /2015	29/10 /2015	17/11 /2015	10/12 /2015	12/01 /2016	17/02 /2016	22/03/2016 & 31/03/2016	19 - 20/04/2016	25/05 /2016	15 – 16/06/2016	20 – 21/07/2016	17 – 18/08/2016	14 – 15/09/ 2016
Sugar Hill Drain Downstream (S1)	O	X	X	X	X	B	B	B	X	X	XX	X	X	X	X	X	XX	B	B	B	B
Costa Beck (S2)	X	X	XX	X	X	A	A	A	XX	A	A	A	A	A	A	A	A	A	X	X	X
Ackland Beck (S3)	XX	X	X	X	X	A	A	A	B	A	A	A	A	A	A	A	A	A	X	B	X
Sugar Hill Drain Upstream (S4)#	O	O	O	O	O	B	B	B	B	X	X	X	X	XX	X	X	X	B	B	B	B
Elm Tree Farm (G1)	X	X	X	X	XX	X	X	XX	X	X	X	X	X	X	X	XX	X	X	X	X	X
West Farm (G2)	X	X	X	X	X	XX	X	X	X	X	X	XX	X	X	X	X	X	X	X	X	XX
The Villa (G3)	X	XX	X	XX	X	X	X	X	X	XX	X	X	X	X	X	X	X	XX	X	X	X
Coultas Farm (G4)	O	O	X	X	XX	A	A	A	A	A	A	A	A	A	A	A	A	A	X	XX	X
Habton Whin (G5)	X	X	X	X	X	X	XX	X	X	X	X	X	XX	X	X	X	X	X	XX	X	X
The Ellers (G6)	X	X	X	XX	X	A	A	A	A	A	A	A	A	A	A	A	A	A	X	X	X
Borehole A (BHA)	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X
Borehole B (BHB)	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X
Borehole C (BHC)	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X
Borehole D (BHD)	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X
Borehole E (BHE)	O	O	O	O	O	O	O	O	O	O	O	O	O	O	XX	X	X	X	X	X	X

Notes: X. Monitoring location sampled and analysed  
 XX. Sample duplicated at monitoring location  
 O. Monitoring location not available or accessible  
 A. Monitoring location removed following initial review of data  
 B. Insufficient water to sample at monitoring location  
 #. Not a monitoring point within the environmental permit

## **APPENDIX E**

### **Analysis Results**

## **APPENDIX F**

### Laboratory Test Certificates



## Water Analysis Test Certificate

Round 1

Our Ref: EXR/193870 (Ver. 1)

Your Ref:

February 25, 2015



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Mr A Rose  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Mr A Rose

Dear Mr Rose

**Sample Analysis - KM8**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

L Bosworth  
Project Co-ordinator  
01283 554362

# TEST REPORT

Report No. EXR/193870 (Ver. 1)

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

**Site: KM8**

The 10 samples described in this report were registered for analysis by ESG on 12-Feb-2015. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 25-Feb-2015

The following tables are contained in this report:

Table 1 Main Analysis Results (Pages 2 to 3)  
Analytical and Deviating Sample Overview (Pages 4 to 5)  
Table of Method Descriptions (Page 6)  
Table of Report Notes (Page 7)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns



Managing Director  
Multi-Sector Services

Date of Issue: 25-Feb-2015

Tests marked '^' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.





Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W193870

Customer      Envireau Water  
Site            KM8  
Report No    W193870

Consignment No W83889  
Date Logged 12-Feb-2015

Report Due 25-Feb-2015

ID Number	Description	Matrix Type	Sampled	Total Hardness as CaCO3 (CALC)	Report B	TPH FTIRPER.	Total Sulphur as SO4 (Diss) VAR	Calcium as Ca (Dissolved) VAR	Magnesium as Mg (Dissolved) VAR	Sodium as Na (Dissolved) VAR	Potassium as K (Dissolved) VAR	Manganese as Mn (Dissolved) VAR	Iron as Fe (Dissolved) VAR	Manganese as Mn (Total) VAR	Iron as Fe (Total) VAR	Fluoride as F	Chloride as Cl (Kone)	Ammoniacal Nitrogen (Kone)	Nitrite as N (Kone)	Nitrate as N (Kone calc)	Total Alkalinity as CaCO3	WSL/MI/2
EX/1568348	ETF/1	Unclassified	11/02/15																			
EX/1568349	WF/1	Unclassified	11/02/15																			
EX/1568350	CB/1	Unclassified	11/02/15																			
EX/1568351	D/1	Unclassified	11/02/15																			
EX/1568352	TV/1	Unclassified	11/02/15																			
EX/1568353	TE/1	Unclassified	11/02/15																			
EX/1568354	AB/1	Unclassified	11/02/15																			
EX/1568355	AB/A	Unclassified	11/02/15																			
EX/1568356	HW/1	Unclassified	11/02/15																			
EX/1568357	B/1	Unclassified	11/02/15																			

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

**Deviating Sample Key**

A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time

**Requested Analysis Key**

	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
	Analysis Subcontracted - <b>Note: due date may vary</b>

Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W193870

Customer      Envireau Water  
Site            KM8  
Report No     W193870

Consignment No W83889  
Date Logged 12-Feb-2015

Report Due 25-Feb-2015

ID Number	Description	MethodID		WSL.M7	WSL.M2	WSL.M27	WSL.M3
		Matrix Type	Sampled	Total Acidity as CaCO3	Conductivity uS/cm @ 25C	Total Dissolved Solids	pH units
EX/1568348	ETF/1	Unclassified	11/02/15				
EX/1568349	WF/1	Unclassified	11/02/15				
EX/1568350	CB/1	Unclassified	11/02/15				
EX/1568351	D/1	Unclassified	11/02/15				
EX/1568352	TV/1	Unclassified	11/02/15				
EX/1568353	TE/1	Unclassified	11/02/15				
EX/1568354	AB/1	Unclassified	11/02/15				
EX/1568355	AB/A	Unclassified	11/02/15				
EX/1568356	HW/1	Unclassified	11/02/15				
EX/1568357	B/1	Unclassified	11/02/15				

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

**In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.**

**Deviating Sample Key**

A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time

**Requested Analysis Key**

	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
	Analysis Subcontracted - <b>Note: due date may vary</b>

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	Calc_HD	As Received	Calculation based on Dissolved metals analysis by ICPOES
Water	FTIRSWPER	As Received	Determination of Tetrachloroethylene Extractable Hydrocarbons by Fourier Transform Infrared spectroscopy (FTIR)
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	ICPWATVART	As Received	Determination of Total Metals in water samples using nitric acid digestion and ICPOES quantitation
Water	ISEF	As Received	Determination of Fluoride in water samples by Ion Selective Electrode (ISE)
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM17	As Received	Titration with Sodium Hydroxide to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Where individual results are flagged see report notes for status.



# Report Notes

## Generic Notes

### Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### Waters Analysis

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup>@ 15°C

### Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

### Asbestos Analysis

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

^ Sub-contracted analysis.

\$\$ Unable to analyse due to the nature of the sample

¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

¥ Results for guidance only due to possible interference

& Blank corrected result

I.S Insufficient sample to complete requested analysis

I.S(g) Insufficient sample to re-analyse, results for guidance only

Intf Unable to analyse due to interferences

N.D Not determined

N.Det Not detected

N.F No Flow

NS Information Not Supplied

Req Analysis requested, see attached sheets for results

▮ Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** KM8  
**Report Number :** W19\_3870

[illegible]

## Water Analysis Test Certificate

Round 2

Our Ref: EXR/195182 (Ver. 2)

Your Ref:

March 19, 2015



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Ms P Jenkinson  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Ms P Jenkinson

Dear Ms Jenkinson

**Sample Analysis - Dissolved Gasses in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

D Brasington  
Project Co-ordinator  
01283 554493

# TEST REPORT



1252

**Report No. EXR/195182 (Ver. 2)**

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

**Site: Dissolved Gasses in Waters**

The 12 samples described in this report were registered for analysis by ESG on 05-Mar-2015. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 19-Mar-2015

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Pages 2 to 4)  
Table of TPH Texas banding (0.01) (Page 5)  
GC-FID Chromatograms (Pages 6 to 17)  
Analytical and Deviating Sample Overview (Pages 18 to 20)  
Table of Additional Report Notes (Page 21)  
Table of Method Descriptions (Page 22)  
Table of Report Notes (Page 23)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns

  
Managing Director  
Multi-Sector Services

Date of Issue: 19-Mar-2015


Tests marked 'N' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.

Units : Method Codes : Method Reporting Limits : UKAS Accredited :			pH units	uS/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
			WSLM3	WSLM2	WSLM12	WSLM17	Calc_HD	KONENS	ISEF	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART
				100		2	7	1	0.1	3	1	1	1	1	1	1	1	1	1
			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LAB ID Number EX/	Client Sample Description	Sample Date	pH units w	Conductivity uS/cm @ 25C w	Total Alkalinity as CaCO3 w	Total Acidity as CaCO3 w	Total Hardness as CaCO3	Chloride as Cl w	Fluoride as F a	Total Sulphur as SO4 (Dissolved) a	Calcium as Ca (Total) a	Calcium as Ca (Dissolved) a	Magnesium as Mg (Total) a	Magnesium as Mg (Dissolved) a	Sodium as Na (Total) a	Sodium as Na (Dissolved) a	Potassium as K (Total) a	Potassium as K (Dissolved) a	
1574568	CB/2	04-Mar-15 09:45	7.8	608	183	28	279	43	0.1	41	82	100	6	7	18	23	2	2	
1574569	WF/2	04-Mar-15 10:15	7.6	917	430	Nil	119	29	0.2	28	35	36	7	7	170	175	3	4	
1574570	ETF/2	04-Mar-15 11:10	7.7	3040	647	Nil	311	103	1.0	820	61	70	30	33	497	566	7	8	
1574571	D/2	04-Mar-15 12:10	8.1	839	267	Nil	428	65	0.3	67	160	160	8	7	25	26	5	6	
1574572	MA1/2A	04-Mar-15 12:45	7.4	636	205	Nil	337	32	0.1	51	96	120	7	9	9	12	1	2	
1574573	MA1/2B	04-Mar-15 12:45	7.4	634	202	Nil	337	32	0.2	50	99	120	7	9	10	12	1	2	
1574574	B/2	04-Mar-15 13:05	7.8	<100	5	8	<7	1	<0.1	<3	<1	<1	<1	<1	<1	<1	<1	<1	
1574575	TV/2A	04-Mar-15 13:30	7.7	1570	609	Nil	82	48	0.6	140	22	23	6	6	345	355	4	4	
1574576	TV/2B	04-Mar-15 13:30	7.6	1580	624	Nil	82	49	0.6	140	22	23	6	6	355	360	4	4	
1574577	TE/2	04-Mar-15 14:00	7.9	1010	441	Nil	92	29	0.3	64	29	27	6	6	205	210	4	3	
1574578	AB/2	04-Mar-15 14:30	7.9	1240	290	Nil	445	173	0.2	70	115	160	9	11	66	91	5	7	
1574579	HW/2	04-Mar-15 14:30	7.6	820	407	Nil	96	23	0.3	17	24	30	4	5	120	160	2	3	
												</							

Units : Method Codes : Method Reporting Limits : UKAS Accredited :			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	µg/l	µg/l	µg/l		
			ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	KONENS	KONENS	KONENS	TPHFID	TPHFID	WSLM27	ICPWATVART	ICPWATVAR	GROHSA	DISGAS1	DISGAS1	DISGAS1		
			0.01	0.01	0.01	0.01	0.01	0.01	0.2	0.01	0.01	5	0.01	0.01	0.1					
			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No		
LAB ID Number EX/	Client Sample Description	Sample Date	Manganese as Mn (Total) a	Manganese as MN (Dissolved) a	Iron as Fe (Total) a	Iron as Fe (Dissolved) a	Ammoniacal Nitrogen as N	Nitrite as N	Nitrate as N	Carbon Banding	TPH GC	Total Dissolved Solids w	Aluminium as Al (Total) a	Aluminium as Al (Dissolved) a	GRO C5->C8	^Dissolved Butane	^Dissolved Methane	^Dissolved Propane		
1574568	CB/2	04-Mar-15 09:45	<0.01	<0.01	0.45	0.13	0.06	0.03	5.7	Req	0.01	368	0.21	0.03	<0.1					
1574569	WF/2	04-Mar-15 10:15	0.34	0.34	0.97	0.05	0.6	<0.01	<0.2	Req	<0.01	520	0.05	<0.01	<0.1	<15	83	<11		
1574570	ETF/2	04-Mar-15 11:10	0.03	<0.01	3.58	0.07	2.3	<0.01	<0.2	Req	<0.01	2048	0.72	0.01	<0.1	<15	213	<11		
1574571	D/2	04-Mar-15 12:10	<0.01	<0.01	0.26	0.12	<0.01	<0.01	5.7	Req	<0.01	569	0.13	0.02	<0.1					
1574572	MA1/2A	04-Mar-15 12:45	<0.01	<0.01	0.12	0.11	<0.01	<0.01	6.2	Req	<0.01	399	0.05	0.02	<0.1	<15	<4	<11		
1574573	MA1/2B	04-Mar-15 12:45	<0.01	<0.01	0.40	0.10	<0.01	<0.01	6.4	Req	<0.01	393	0.15	0.02	<0.1	<15	<4	<11		
1574574	B/2	04-Mar-15 13:05	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.2	Req	<0.01	14	0.05	<0.01	<0.1					
1574575	TV/2A	04-Mar-15 13:30	0.04	0.03	0.22	0.03	1.1	<0.01	<0.2	Req	<0.01	945	0.04	<0.01	<0.1	<15	1295	<11		
1574576	TV/2B	04-Mar-15 13:30	0.03	0.03	0.19	0.04	1.1	<0.01	<0.2	Req	<0.01	952	0.03	<0.01	<0.1	<15	1170	<11		
1574577	TE/2	04-Mar-15 14:00	0.61	0.01	1.96	0.10	0.04	<0.01	<0.2	Req	0.02	599	0.41	<0.01	<0.1					
1574578	AB/2	04-Mar-15 14:30	0.02	0.02	0.19	0.13	<0.01	<0.01	3.1	Req	0.01	743	0.10	0.02	<0.1					
1574579	HW/2	04-Mar-15 14:30	0.23	0.28	0.24	0.04	0.6	<0.01	<0.2	Req	0.2	474	0.04	<0.01	<0.1	<15	7	<11		
<div><div>ESG</div><div></div><div>Bretby Business Park, Ashby Road</div><div>Burton-on-Trent, Staffordshire, DE15 0YZ</div><div>Tel +44 (0) 1283 554400</div><div>Fax +44 (0) 1283 554422</div></div>			Client Name		Envireau Water						Sample Analysis									
			Contact		Ms P Jenkinson						Date Printed							19-Mar-2015		
			Dissolved Gasses in Waters									Report Number		EXR/195182						
												Table Number		1						





# Total Petroleum Hydrocarbons (TPH) Carbon Ranges

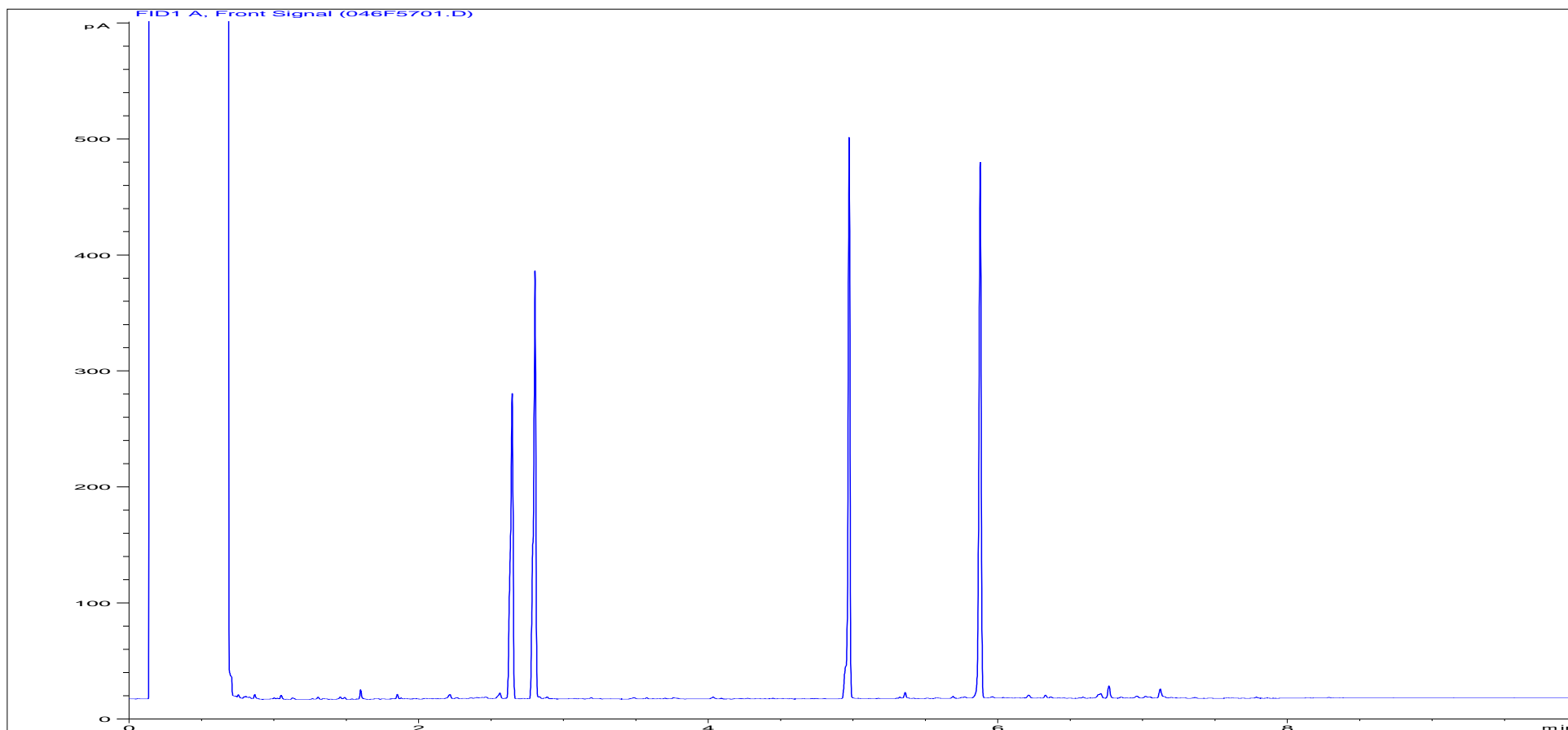
**Customer and Site Details:** Envireau Water : Dissolved Gasses in Waters  
**Job Number:** W19\_5182  
**QC Batch Number:** 150179  
**Directory:** D:\TES\DATA\Y2015\031615TPH\_GC17\031615 2015-03-16 09-32-00\057F6801.D  
**Method:** Bottle

**Matrix:** Water  
**Date Booked in:** 05-Mar-15  
**Date Extracted:** 16-Mar-15  
**Date Analysed:** 17-Mar-15, 06:06:45

\* Sample data with an asterisk are not UKAS accredited.

Sample ID	Client ID	Concentration, (mg/l)				
		>C8 - C10*	>C10 - C12	>C12 - C16	>C16 - C21	>C21 - C35
EX1574568	CB/2	<0.01	<0.01	<0.01	<0.01	<0.01
EX1574569	WF/2	<0.01	<0.01	<0.01	<0.01	<0.01
EX1574570	ETF/2	<0.01	<0.01	<0.01	<0.01	<0.01
EX1574571	D/2	<0.01	<0.01	<0.01	<0.01	<0.01
EX1574572	MA1/2A	<0.01	<0.01	<0.01	<0.01	<0.01
EX1574573	MA1/2B	<0.01	<0.01	<0.01	<0.01	<0.01
EX1574574	B/2	<0.01	<0.01	<0.01	<0.01	<0.01
EX1574575	TV/2A	<0.01	<0.01	<0.01	<0.01	<0.01
EX1574576	TV/2B	<0.01	<0.01	<0.01	<0.01	<0.01
EX1574577	TE/2	<0.01	<0.01	<0.01	<0.01	0.015
EX1574578	AB/2	<0.01	<0.01	<0.01	<0.01	<0.01
EX1574579	HW/2	<0.01	<0.01	<0.01	0.046	0.136

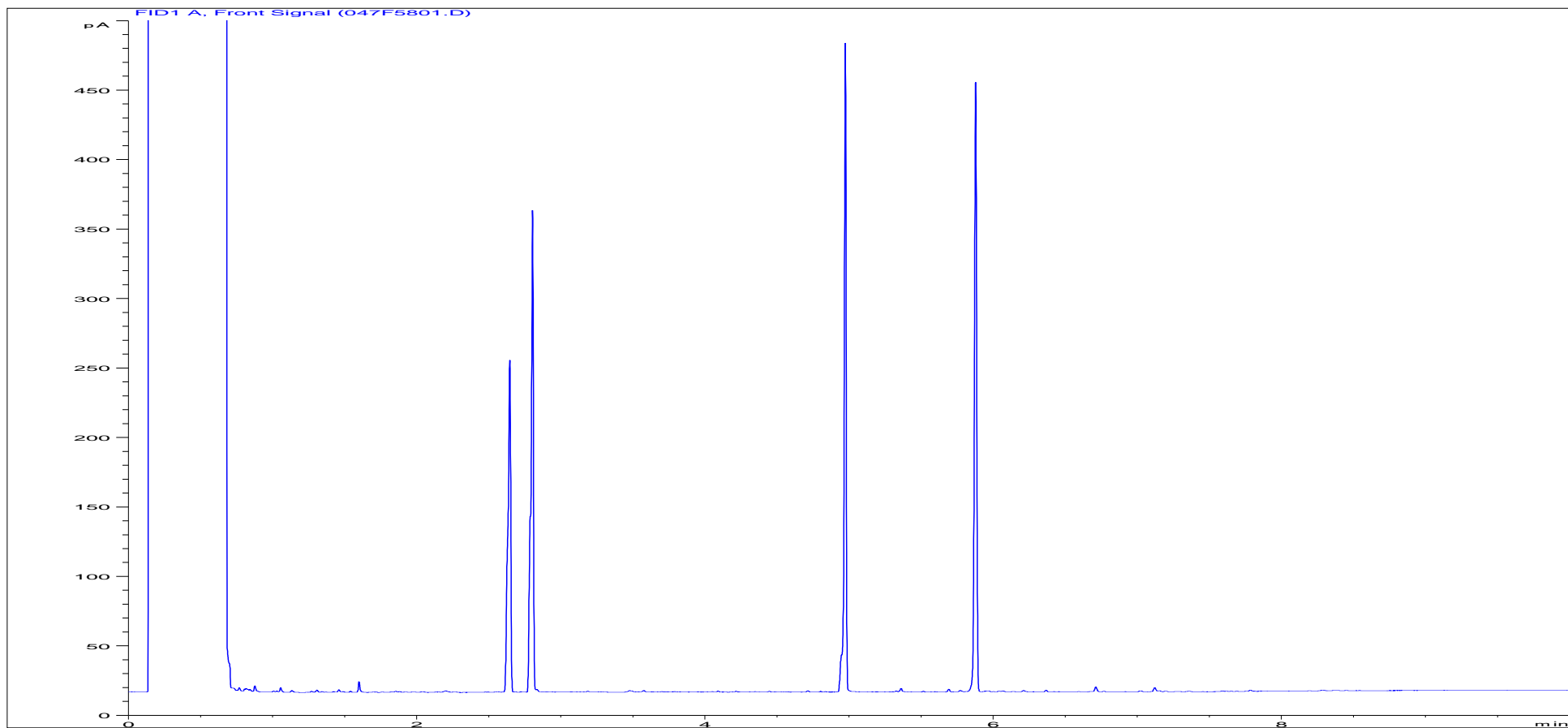
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1574568	<b>Job Number:</b>	W19_5182
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	CB/2
<b>Acquisition Date/Time:</b>	17-Mar-15, 02:50:44		
<b>Datafile:</b>	D:\TES\DATA\Y2015\031615TPH_GC17\031615 2015-03-16 09-32-00\046F5701.D		

Where individual results are flagged see report notes for status.

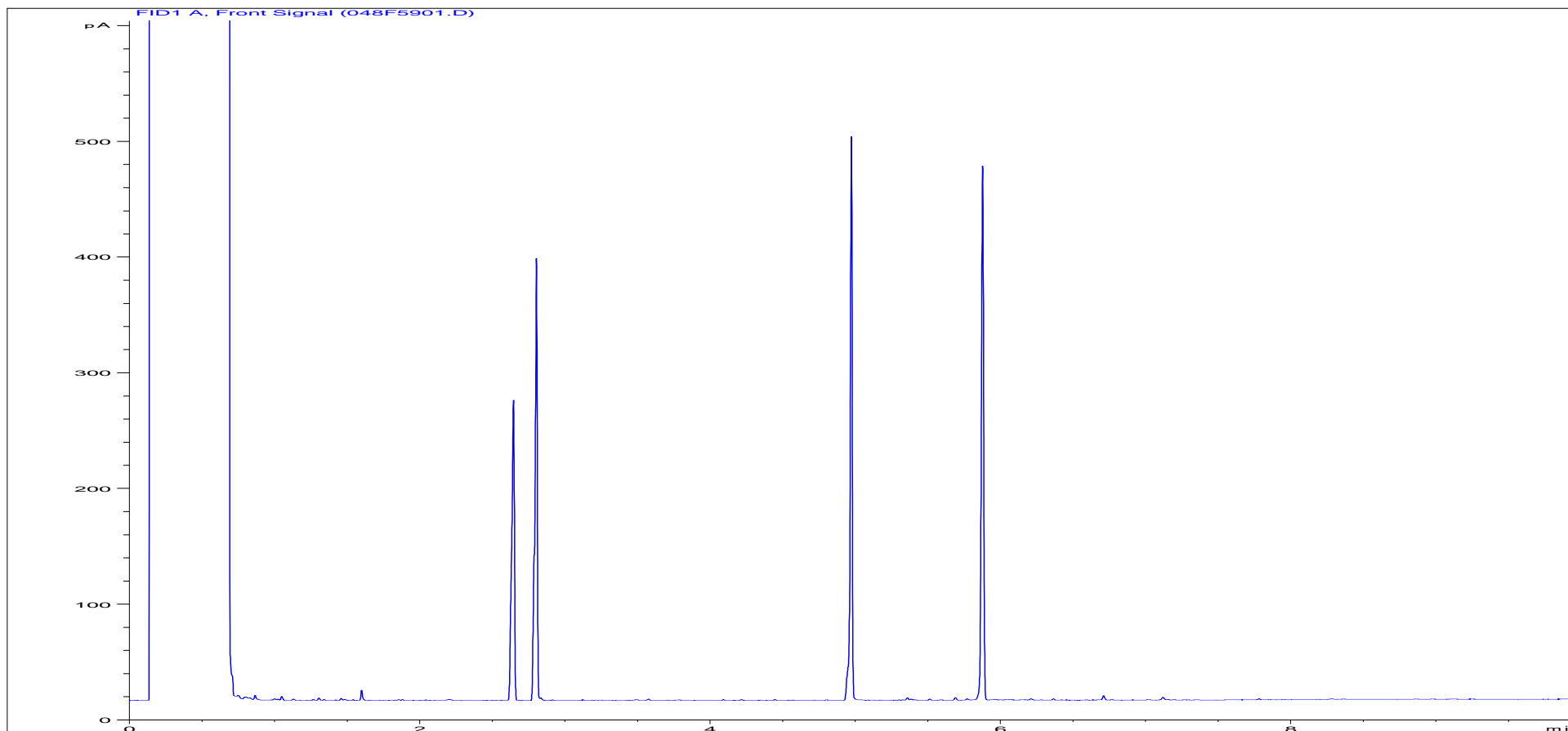
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1574569	<b>Job Number:</b>	W19_5182
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	WF/2
<b>Acquisition Date/Time:</b>	17-Mar-15, 03:08:32		
<b>Datafile:</b>	D:\TES\DATA\Y2015\031615TPH_GC17\031615 2015-03-16 09-32-00\047F5801.D		

Where individual results are flagged see report notes for status.

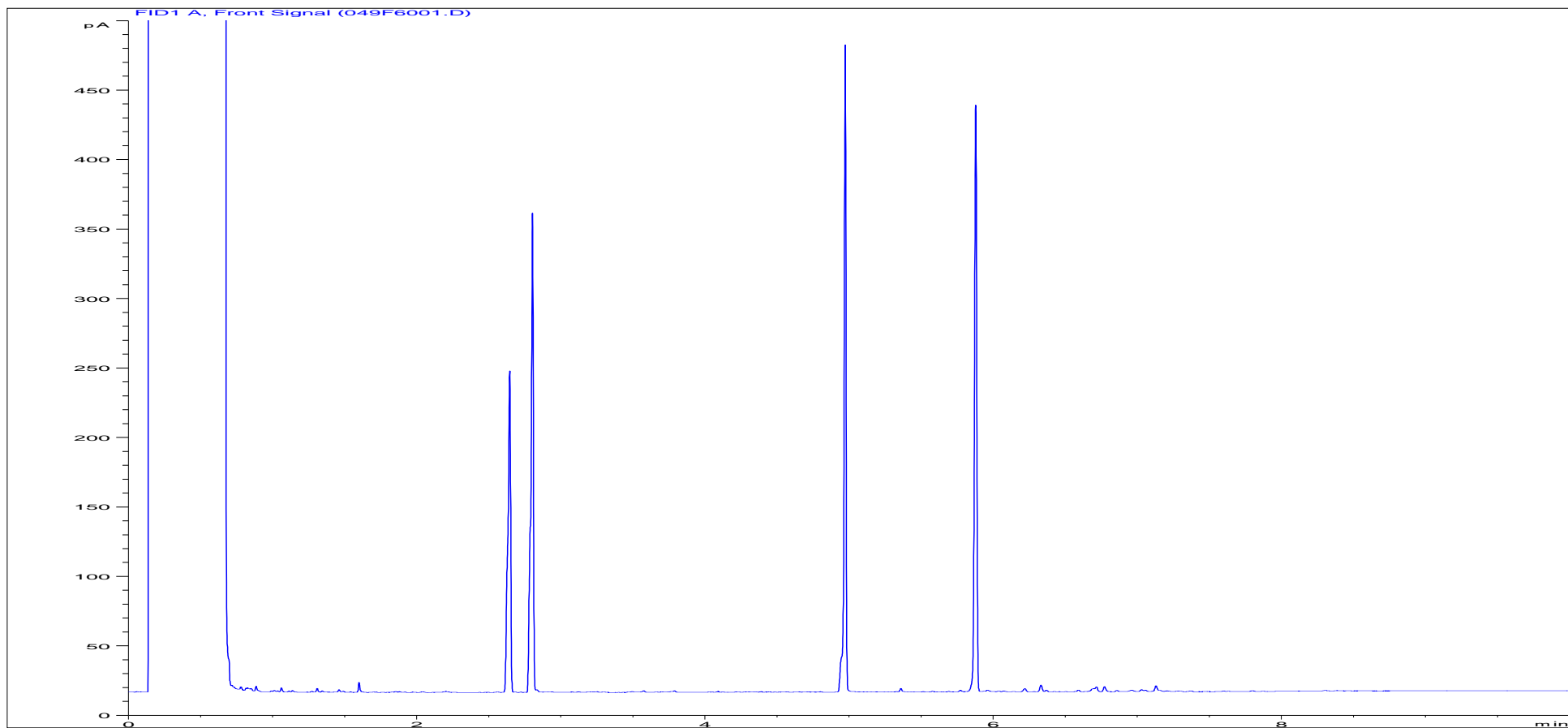
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1574570	<b>Job Number:</b>	W19_5182
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	ETF/2
<b>Acquisition Date/Time:</b>	17-Mar-15, 03:26:27		
<b>Datafile:</b>	D:\TES\DATA\Y2015\031615TPH_GC17\031615 2015-03-16 09-32-00\048F5901.D		

Where individual results are flagged see report notes for status.

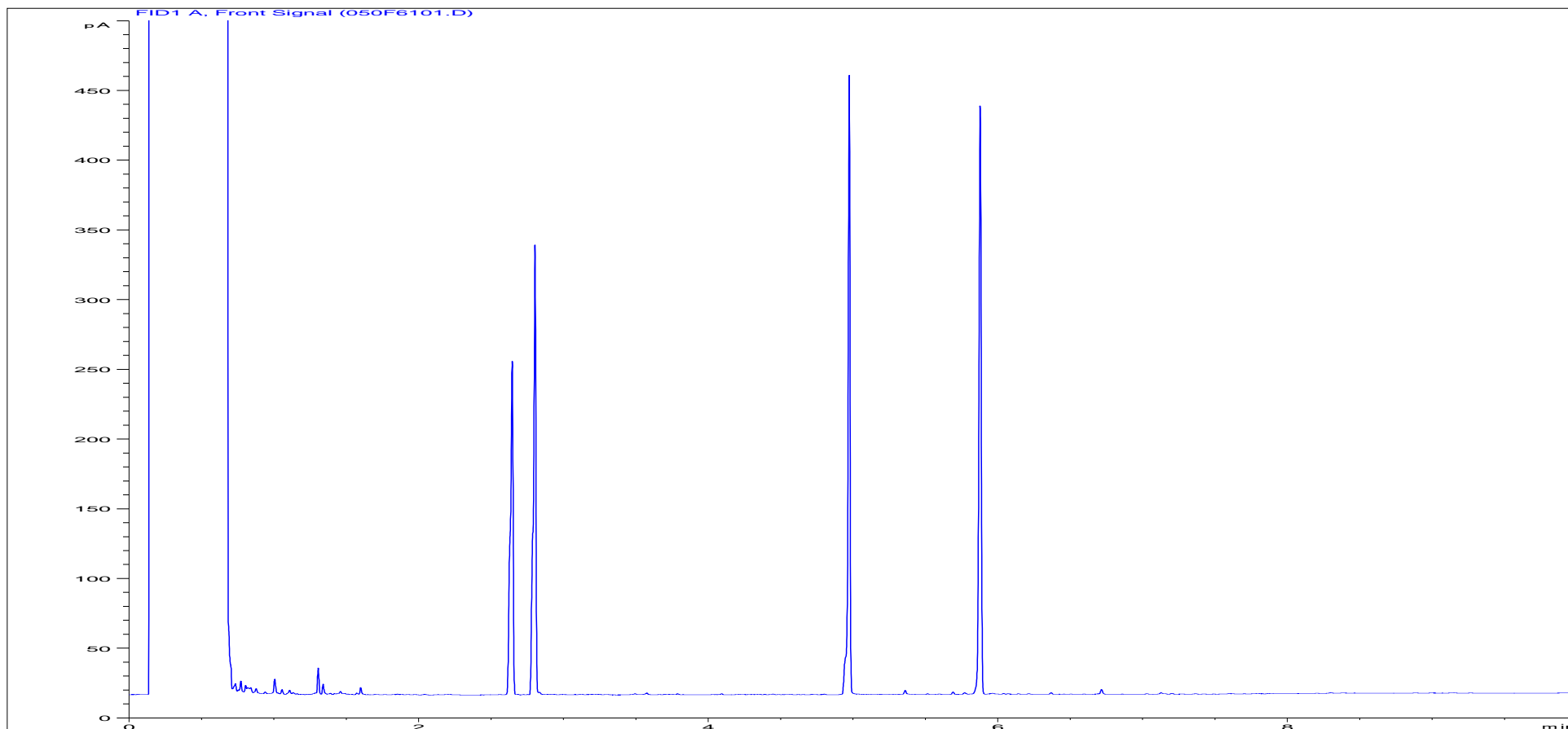
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1574571	Job Number:	W19_5182
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	D/2
Acquisition Date/Time:	17-Mar-15, 03:44:29		
Datafile:	D:\TES\DATA\Y2015\031615TPH_GC17\031615 2015-03-16 09-32-00\049F6001.D		

Where individual results are flagged see report notes for status.

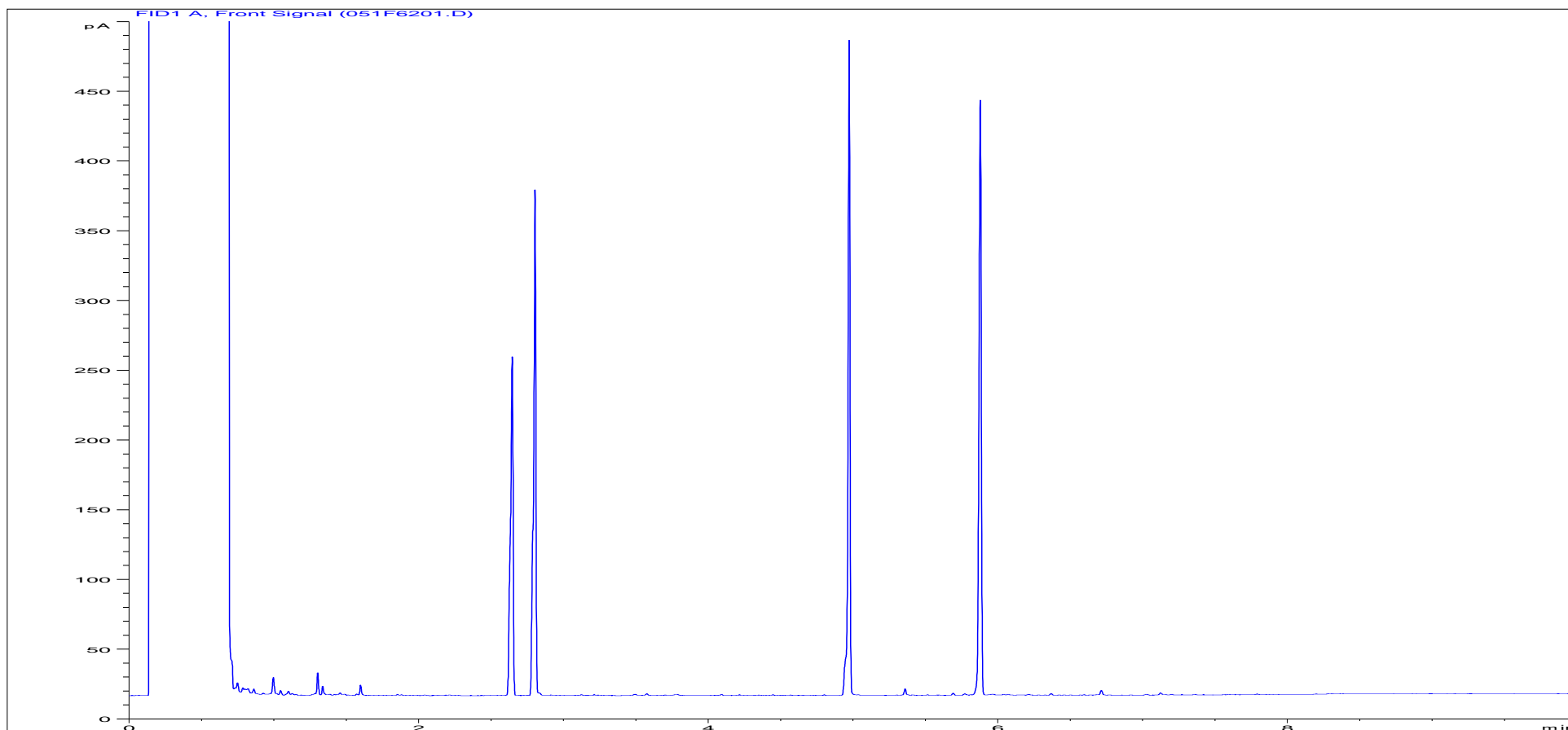
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1574572	<b>Job Number:</b>	W19_5182
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	MA1/2A
<b>Acquisition Date/Time:</b>	17-Mar-15, 04:02:17		
<b>Datafile:</b>	D:\TES\DATA\Y2015\031615TPH_GC17\031615 2015-03-16 09-32-00\050F6101.D		

Where individual results are flagged see report notes for status.

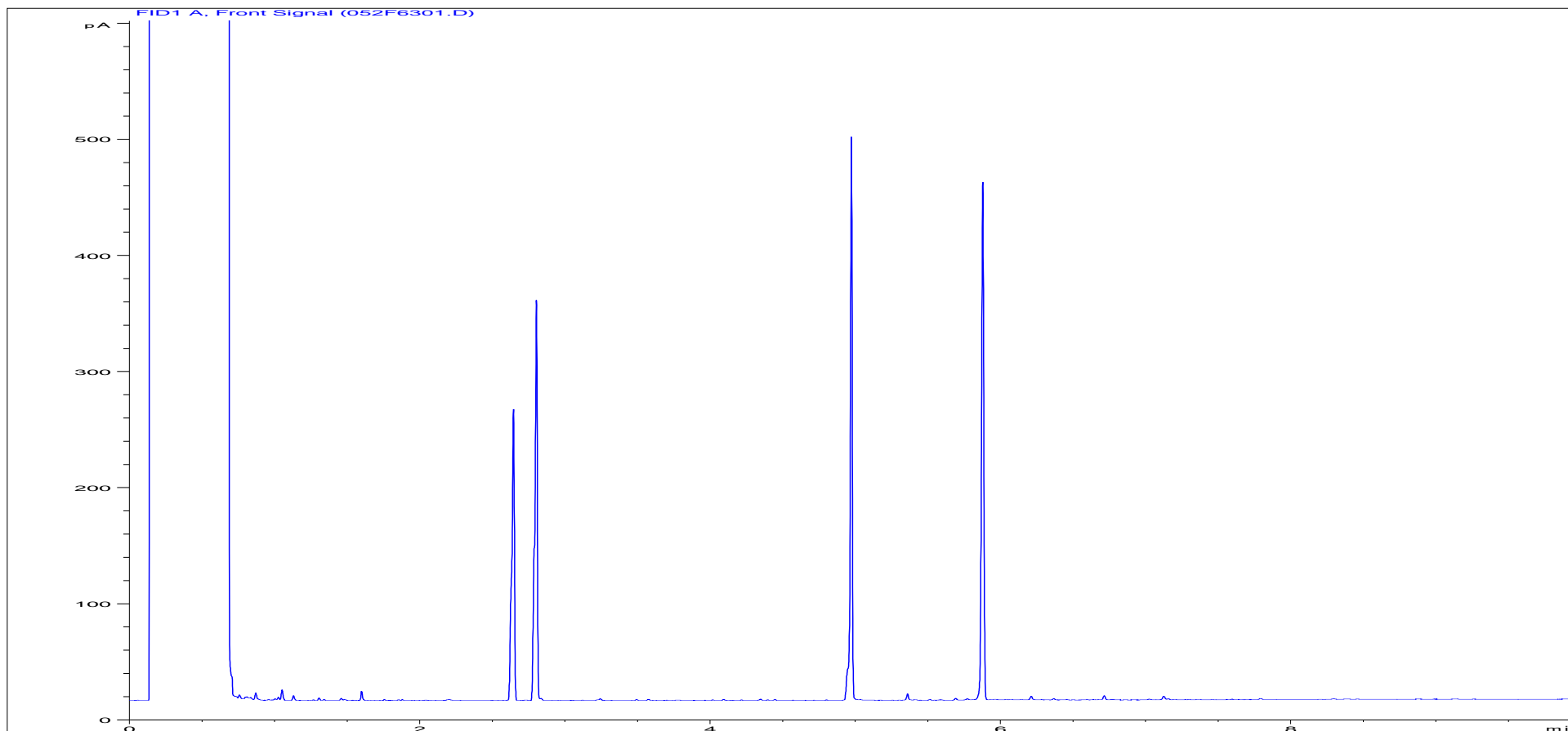
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1574573	<b>Job Number:</b>	W19_5182
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	MA1/2B
<b>Acquisition Date/Time:</b>	17-Mar-15, 04:20:03		
<b>Datafile:</b>	D:\TES\DATA\Y2015\031615TPH_GC17\031615 2015-03-16 09-32-00\051F6201.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID

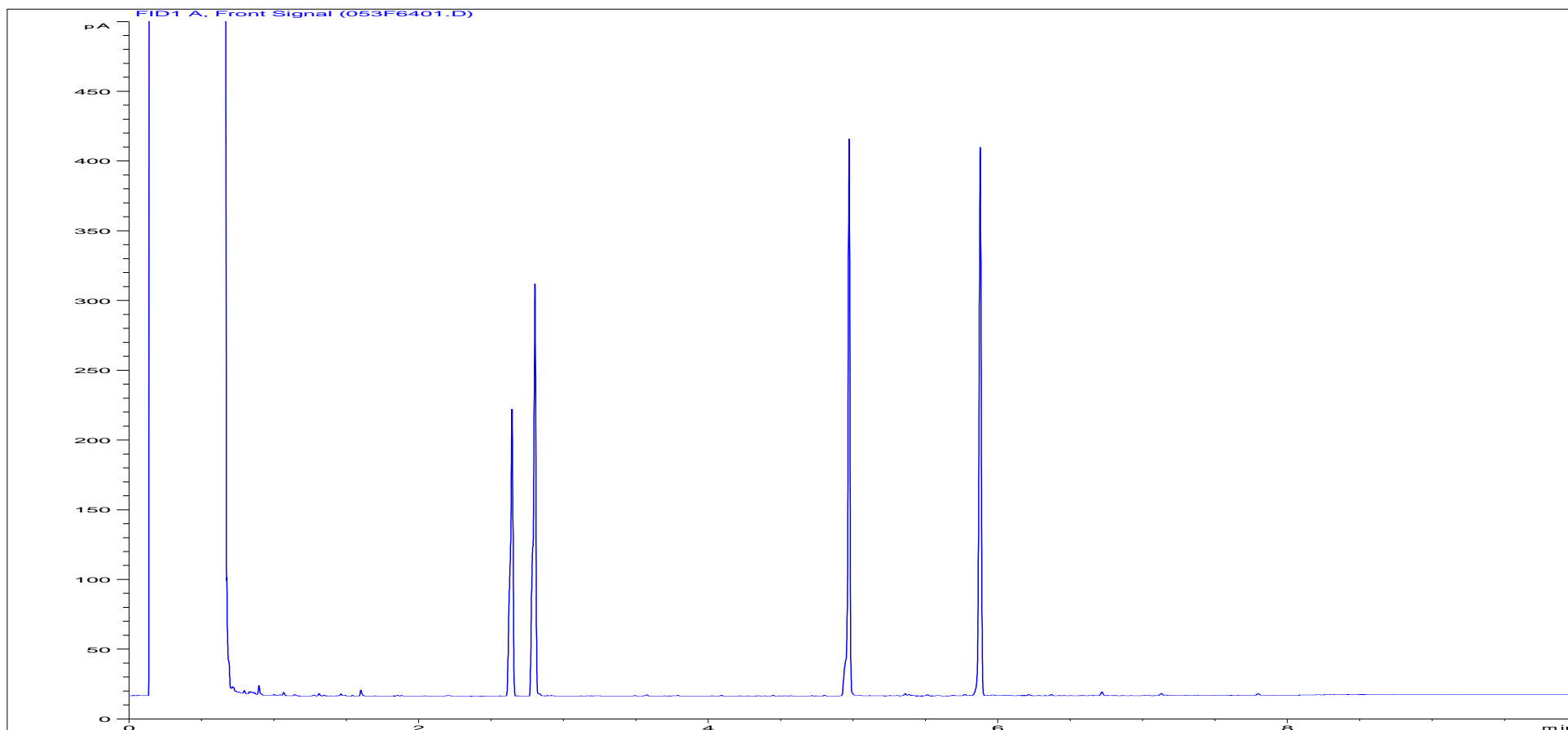


<b>Sample ID:</b>	EX1574574	<b>Job Number:</b>	W19_5182
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	B/2
<b>Acquisition Date/Time:</b>	17-Mar-15, 04:37:54		
<b>Datafile:</b>	D:\TES\DATA\Y2015\031615TPH_GC17\031615 2015-03-16 09-32-00\052F6301.D		

Where individual results are flagged see report notes for status.



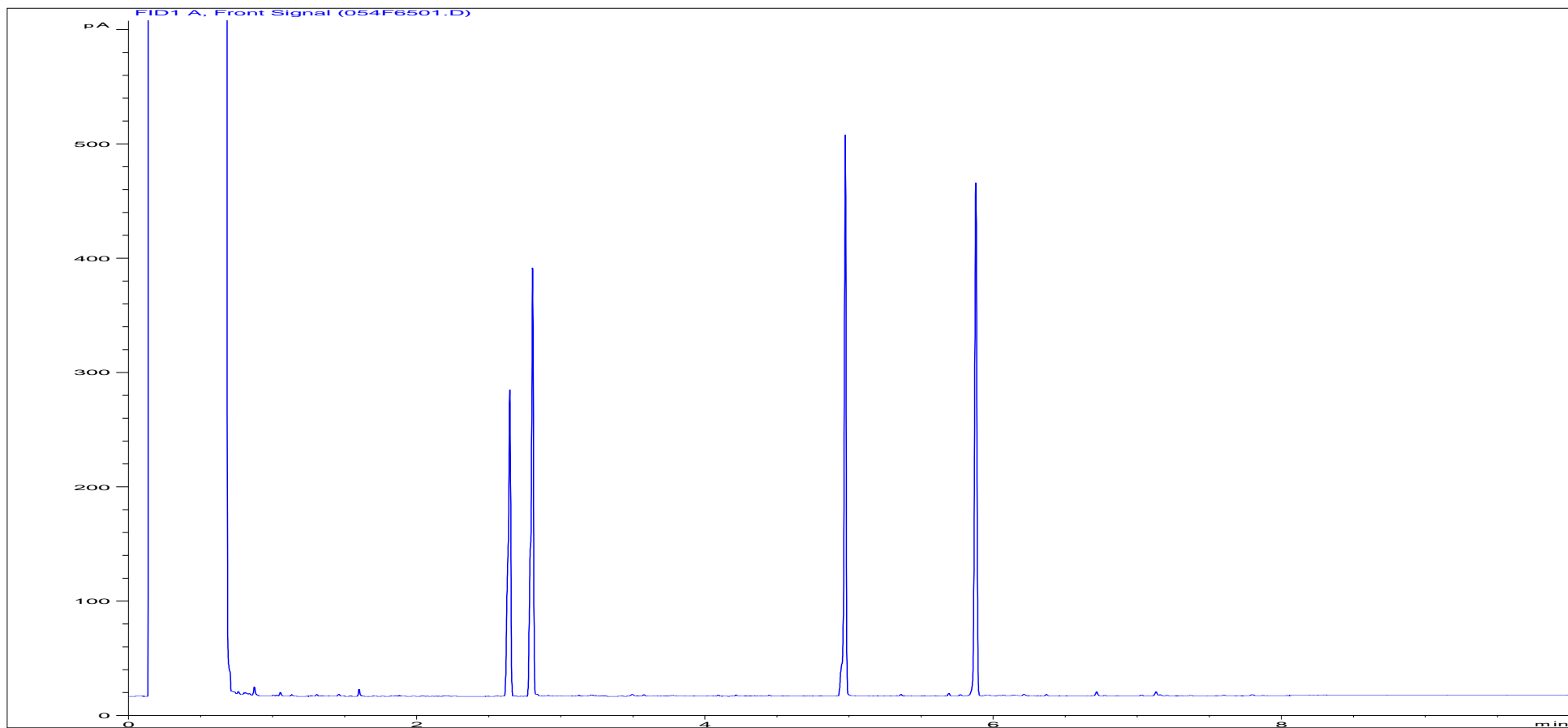
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1574575	<b>Job Number:</b>	W19_5182
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV/2A
<b>Acquisition Date/Time:</b>	17-Mar-15, 04:55:39		
<b>Datafile:</b>	D:\TES\DATA\Y2015\031615TPH_GC17\031615 2015-03-16 09-32-00\053F6401.D		

Where individual results are flagged see report notes for status.

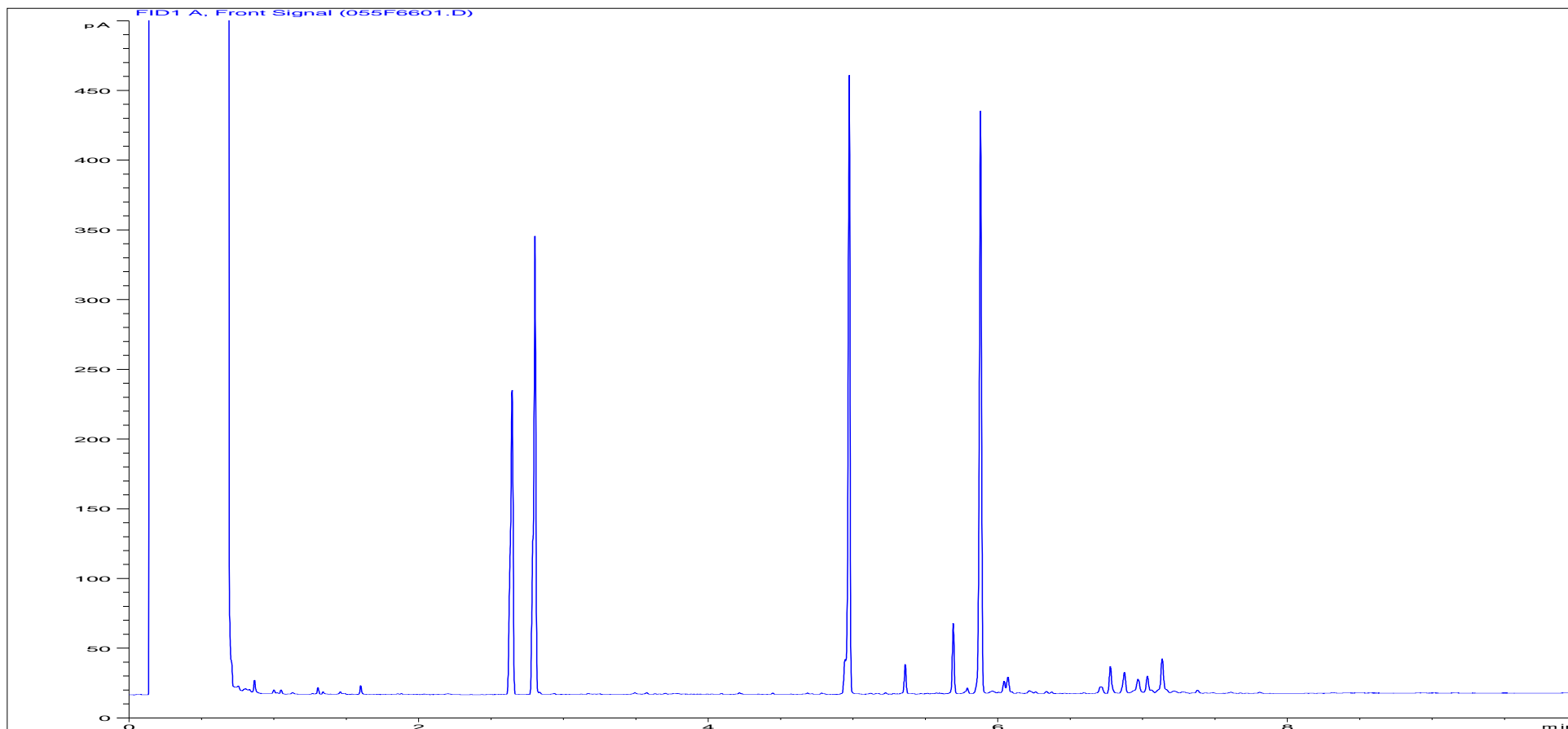
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1574576	<b>Job Number:</b>	W19_5182
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV/2B
<b>Acquisition Date/Time:</b>	17-Mar-15, 05:13:24		
<b>Datafile:</b>	D:\TES\DATA\Y2015\031615TPH_GC17\031615 2015-03-16 09-32-00\054F6501.D		

Where individual results are flagged see report notes for status.

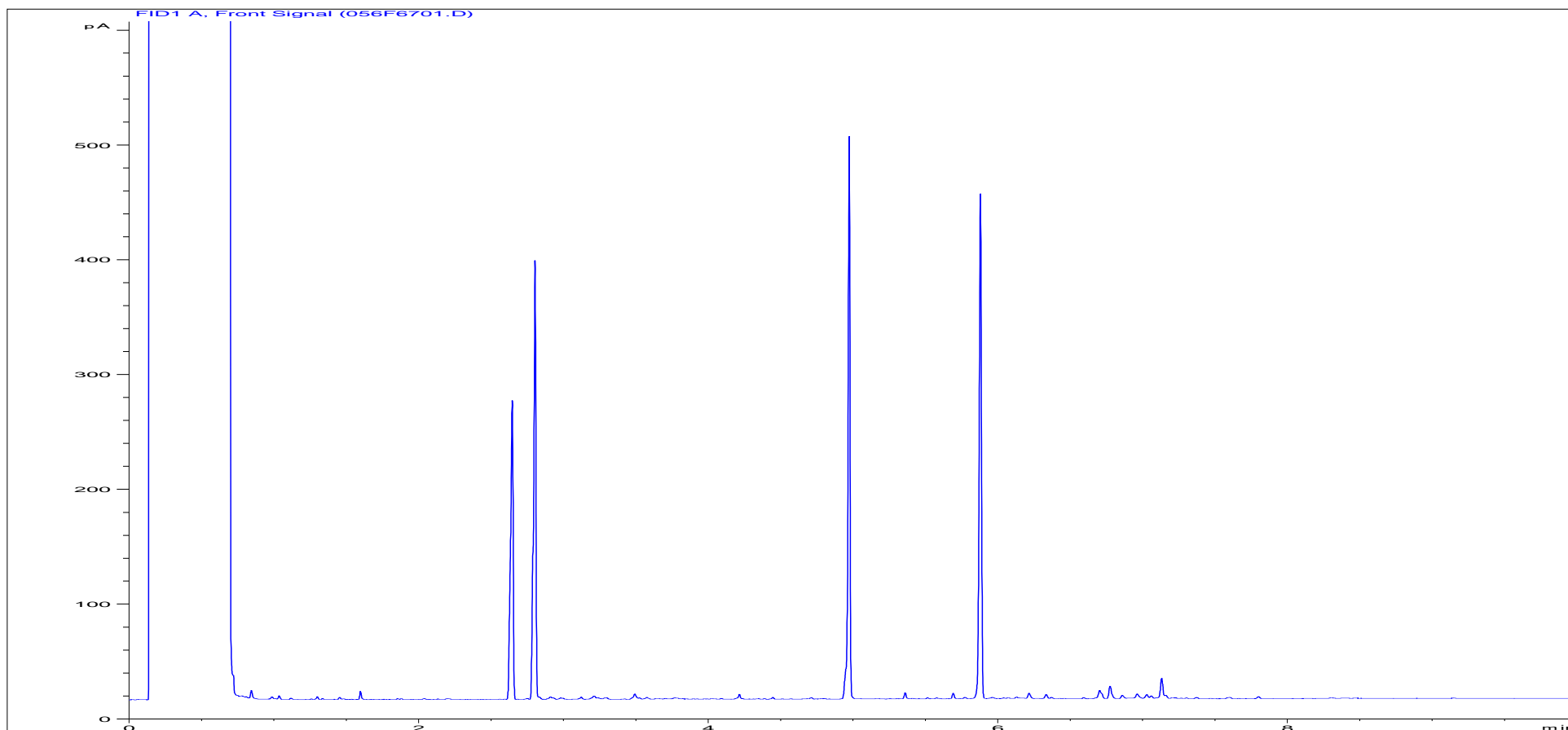
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1574577	<b>Job Number:</b>	W19_5182
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TE/2
<b>Acquisition Date/Time:</b>	17-Mar-15, 05:31:09		
<b>Datafile:</b>	D:\TES\DATA\Y2015\031615TPH_GC17\031615 2015-03-16 09-32-00\055F6601.D		

Where individual results are flagged see report notes for status.

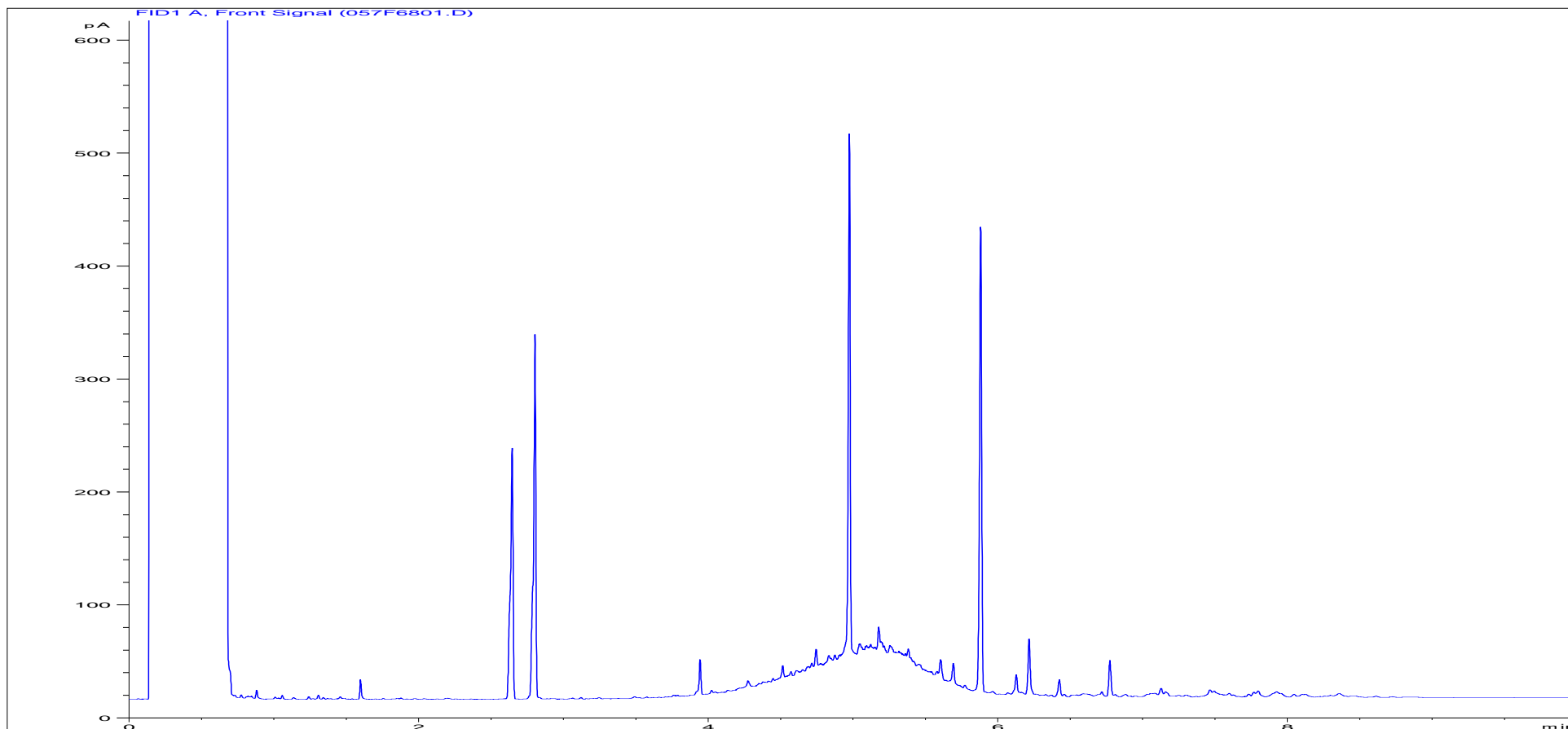
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1574578	<b>Job Number:</b>	W19_5182
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	AB/2
<b>Acquisition Date/Time:</b>	17-Mar-15, 05:49:00		
<b>Datafile:</b>	D:\TES\DATA\Y2015\031615TPH_GC17\031615 2015-03-16 09-32-00\056F6701.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1574579	<b>Job Number:</b>	W19_5182
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	HW/2
<b>Acquisition Date/Time:</b>	17-Mar-15, 06:06:45		
<b>Datafile:</b>	D:\TES\DATA\Y2015\031615TPH_GC17\031615 2015-03-16 09-32-00\057F6801.D		

Where individual results are flagged see report notes for status.

Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W195182

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W195182

Consignment No W84957  
Date Logged 05-Mar-2015

Report Due 18-Mar-2015

ID Number	Description	Matrix Type	Sampled	MethodID	Data Columns																	
					Calc_HD	CUSTSERV	DISGAST					GROHSA	REP/ANALYST	REP/ANALYST	REP/ANALYST	REP/ANALYST	REP/ANALYST	REP/ANALYST	REP/ANALYST	REP/ANALYST	REP/ANALYST	REP/ANALYST
ID Number	Description	Matrix Type	Sampled	MethodID	Total Hardness as CaCO3 (CALC)	Report B	^Dissolved Butane	^Dissolved Methane	^Dissolved Propane	^Dissolved Ethane	^Dissolved Ethene	GRO C5->C8	Total Sulphur as SO4 (Diss) VAR	Calcium as Ca (Dissolved) VAR	Magnesium as Mg (Dissolved) VAR	Sodium as Na (Dissolved) VAR	Potassium as K (Dissolved) VAR	Manganese as Mn (Dissolved) VAR	Iron as Fe (Dissolved) VAR	Aluminium as Al (Dissolved) VAR	Calcium as Ca (Total) VAR	Magnesium as Mg (Total) VAR
					>								>	>	>	>	>	>	>	>	>	>
EX/1574568	CB/2	Surface Water	04/03/15																			
EX/1574569	WF/2	Groundwater	04/03/15																			
EX/1574570	ETF/2	Groundwater	04/03/15																			
EX/1574571	D/2	Surface Water	04/03/15																			
EX/1574572	MA1/2A	Groundwater	04/03/15																			
EX/1574573	MA1/2B	Groundwater	04/03/15																			
EX/1574574	B/2	Groundwater	04/03/15																			
EX/1574575	TV/2A	Groundwater	04/03/15																			
EX/1574576	TV/2B	Groundwater	04/03/15																			
EX/1574577	TE/2	Surface Water	04/03/15																			
EX/1574578	AB/2	Surface Water	04/03/15																			
EX/1574579	HW/2	Groundwater	04/03/15																			

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
^	Analysis Subcontracted - <b>Note: due date may vary</b>

Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W195182

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W195182

Consignment No W84957  
Date Logged 05-Mar-2015

Report Due 18-Mar-2015

ID Number	Description	Matrix Type	Sampled	MethodID							ISEF	KONENS	TPHFD	VOCISAM						
				Sodium as Na (Total) VAR	Potassium as K (Total) VAR	Manganese as Mn (Total) VAR	Iron as Fe (Total) VAR	Aluminium as Al (Total) VAR	Fluoride as F	Chloride as Cl (Kone)				Ammoniacal Nitrogen (Kone)	Nitrite as N (Kone)	Nitrate as N (Kone calc)	TPH Carbon Banding	TPH GC	BTEX Analysis HSA GC-MS	Benzene (µg/l)
				✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EX/1574568	CB/2	Surface Water	04/03/15																	
EX/1574569	WF/2	Groundwater	04/03/15																	
EX/1574570	ETF/2	Groundwater	04/03/15																	
EX/1574571	D/2	Surface Water	04/03/15																	
EX/1574572	MA1/2A	Groundwater	04/03/15																	
EX/1574573	MA1/2B	Groundwater	04/03/15																	
EX/1574574	B/2	Groundwater	04/03/15																	
EX/1574575	TV/2A	Groundwater	04/03/15																	
EX/1574576	TV/2B	Groundwater	04/03/15																	
EX/1574577	TE/2	Surface Water	04/03/15																	
EX/1574578	AB/2	Surface Water	04/03/15																	
EX/1574579	HW/2	Groundwater	04/03/15																	

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
^	Analysis Subcontracted - <b>Note: due date may vary</b>

Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W195182

Customer      Envireau Water  
Site            Dissolved Gasses in Waters  
Report No     W195182

Consignment No W84957  
Date Logged 05-Mar-2015

Report Due 18-Mar-2015

ID Number	Description	MethodID		VOCHSAM	WSLM12	WSLM17	WSLM2	WSLM27	WSLM3
		Matrix Type	Sampled	o Xylene (µg/l)	Total Alkalinity as CaCO3	Total Acidity as CaCO3	Conductivity uS/cm @ 25C	Total Dissolved Solids	pH units
				✓	✓	✓	✓		✓
EX/1574568	CB/2	Surface Water	04/03/15						
EX/1574569	WF/2	Groundwater	04/03/15						
EX/1574570	ETF/2	Groundwater	04/03/15						
EX/1574571	D/2	Surface Water	04/03/15						
EX/1574572	MA1/2A	Groundwater	04/03/15						
EX/1574573	MA1/2B	Groundwater	04/03/15						
EX/1574574	B/2	Groundwater	04/03/15						
EX/1574575	TV/2A	Groundwater	04/03/15						
EX/1574576	TV/2B	Groundwater	04/03/15						
EX/1574577	TE/2	Surface Water	04/03/15						
EX/1574578	AB/2	Surface Water	04/03/15						
EX/1574579	HW/2	Groundwater	04/03/15						

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

**Deviating Sample Key**

- A The sample was received in an inappropriate container for this analysis
- B The sample was received without the correct preservation for this analysis
- C Headspace present in the sample container
- D The sampling date was not supplied so holding time may be compromised - applicable to all analysis
- E Sample processing did not commence within the appropriate holding time
- F Sample processing did not commence within the appropriate handling time

**Requested Analysis Key**

- Analysis Required
- Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
- No analysis scheduled
- ^ Analysis Subcontracted - **Note: due date may vary**



# Additional Report Notes

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
TPHFID	EX1574568-79	The Primary process control result associated with this Test has not wholly met the requirements of the Laboratory Quality Management System (QMS). The Laboratory believes that the validity of the data has not been affected but in line with our QMS policy we have removed accreditation from >nC8-10 and >nC8-14 . These circumstances should be taken into consideration when utilising the data.

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	Calc_HD	As Received	Calculation based on Dissolved metals analysis by ICPOES
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	GROHSA	As Received	Determination of Total Gasoline Range Organics Hydrocarbons (GRO) by Headspace FID
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	ICPWATVART	As Received	Determination of Total Metals in water samples using nitric acid digestion and ICPOES quantitation
Water	ISEF	As Received	Determination of Fluoride in water samples by Ion Selective Electrode (ISE)
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	VOCHSAW	As Received	Determination of Volatile Organics Compounds by Headspace GCMS
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM17	As Received	Titration with Sodium Hydroxide to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Where individual results are flagged see report notes for status.

# Report Notes

## Generic Notes

### Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### Waters Analysis

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup> @ 15°C

### Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

### Asbestos Analysis

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

**^** Sub-contracted analysis.

**\$\$** Unable to analyse due to the nature of the sample

**¶** Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

**¥** Results for guidance only due to possible interference

**&** Blank corrected result

**I.S** Insufficient sample to complete requested analysis

**I.S(g)** Insufficient sample to re-analyse, results for guidance only

**Intf** Unable to analyse due to interferences

**N.D** Not determined

**N.Det** Not detected

**N.F** No Flow

**NS** Information Not Supplied

**Req** Analysis requested, see attached sheets for results

**▮** Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** Dissolved Gasses in Waters  
**Report Number :** W19\_5182

[illegible]

## Water Analysis Test Certificate

Round 3

Our Ref: EXR/196429 (Ver. 1)

Your Ref:

April 9, 2015



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Ms P Jenkinson  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Ms P Jenkinson

Dear Ms Jenkinson

**Sample Analysis - Dissolved Gasses in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

A handwritten signature in black ink, appearing to read 'D Simpson', written over a horizontal line.

D Simpson  
Project Co-ordinator  
01283 554458

# TEST REPORT



Report No. EXR/196429 (Ver. 1)

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

## Site: Dissolved Gasses in Waters

The 13 samples described in this report were registered for analysis by ESG on 25-Mar-2015. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 09-Apr-2015

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Pages 2 to 4)  
Table of TPH Texas banding (0.01) (Page 5)  
GC-FID Chromatograms (Pages 6 to 18)  
Analytical and Deviating Sample Overview (Pages 19 to 20)  
Table of Method Descriptions (Page 21)  
Table of Report Notes (Page 22)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns


  
Managing Director  
Multi-Sector Services

Date of Issue: 09-Apr-2015

Tests marked '^' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

ESG accepts no responsibility for any sampling not carried out by our personnel.

Units : Method Codes : Method Reporting Limits : UKAS Accredited :			pH units	uS/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l					
			WSLM3	WSLM2	WSLM12	WSLM17	Calc_HD	KONENS	ISEF	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART				
				100		2	7	1	0.1	3	1	1	1	1	1	1	1	1	1				
			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
LAB ID Number	EX/	Client Sample Description	Sample Date	pH units w	Conductivity uS/cm @ 25C w	Total Alkalinity as CaCO3 w	Total Acidity as CaCO3 w	Total Hardness as CaCO3	Chloride as Cl w	Fluoride as F a	Total Sulphur as SO4 (Dissolved) a	Calcium as Ca (Total) a	Calcium as Ca (Dissolved) a	Magnesium as Mg (Total) a	Magnesium as Mg (Dissolved) a	Sodium as Na (Total) a	Sodium as Na (Dissolved) a	Potassium as K (Total) a	Potassium as K (Dissolved) a				
1580157		WF/3A	23-Mar-15 10:15	7.5	922	434	Nil	133	28	0.2	30	38	40	8	8	190	200	4	4				
1580158		WF/3B	23-Mar-15 10:30	7.8	916	444	Nil	133	28	0.2	30	32	40	7	8	160	200	3	4				
1580159		B/3	23-Mar-15 10:45	7.7	<100	2	Nil	<7	<1	<0.1	<3	<1	<1	<1	<1	<1	<1	<1	<1				
1580160		CB/3A	23-Mar-15 11:20	7.8	601	196	Nil	349	30	0.1	48	97	125	7	9	15	18	2	3				
1580161		CB/3B	23-Mar-15 11:35	7.8	599	190	Nil	337	29	0.1	48	92	120	7	9	14	18	2	2				
1580162		ETF/3	23-Mar-15 11:55	7.8	3050	682	Nil	280	104	1.1	840	52	61	26	31	948	638	7	8				
1580163		D/3	23-Mar-15 12:15	8.1	817	242	Nil	474	61	0.3	78	140	175	8	9	21	26	4	5				
1580164		MA1/3	23-Mar-15 12:55	7.4	638	205	Nil	366	31	<0.1	57	94	130	7	10	10	13	1	2				
1580165		TV/3	23-Mar-15 13:20	7.7	1580	621	Nil	87	47	0.6	155	22	25	6	6	370	337	4	5				
1580166		TE/3	23-Mar-15 13:45	7.9	1060	460	Nil	104	28	0.3	75	24	30	5	7	210	265	3	4				
1580167		AB/3	23-Mar-15 14:30	7.9	1070	291	Nil	495	120	0.3	82	150	175	12	14	54	63	5	7				
1580168		HW/3	23-Mar-15 14:45	7.5	820	407	Nil	107	22	0.3	18	29	33	5	6	160	180	3	3				
1580169		CF/3	23-Mar-15 15:45	7.7	1140	485	Nil	109	26	0.3	94	27	32	6	7	220	270	3	4				
<div></div> <div>Bretby Business Park, Ashby Road</div> <div>Burton-on-Trent, Staffordshire, DE15 0YZ</div> <div>Tel +44 (0) 1283 554400</div> <div>Fax +44 (0) 1283 554422</div>				Client Name		Envireau Water						Sample Analysis											
				Contact		Ms P Jenkinson																	
				Dissolved Gasses in Waters										Date Printed						09-Apr-2015			
														Report Number						EXR/196429			
														Table Number						1			



Units : Method Codes : Method Reporting Limits : UKAS Accredited :			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	µg/l	µg/l	µg/l	
			ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	KONENS	KONENS	KONENS	GROHSA	TPHFID	TPHFID	WSLM27	ICPWATVART	ICPWATVAR	DISGAS1	DISGAS1	DISGAS1	
			0.01	0.01	0.01	0.01	0.01	0.01	0.2	0.1	0.01	0.01	5	0.01	0.01	15	6	6	
			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
LAB ID Number	EX/	Client Sample Description	Sample Date	Manganese as Mn (Total) a	Manganese as MN (Dissolved) a	Iron as Fe (Total) a	Iron as Fe (Dissolved) a	Ammoniacal Nitrogen as N	Nitrite as N	Nitrate as N	GRO-HSA o	Carbon Banding	TPH GC	Total Dissolved Solids w	Aluminium as Al (Total) a	Aluminium as Al (Dissolved) a	^Dissolved Butane	^Dissolved Methane	^Dissolved Propane
1580157		WF/3A	23-Mar-15 10:15	0.36	0.36	0.24	0.05	0.7	<0.01	<0.2	<0.1	Req	<0.01	520	0.02	<0.01	<22	<0.6	<16
1580158		WF/3B	23-Mar-15 10:30	0.30	0.37	0.31	0.05	0.7	<0.01	<0.2	<0.1	Req	<0.01	520	0.02	<0.01	<22	10	<17
1580159		B/3	23-Mar-15 10:45	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.2	<0.1	Req	<0.01	9	0.01	<0.01	<14	<4	<11
1580160		CB/3A	23-Mar-15 11:20	0.02	<0.01	0.42	0.12	0.05	0.02	6.4	<0.1	Req	0.01	350	0.15	0.02			
1580161		CB/3B	23-Mar-15 11:35	0.01	<0.01	0.27	0.12	0.05	0.02	6.5	<0.1	Req	0.01	360	0.08	0.02			
1580162		ETF/3	23-Mar-15 11:55	0.03	<0.01	1.00	0.06	2.2	<0.01	0.5	<0.1	Req	<0.01	2030	0.35	<0.01	<17	383	<13
1580163		D/3	23-Mar-15 12:15	<0.01	<0.01	0.16	0.13	0.02	<0.01	5.5	<0.1	Req	<0.01	560	0.08	0.01			
1580164		MA1/3	23-Mar-15 12:55	<0.01	<0.01	0.11	0.11	<0.01	<0.01	6.3	<0.1	Req	<0.01	390	0.03	0.01	<14	<4	<11
1580165		TV/3	23-Mar-15 13:20	0.04	0.02	0.15	0.03	1.2	<0.01	<0.2	<0.1	Req	<0.01	960	0.02	<0.01	<16	2516	<12
1580166		TE/3	23-Mar-15 13:45	0.04	0.02	0.26	0.10	0.11	<0.01	<0.2	<0.1	Req	0.01	600	0.06	<0.01			
1580167		AB/3	23-Mar-15 14:30	0.04	0.03	0.47	0.13	0.4	<0.01	1.9	<0.1	Req	0.04	630	0.42	0.01			
1580168		HW/3	23-Mar-15 14:45	0.28	0.31	0.52	0.05	0.6	<0.01	<0.2	<0.1	Req	<0.01	430	0.06	<0.01	<22	6	<17
1580169		CF/3	23-Mar-15 15:45	0.22	0.25	0.17	0.03	0.7	<0.01	<0.2	<0.1	Req	<0.01	670	0.02	<0.01	<14	5	<11

Units : Method Codes : Method Reporting Limits : UKAS Accredited :			µg/l	µg/l														
			DISGAS1	DISGAS1														
			12	11														
			No	No														
LAB ID Number EX/	Client Sample Description	Sample Date	^Dissolved Ethane	^Dissolved Ethene														
1580157	WF/3A	23-Mar-15 10:15	<11	<10														
1580158	WF/3B	23-Mar-15 10:30	<12	<11														
1580159	B/3	23-Mar-15 10:45	<7	<7														
1580160	CB/3A	23-Mar-15 11:20																
1580161	CB/3B	23-Mar-15 11:35																
1580162	ETF/3	23-Mar-15 11:55	<9	<8														
1580163	D/3	23-Mar-15 12:15																
1580164	MA1/3	23-Mar-15 12:55	<7	<7														
1580165	TV/3	23-Mar-15 13:20	12	<8														
1580166	TE/3	23-Mar-15 13:45																
1580167	AB/3	23-Mar-15 14:30																
1580168	HW/3	23-Mar-15 14:45	<11	<11														
1580169	CF/3	23-Mar-15 15:45	<7	<7														

# Total Petroleum Hydrocarbons (TPH) Carbon Ranges

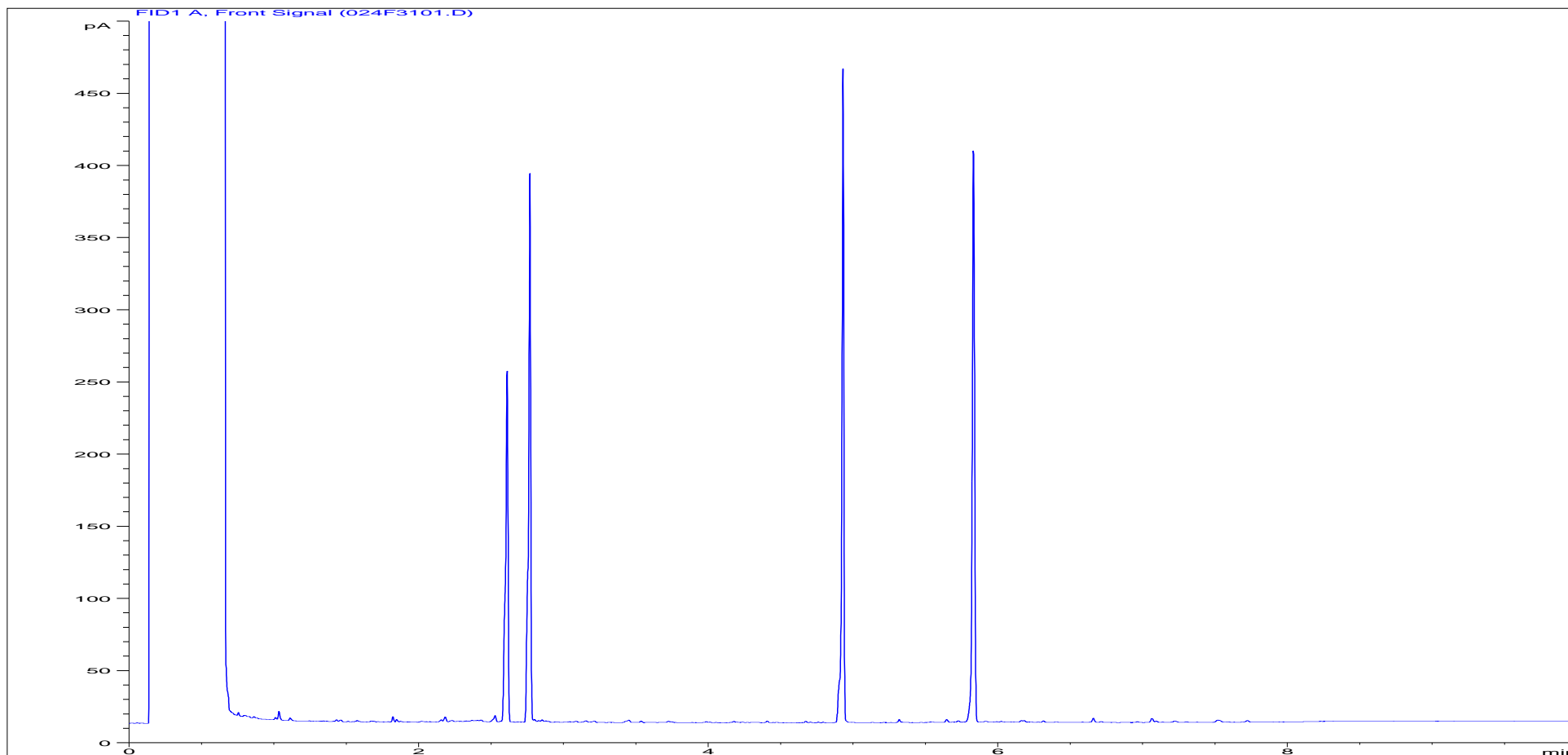
**Customer and Site Details:** Envireau Water : Dissolved Gasses in Waters  
**Job Number:** W19\_6429  
**QC Batch Number:** 1580222  
**Directory:** D:\TES\DATA\Y2015\032715TPH\_GC17\032715 2015-03-27 13-09-04\036F4301.D  
**Method:** Bottle

**Matrix:** Water  
**Date Booked in:** 25-Mar-15  
**Date Extracted:** 27-Mar-15  
**Date Analysed:** 28-Mar-15, 02:04:00

\* Sample data with an asterisk are not UKAS accredited.

Sample ID	Client ID	Concentration, (mg/l)				
		>C8 - C10	>C10 - C12	>C12 - C16	>C16 - C21	>C21 - C35
EX1580157	WF/3A	<0.01	<0.01	<0.01	<0.01	<0.01
EX1580158	WF/3B	<0.01	<0.01	<0.01	<0.01	<0.01
EX1580159	B/3	<0.01	<0.01	<0.01	<0.01	<0.01
EX1580160	CB/3A	<0.01	<0.01	<0.01	<0.01	0.01
EX1580161	CB/3B	<0.01	<0.01	<0.01	<0.01	<0.01
EX1580162	ETF/3	<0.01	<0.01	<0.01	<0.01	<0.01
EX1580163	D/3	<0.01	<0.01	<0.01	<0.01	<0.01
EX1580164	MA1/3	<0.01	<0.01	<0.01	<0.01	<0.01
EX1580165	TV/3	<0.01	<0.01	<0.01	<0.01	<0.01
EX1580166	TE/3	<0.01	<0.01	<0.01	<0.01	<0.01
EX1580167	AB/3	<0.01	<0.01	<0.01	<0.01	0.028
EX1580168	HW/3	<0.01	<0.01	<0.01	<0.01	<0.01
EX1580169	CF/3	<0.01	<0.01	<0.01	<0.01	<0.01

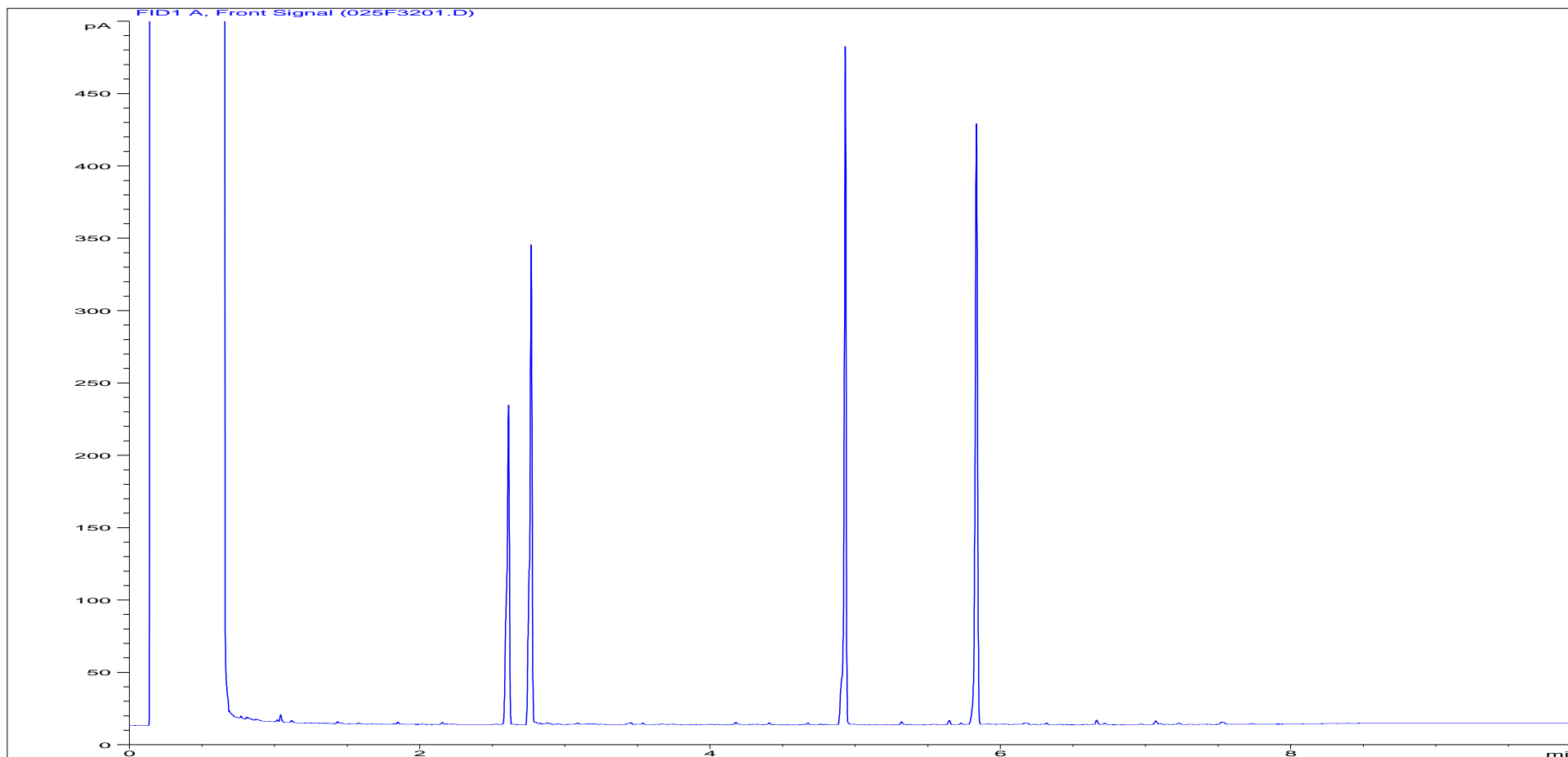
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1580157	<b>Job Number:</b>	W19_6429
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	WF/3A
<b>Acquisition Date/Time:</b>	27-Mar-15, 22:27:08		
<b>Datafile:</b>	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\024F3101.D		

Where individual results are flagged see report notes for status.

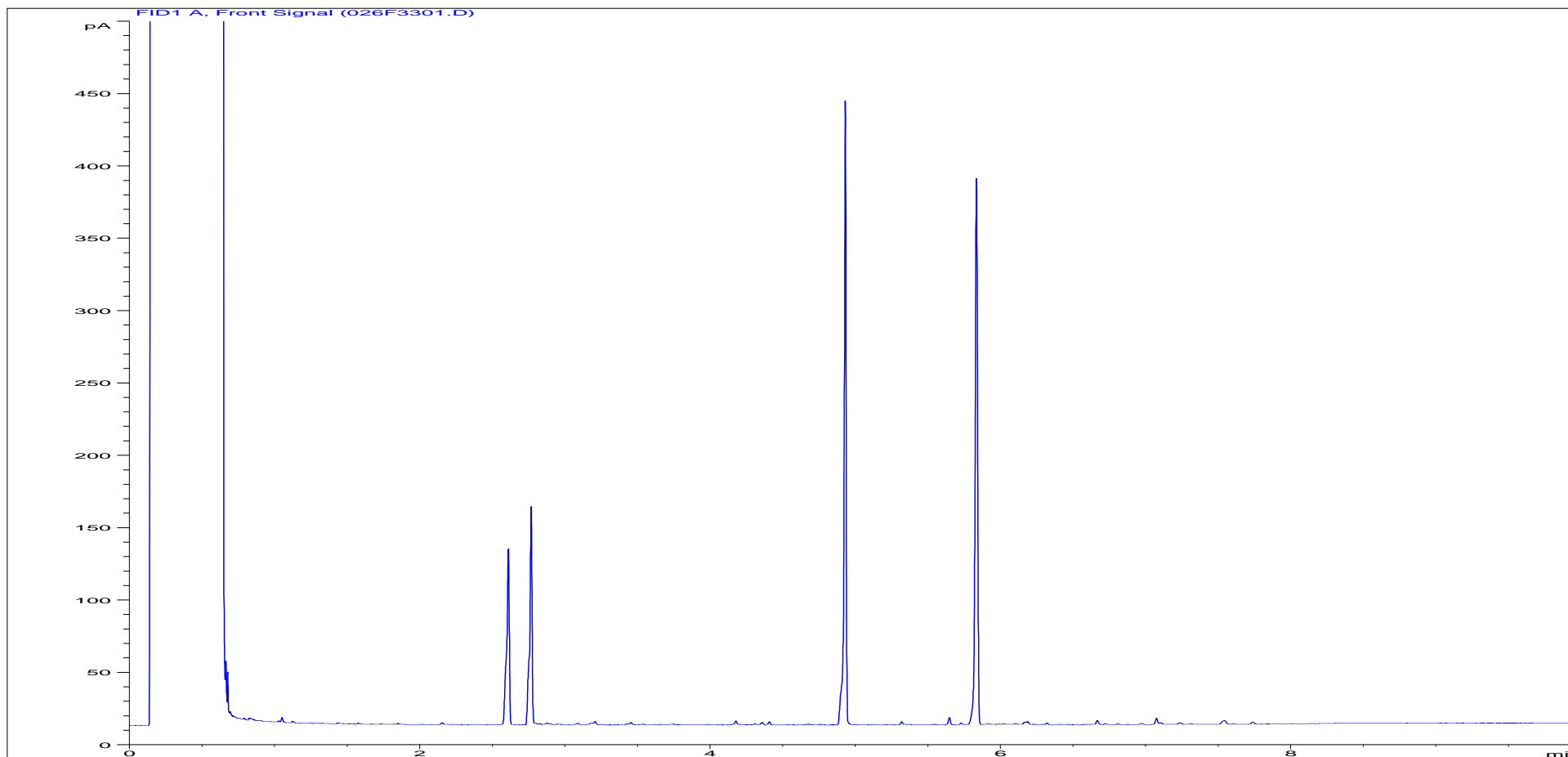
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1580158	<b>Job Number:</b>	W19_6429
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	WF/3B
<b>Acquisition Date/Time:</b>	27-Mar-15, 22:45:15		
<b>Datafile:</b>	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\025F3201.D		

Where individual results are flagged see report notes for status.

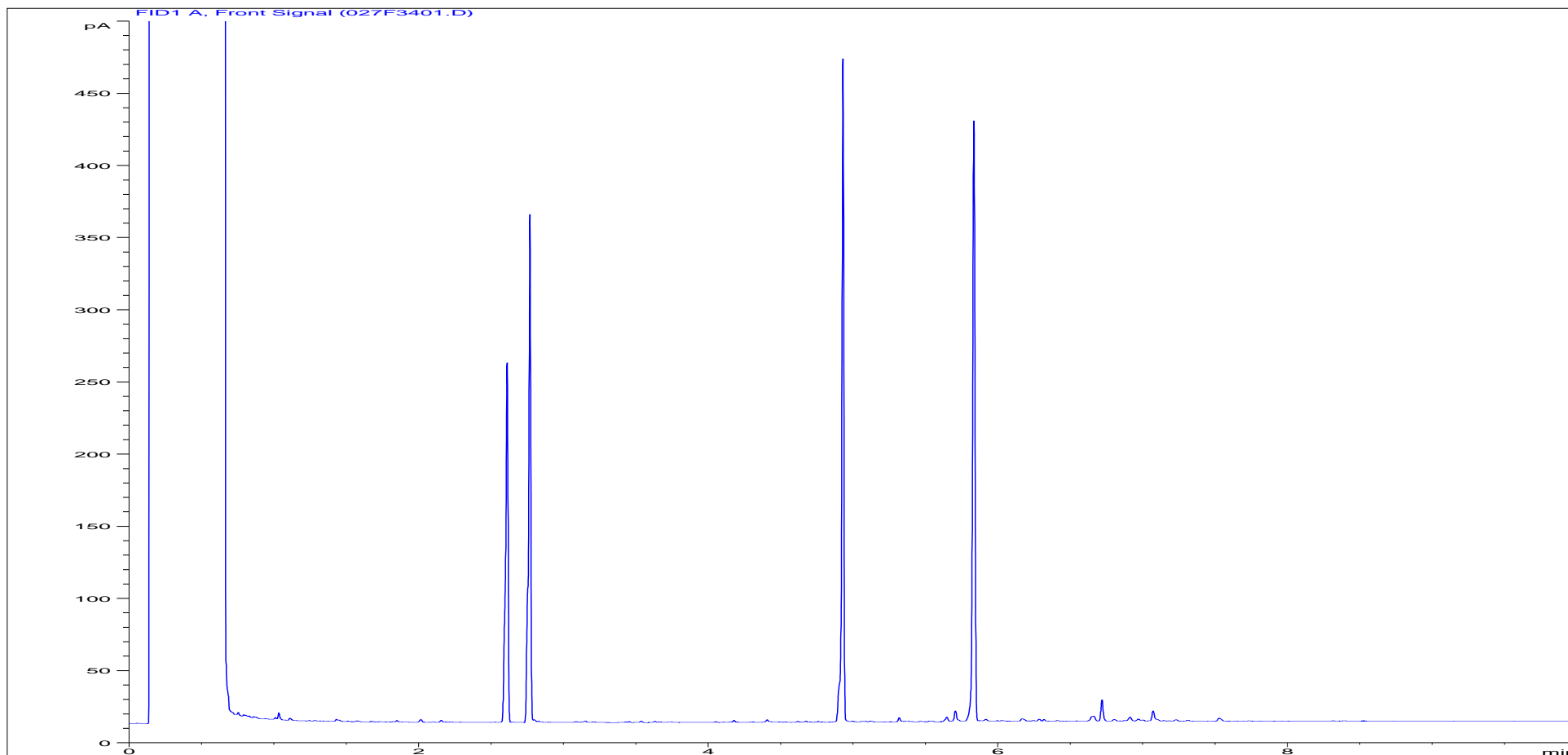
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1580159	<b>Job Number:</b>	W19_6429
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	B/3
<b>Acquisition Date/Time:</b>	27-Mar-15, 23:03:21		
<b>Datafile:</b>	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\026F3301.D		

Where individual results are flagged see report notes for status.

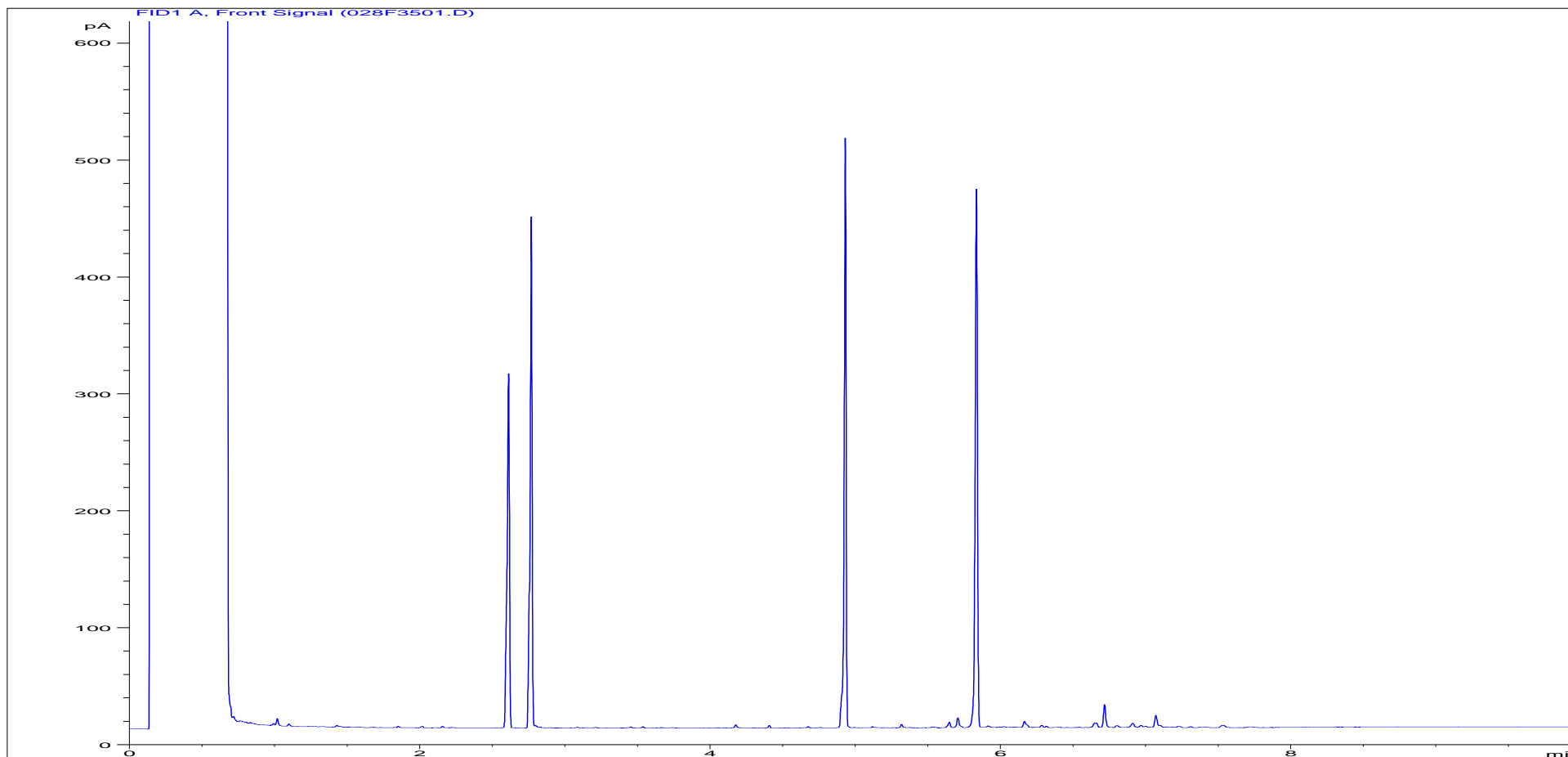
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1580160	Job Number:	W19_6429
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	CB/3A
Acquisition Date/Time:	27-Mar-15, 23:21:31		
Datafile:	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\027F3401.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID

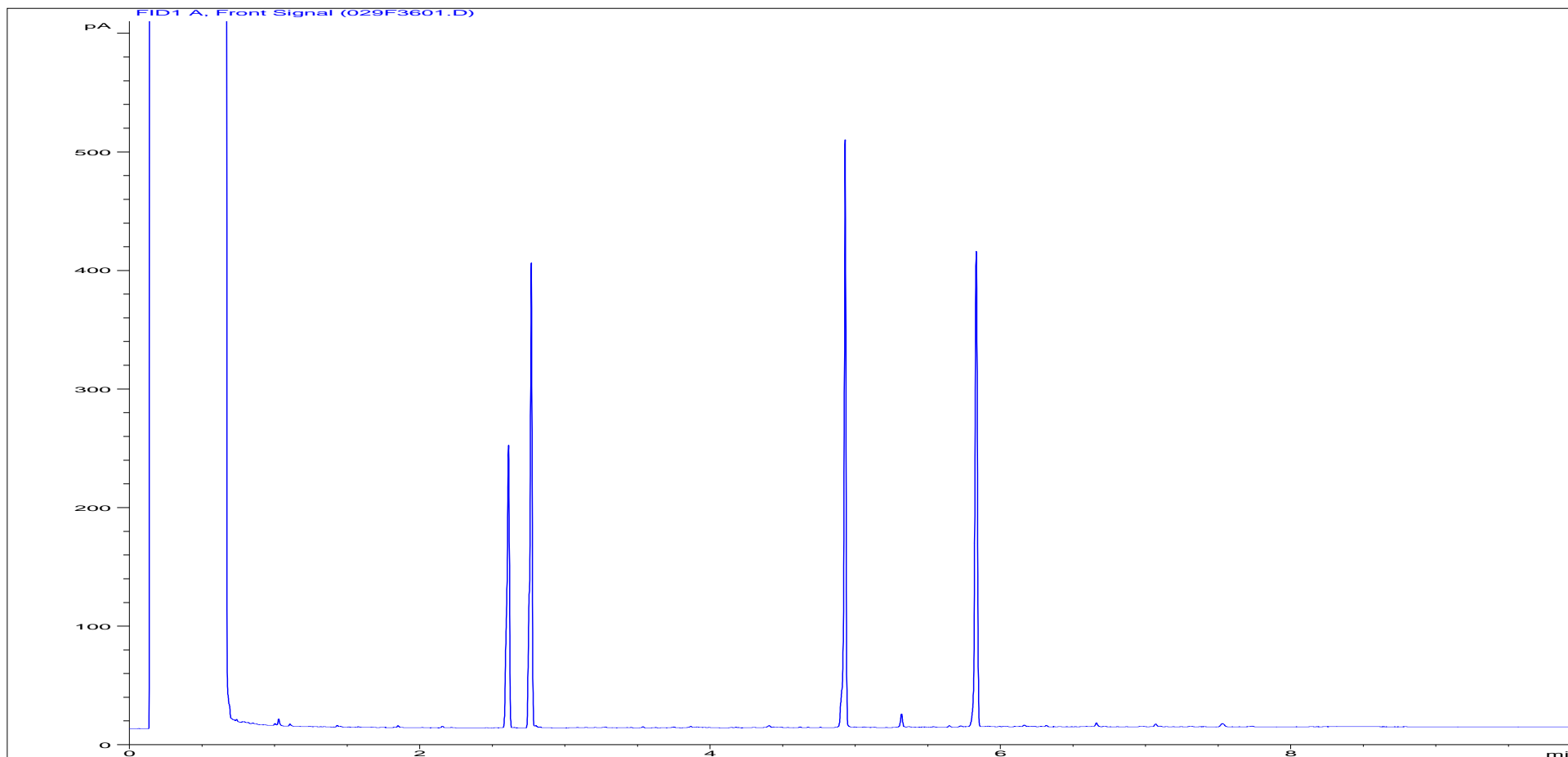


Sample ID:	EX1580161	Job Number:	W19_6429
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	CB/3B
Acquisition Date/Time:	27-Mar-15, 23:39:34		
Datafile:	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\028F3501.D		

Where individual results are flagged see report notes for status.



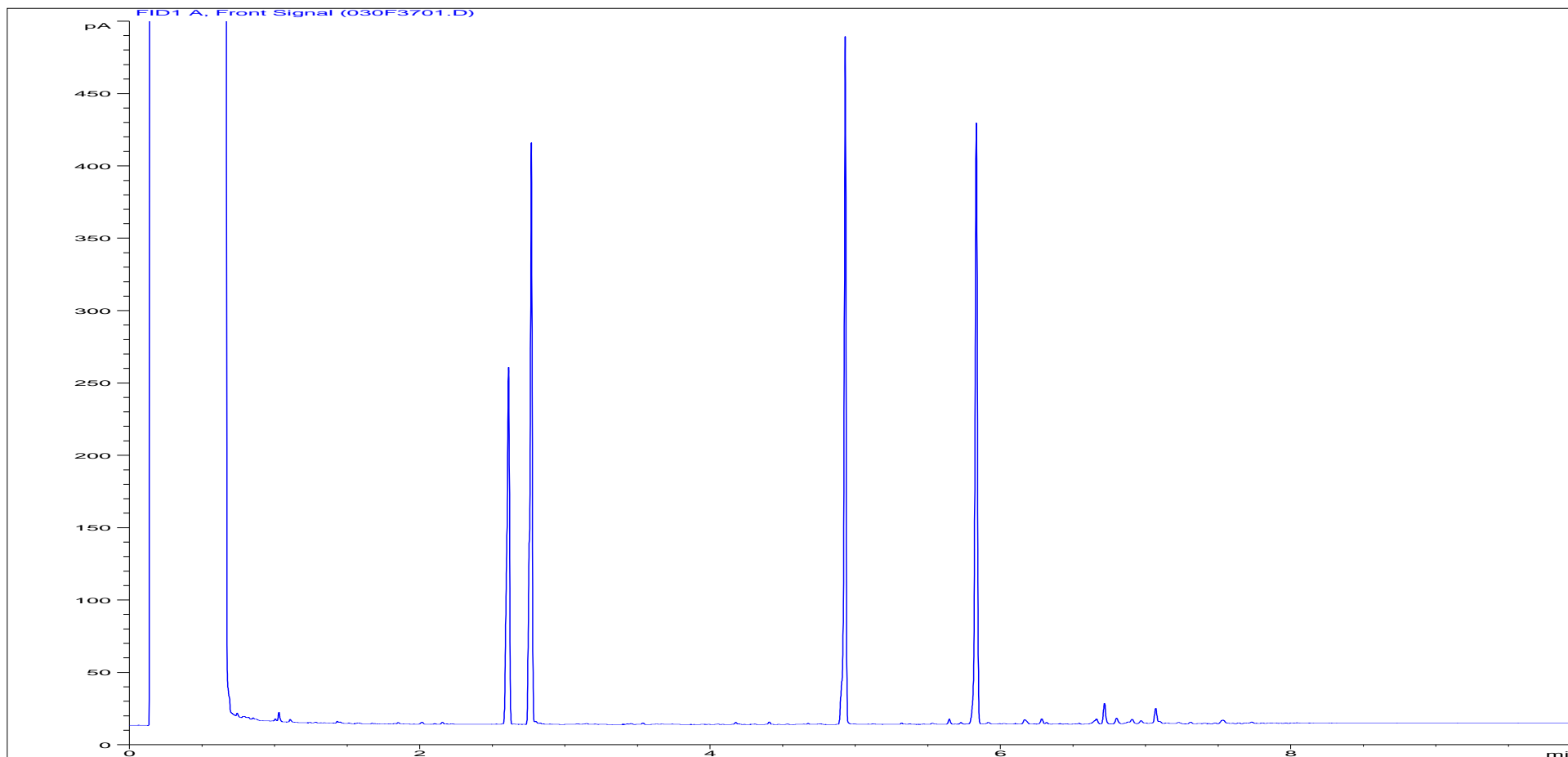
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1580162	<b>Job Number:</b>	W19_6429
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	ETF/3
<b>Acquisition Date/Time:</b>	27-Mar-15, 23:57:37		
<b>Datafile:</b>	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\029F3601.D		

Where individual results are flagged see report notes for status.

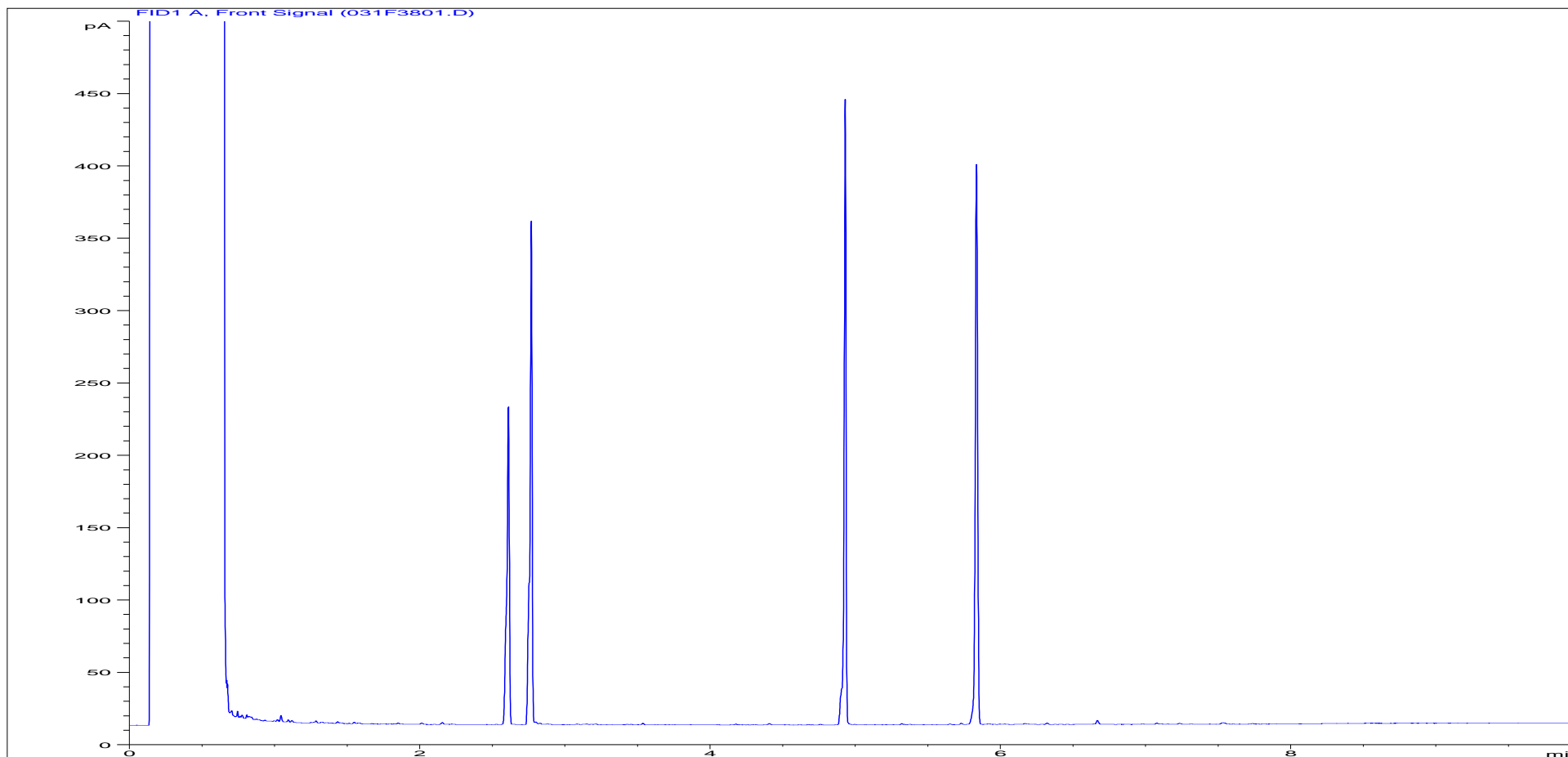
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1580163	<b>Job Number:</b>	W19_6429
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	D/3
<b>Acquisition Date/Time:</b>	28-Mar-15, 00:15:38		
<b>Datafile:</b>	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\030F3701.D		

Where individual results are flagged see report notes for status.

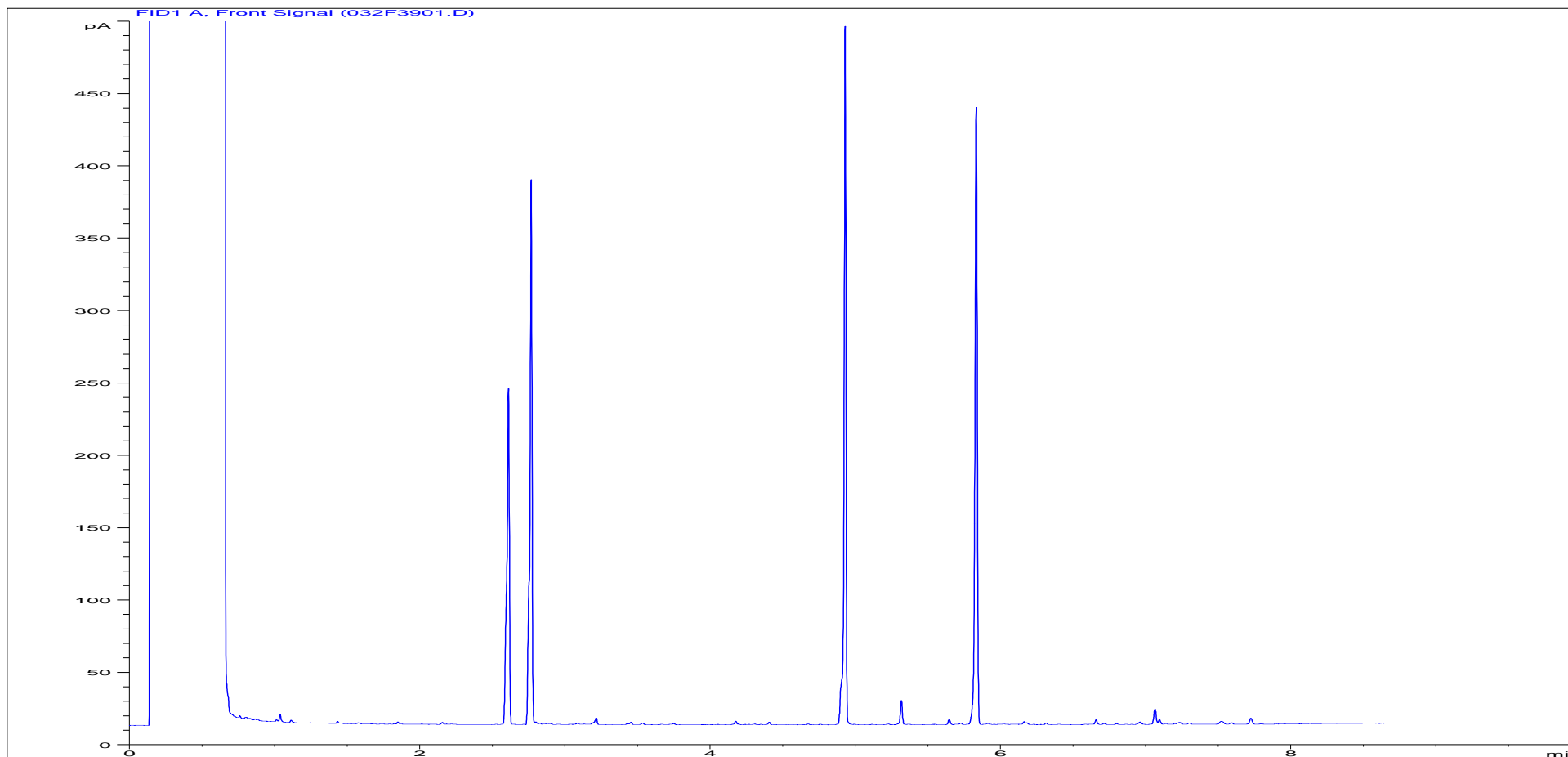
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1580164	Job Number:	W19_6429
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	MA1/3
Acquisition Date/Time:	28-Mar-15, 00:33:47		
Datafile:	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\031F3801.D		

Where individual results are flagged see report notes for status.

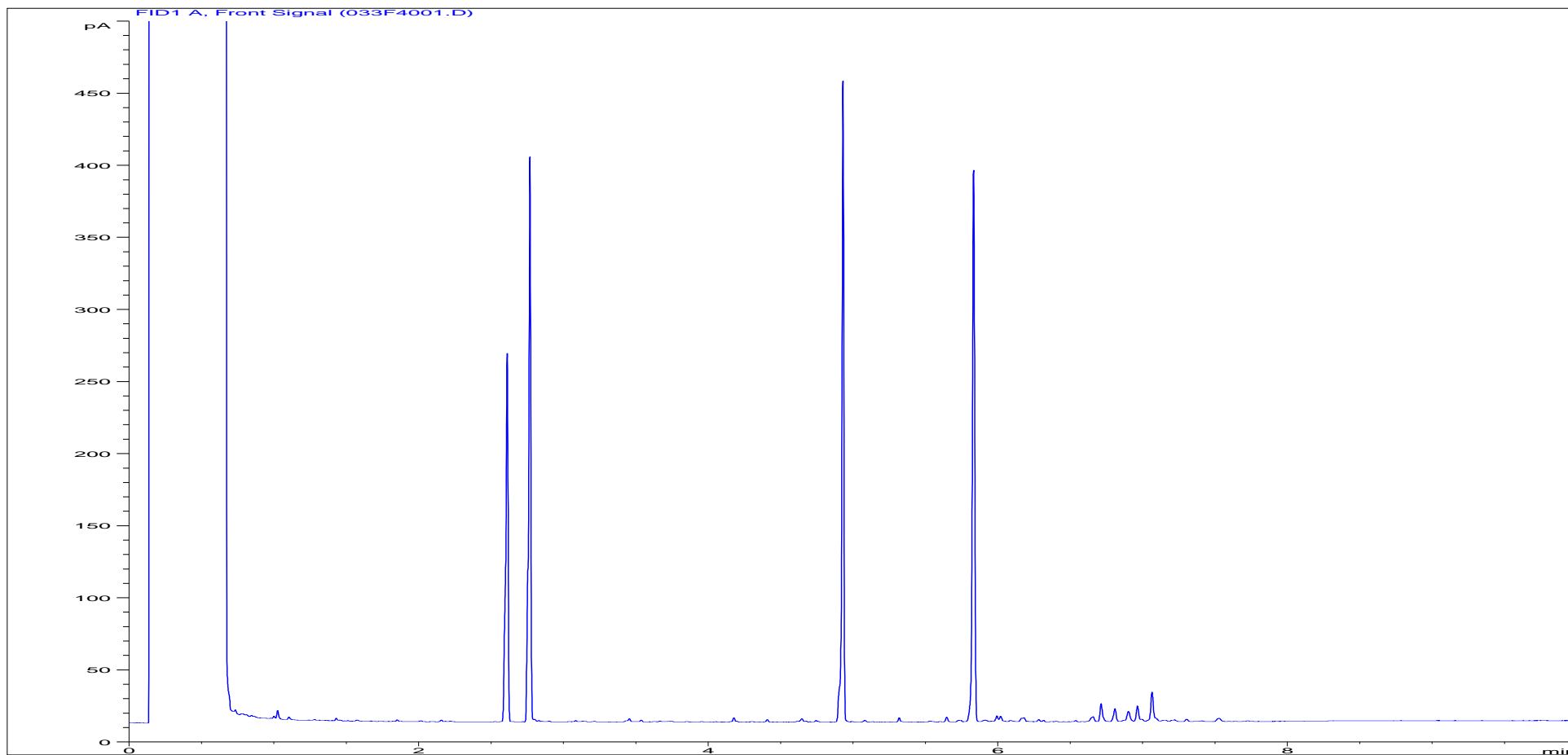
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1580165	<b>Job Number:</b>	W19_6429
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV/3
<b>Acquisition Date/Time:</b>	28-Mar-15, 00:51:51		
<b>Datafile:</b>	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\032F3901.D		

Where individual results are flagged see report notes for status.

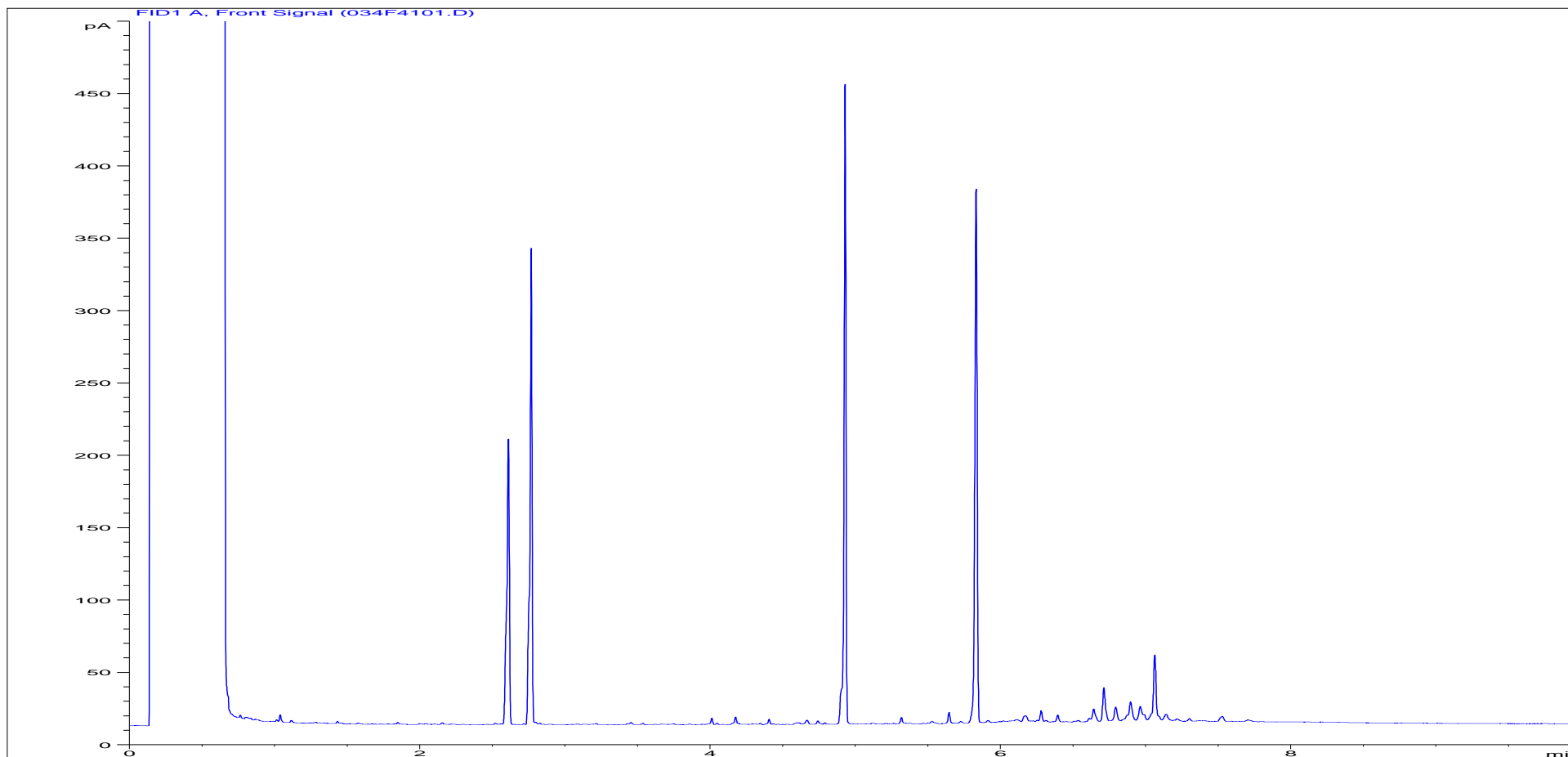
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1580166	Job Number:	W19_6429
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	TE/3
Acquisition Date/Time:	28-Mar-15, 01:09:53		
Datafile:	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\033F4001.D		

Where individual results are flagged see report notes for status.

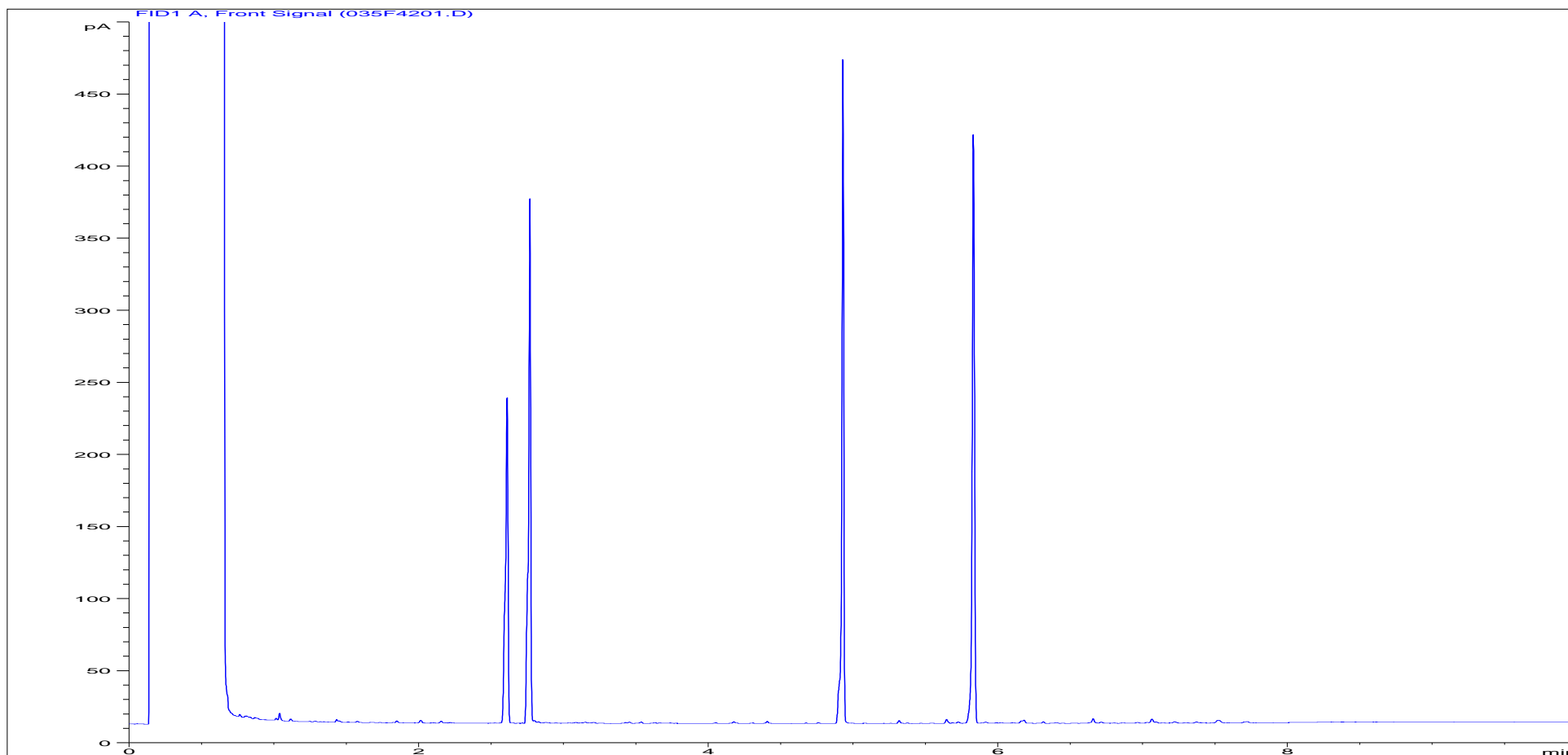
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1580167	<b>Job Number:</b>	W19_6429
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	AB/3
<b>Acquisition Date/Time:</b>	28-Mar-15, 01:27:54		
<b>Datafile:</b>	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\034F4101.D		

Where individual results are flagged see report notes for status.

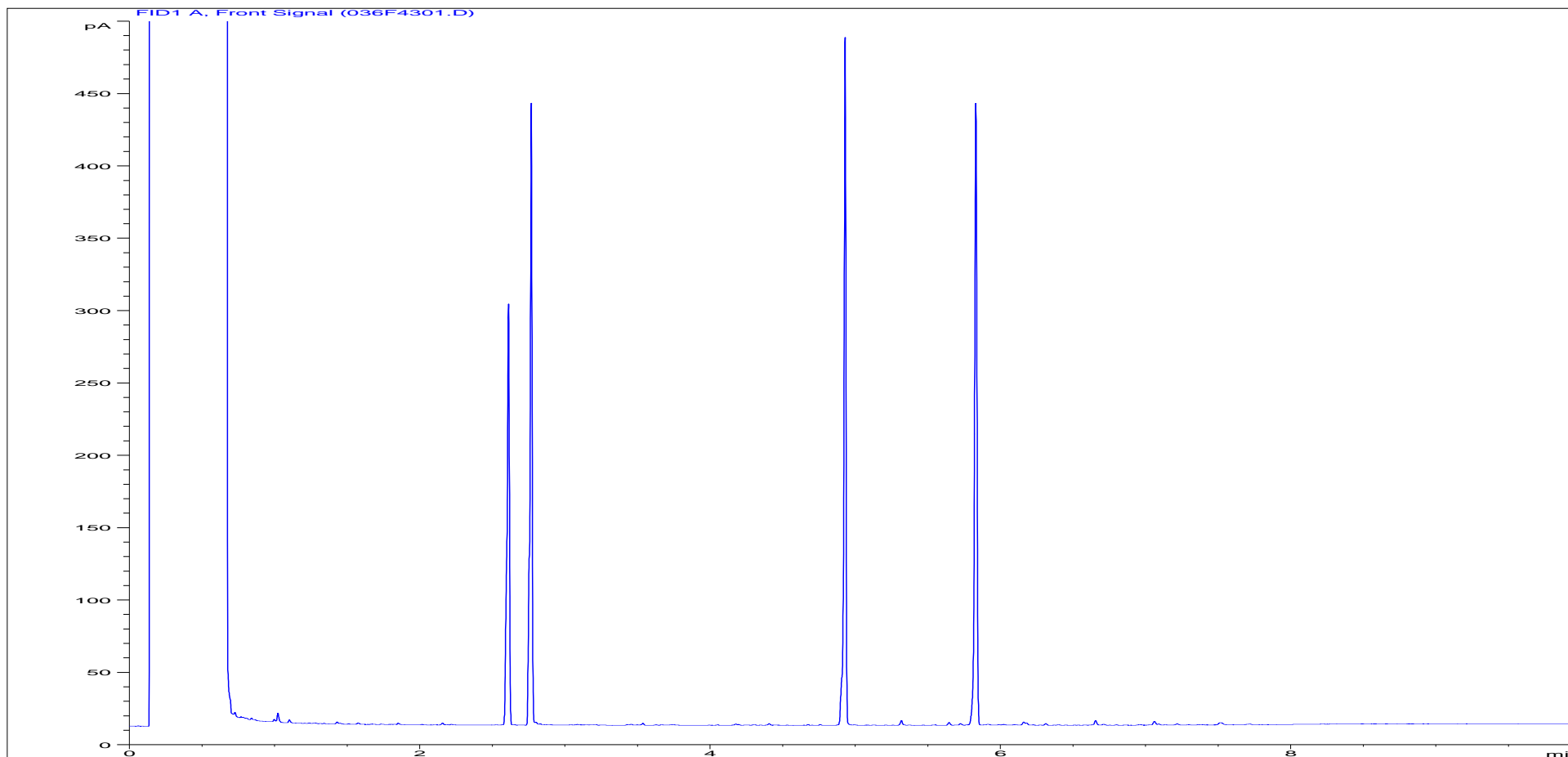
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1580168	<b>Job Number:</b>	W19_6429
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	HW/3
<b>Acquisition Date/Time:</b>	28-Mar-15, 01:46:02		
<b>Datafile:</b>	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\035F4201.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1580169	<b>Job Number:</b>	W19_6429
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	CF/3
<b>Acquisition Date/Time:</b>	28-Mar-15, 02:04:00		
<b>Datafile:</b>	D:\TES\DATA\Y2015\032715TPH_GC17\032715 2015-03-27 13-09-04\036F4301.D		

Where individual results are flagged see report notes for status.



Report Due 09-Apr-2015

ID Number	Description	MethodID		CALC_HD	CUST SERV	DISGAS1	DISGAS2	DISGAS3	DISGAS4	DISGAS5	DISGAS6	DISGAS7	DISGAS8	DISGAS9	DISGAS10	DISGAS11	DISGAS12	DISGAS13	DISGAS14	DISGAS15	DISGAS16	DISGAS17	DISGAS18	DISGAS19	DISGAS20	DISGAS21	DISGAS22	DISGAS23	DISGAS24	DISGAS25	DISGAS26	DISGAS27	DISGAS28	DISGAS29	DISGAS30	DISGAS31	DISGAS32	DISGAS33	DISGAS34	DISGAS35	DISGAS36	DISGAS37	DISGAS38	DISGAS39	DISGAS40	DISGAS41	DISGAS42	DISGAS43	DISGAS44	DISGAS45	DISGAS46	DISGAS47	DISGAS48	DISGAS49	DISGAS50	DISGAS51	DISGAS52	DISGAS53	DISGAS54	DISGAS55	DISGAS56	DISGAS57	DISGAS58	DISGAS59	DISGAS60	DISGAS61	DISGAS62	DISGAS63	DISGAS64	DISGAS65	DISGAS66	DISGAS67	DISGAS68	DISGAS69	DISGAS70	DISGAS71	DISGAS72	DISGAS73	DISGAS74	DISGAS75	DISGAS76	DISGAS77	DISGAS78	DISGAS79	DISGAS80	DISGAS81	DISGAS82	DISGAS83	DISGAS84	DISGAS85	DISGAS86	DISGAS87	DISGAS88	DISGAS89	DISGAS90	DISGAS91	DISGAS92	DISGAS93	DISGAS94	DISGAS95	DISGAS96	DISGAS97	DISGAS98	DISGAS99	DISGAS100	DISGAS101	DISGAS102	DISGAS103	DISGAS104	DISGAS105	DISGAS106	DISGAS107	DISGAS108	DISGAS109	DISGAS110	DISGAS111	DISGAS112	DISGAS113	DISGAS114	DISGAS115	DISGAS116	DISGAS117	DISGAS118	DISGAS119	DISGAS120	DISGAS121	DISGAS122	DISGAS123	DISGAS124	DISGAS125	DISGAS126	DISGAS127	DISGAS128	DISGAS129	DISGAS130	DISGAS131	DISGAS132	DISGAS133	DISGAS134	DISGAS135	DISGAS136	DISGAS137	DISGAS138	DISGAS139	DISGAS140	DISGAS141	DISGAS142	DISGAS143	DISGAS144	DISGAS145	DISGAS146	DISGAS147	DISGAS148	DISGAS149	DISGAS150	DISGAS151	DISGAS152	DISGAS153	DISGAS154	DISGAS155	DISGAS156	DISGAS157	DISGAS158	DISGAS159	DISGAS160	DISGAS161	DISGAS162	DISGAS163	DISGAS164	DISGAS165	DISGAS166	DISGAS167	DISGAS168	DISGAS169	DISGAS170	DISGAS171	DISGAS172	DISGAS173	DISGAS174	DISGAS175	DISGAS176	DISGAS177	DISGAS178	DISGAS179	DISGAS180	DISGAS181	DISGAS182	DISGAS183	DISGAS184	DISGAS185	DISGAS186	DISGAS187	DISGAS188	DISGAS189	DISGAS190	DISGAS191	DISGAS192	DISGAS193	DISGAS194	DISGAS195	DISGAS196	DISGAS197	DISGAS198	DISGAS199	DISGAS200	DISGAS201	DISGAS202	DISGAS203	DISGAS204	DISGAS205	DISGAS206	DISGAS207	DISGAS208	DISGAS209	DISGAS210	DISGAS211	DISGAS212	DISGAS213	DISGAS214	DISGAS215	DISGAS216	DISGAS217	DISGAS218	DISGAS219	DISGAS220	DISGAS221	DISGAS222	DISGAS223	DISGAS224	DISGAS225	DISGAS226	DISGAS227	DISGAS228	DISGAS229	DISGAS230	DISGAS231	DISGAS232	DISGAS233	DISGAS234	DISGAS235	DISGAS236	DISGAS237	DISGAS238	DISGAS239	DISGAS240	DISGAS241	DISGAS242	DISGAS243	DISGAS244	DISGAS245	DISGAS246	DISGAS247	DISGAS248	DISGAS249	DISGAS250	DISGAS251	DISGAS252	DISGAS253	DISGAS254	DISGAS255	DISGAS256	DISGAS257	DISGAS258	DISGAS259	DISGAS260	DISGAS261	DISGAS262	DISGAS263	DISGAS264	DISGAS265	DISGAS266	DISGAS267	DISGAS268	DISGAS269	DISGAS270	DISGAS271	DISGAS272	DISGAS273	DISGAS274	DISGAS275	DISGAS276	DISGAS277	DISGAS278	DISGAS279	DISGAS280	DISGAS281	DISGAS282	DISGAS283	DISGAS284	DISGAS285	DISGAS286	DISGAS287	DISGAS288	DISGAS289	DISGAS290	DISGAS291	DISGAS292	DISGAS293	DISGAS294	DISGAS295	DISGAS296
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# Sample Analysis

## ESG Environmental Chemistry Analytical and Deviating Sample Overview

W196429

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W196429

Consignment No W85912

Date Logged 25-Mar-2015

Report Due 09-Apr-2015

ID Number	Description	Matrix Type	Sampled	MethodID						ISEF	KONENS	TPH/FID	WSL.M12	WSL.M17	WSL.M2	WSL.M27	WSL.M3
				IGM/VART	Sodium as Na (Total) VAR	Potassium as K (Total) VAR	Manganese as Mn (Total) VAR	Iron as Fe (Total) VAR	Aluminium as Al (Total) VAR								
					✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
EX/1580157	WF/3A	Groundwater	23/03/15														
EX/1580158	WF/3B	Groundwater	23/03/15														
EX/1580159	B/3	Groundwater	23/03/15														
EX/1580160	CB/3A	Surface Water	23/03/15														
EX/1580161	CB/3B	Surface Water	23/03/15														
EX/1580162	ETF/3	Groundwater	23/03/15														
EX/1580163	D/3	Surface Water	23/03/15														
EX/1580164	MA1/3	Groundwater	23/03/15														
EX/1580165	TV/3	Groundwater	23/03/15														
EX/1580166	TE/3	Surface Water	23/03/15														
EX/1580167	AB/3	Surface Water	23/03/15														
EX/1580168	HW/3	Groundwater	23/03/15														
EX/1580169	CF/3	Groundwater	23/03/15														

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

### Deviating Sample Key

- A The sample was received in an inappropriate container for this analysis
- B The sample was received without the correct preservation for this analysis
- C Headspace present in the sample container
- D The sampling date was not supplied so holding time may be compromised - applicable to all analysis
- E Sample processing did not commence within the appropriate holding time
- F Sample processing did not commence within the appropriate handling time

### Requested Analysis Key

- Analysis Required
- Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
- No analysis scheduled
- ^ Analysis Subcontracted - **Note: due date may vary**

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	Calc_HD	As Received	Calculation based on Dissolved metals analysis by ICPOES
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	GROHSA	As Received	Determination of Total Gasoline Range Organics Hydrocarbons (GRO) by Headspace FID
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	ICPWATVART	As Received	Determination of Total Metals in water samples using nitric acid digestion and ICPOES quantitation
Water	ISEF	As Received	Determination of Fluoride in water samples by Ion Selective Electrode (ISE)
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM17	As Received	Titration with Sodium Hydroxide to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Where individual results are flagged see report notes for status.

# Report Notes

## Generic Notes

### Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### Waters Analysis

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup>@ 15°C

### Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

### Asbestos Analysis

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

**^** Sub-contracted analysis.

**\$\$** Unable to analyse due to the nature of the sample

**¶** Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

**¥** Results for guidance only due to possible interference

**&** Blank corrected result

**I.S** Insufficient sample to complete requested analysis

**I.S(g)** Insufficient sample to re-analyse, results for guidance only

**Intf** Unable to analyse due to interferences

**N.D** Not determined

**N.Det** Not detected

**N.F** No Flow

**NS** Information Not Supplied

**Req** Analysis requested, see attached sheets for results

**▯** Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** Dissolved Gasses in Waters  
**Report Number :** W19\_6429

[illegible]

## Water Analysis Test Certificate

Round 4

Our Ref: EXR/198642 (Ver. 1)

Your Ref:

May 15, 2015



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Ms P Jenkinson  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Ms P Jenkinson

Dear Ms Jenkinson

**Sample Analysis - Dissolved Gasses in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

A handwritten signature in black ink that reads 'L Bosworth'. The signature is written in a cursive, slightly slanted style.

L Bosworth  
Project Co-ordinator  
01283 554362

# TEST REPORT



Report No. EXR/198642 (Ver. 1)

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

## Site: Dissolved Gasses in Waters

The 14 samples described in this report were registered for analysis by ESG on 01-May-2015. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 15-May-2015

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Pages 2 to 4)  
Table of TPH Texas banding (0.01) (Page 5)  
GC-FID Chromatograms (Pages 6 to 19)  
Sub Contracted Analysis Results (Pages 20 to 23)  
Analytical and Deviating Sample Overview (Pages 24 to 26)  
Table of Additional Report Notes (Page 27)  
Table of Method Descriptions (Page 28)  
Table of Report Notes (Page 29)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns

  
Managing Director  
Multi-Sector Services

Date of Issue: 15-May-2015


Tests marked 'N' have been subcontracted to another laboratory.


Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.


ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.



Units : Method Codes : Method Reporting Limits : UKAS Accredited :			pH units	uS/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l			
			WSLM3	WSLM2	WSLM12	WSLM17	Calc_HD	KONENS	ISEF	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART		
				100		2	7	1	0.1	3	1	1	1	1	1	1	1	1	1		
			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
LAB ID Number	EX/	Client Sample Description	Sample Date	pH units w	Conductivity uS/cm @ 25C w	Total Alkalinity as CaCO3 w	Total Acidity as CaCO3 w	Total Hardness as CaCO3	Chloride as Cl w	Fluoride as F a	Total Sulphur as SO4 (Dissolved) a	Calcium as Ca (Total) a	Calcium as Ca (Dissolved) a	Magnesium as Mg (Total) a	Magnesium as Mg (Dissolved) a	Sodium as Na (Total) a	Sodium as Na (Dissolved) a	Potassium as K (Total) a	Potassium as K (Dissolved) a		
1590063		WF/4	30-Apr-15 10:50	7.6	921	446	Nil	123	28	0.3	27	30	36	6	8	150	180	3	3		
1590064		CB/4	30-Apr-15 09:30	7.8	604	199	Nil	295	30	0.2	45	98	105	7	8	15	16	2	2		
1590065		ETF/4	30-Apr-15 10:15	7.8	3030	729	Nil	210	112	9.4	700	52	46	26	23	701	640	7	6		
1590066		D/4	30-Apr-15 11:55	8.2	657	148	Nil	295	68	0.4	71	105	105	7	8	26	27	7	7		
1590067		MA1/4	30-Apr-15 11:35	7.4	627	231	Nil	337	31	0.6	51	140	120	10	9	14	12	2	2		
1590068		KGS/4	30-Apr-15 15:50	7.7	639	182	Nil	324	32	1.0	75	115	115	8	9	15	15	2	2		
1590069		CF/4	30-Apr-15 13:45	7.6	1120	484	Nil	104	26	0.4	86	29	30	6	7	230	245	3	3		
1590070		TV/4A	30-Apr-15 14:25	7.7	1580	635	Nil	80	50	2.3	140	23	22	6	6	360	355	5	4		
1590071		TV/4B	30-Apr-15 14:25	7.6	1570	631	Nil	82	50	0.7	140	25	23	6	6	359	370	4	4		
1590072		TE/4A	30-Apr-15 15:15	7.8	1110	479	Nil	87	26	0.4	86	23	25	6	6	225	245	3	3		
1590073		TE/4B	30-Apr-15 15:15	7.8	1110	483	Nil	87	26	0.4	86	26	25	6	6	255	245	4	3		
1590074		AB/4	30-Apr-15 15:50	8.0	1110	222	Nil	382	161	0.4	67	130	130	14	14	85	86	5	5		
1590075		HW/4	30-Apr-15 16:00	7.6	811	407	Nil	100	22	0.3	16	31	30	6	6	165	165	3	3		
1590076		B/4	30-Apr-15 09:45	7.8	<100	2	12	<7	<1	<0.1	<3	<1	<1	<1	<1	<1	<1	<1	<1		
<div></div> <div>Bretby Business Park, Ashby Road</div> <div>Burton-on-Trent, Staffordshire, DE15 0YZ</div> <div>Tel +44 (0) 1283 554400</div> <div>Fax +44 (0) 1283 554422</div>			Client Name		Envireau Water							Sample Analysis									
			Contact		Ms P Jenkinson																
			Dissolved Gasses in Waters											Date Printed					15-May-2015		
														Report Number					EXR/198642		
														Table Number					1		

			Units :	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	µg/l								
			Method Codes :	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	KONENS	KONENS	KONENS	GROHSA	TPHFID	TPHFID	ICPMSWT	ICPMSW	WSLM27	ICPWATVART	ICPWATVAR	DISGAS1						
			Method Reporting Limits :	0.01	0.01	0.01	0.01	0.01	0.01	0.2	0.1	0.01	0.01	0.001	0.001	5	0.01	0.01	15						
			UKAS Accredited :	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No						
LAB ID Number	EX/	Client Sample Description	Sample Date	Manganese as Mn (Total) a	Manganese as MN (Dissolved) a	Iron as Fe (Total) a	Iron as Fe (Dissolved) a	Ammoniacal Nitrogen as N	Nitrite as N	Nitrate as N	GRO-HSA o	Carbon Banding	TPH GC	Uranium as U (Total)	Uranium as U (Dissolved)	Total Dissolved Solids w	Aluminium as Al (Total) a	Aluminium as Al (Dissolved) a	^Dissolved Butane						
1590063		WF/4	30-Apr-15 10:50	0.30	0.34	0.86	0.06	0.7	<0.01	<0.2	<0.1	Req	<0.01	0.001	0.001	530	0.06	<0.01	<22						
1590064		CB/4	30-Apr-15 09:30	<0.01	<0.01	0.64	0.14	0.11	0.03	6.5	<0.1	Req	0.01	<0.001	<0.001	360	0.11	0.02							
1590065		ETF/4	30-Apr-15 10:15	0.02	0.02	0.65	0.06	2.0	<0.01	<0.2	<0.1	Req	<0.01	<0.001	<0.001	2010	0.37	<0.01	<22						
1590066		D/4	30-Apr-15 11:55	<0.01	<0.01	0.50	0.13	0.02	<0.01	1.4	<0.1	Req	0.02	0.002	0.002	420	0.52	0.02							
1590067		MA1/4	30-Apr-15 11:35	<0.01	<0.01	0.15	0.12	<0.01	<0.01	6.3	<0.1	Req	<0.01	<0.001	<0.001	400	0.06	0.02	<14						
1590068		KGS/4	30-Apr-15 15:50	<0.01	<0.01	0.14	0.12	<0.01	<0.01	5.7	<0.1	Req	<0.01	<0.001	<0.001	420	0.20	0.02	<16						
1590069		CF/4	30-Apr-15 13:45	0.23	0.22	0.96	0.05	0.7	<0.01	<0.2	<0.1	Req	<0.01	0.001	0.001	680	0.05	<0.01	<17						
1590070		TV/4A	30-Apr-15 14:25	0.05	0.03	0.16	0.03	1.1	<0.01	<0.2	<0.1	Req	<0.01	<0.001	<0.001	960	0.07	<0.01	<17						
1590071		TV/4B	30-Apr-15 14:25	0.03	0.04	0.16	0.04	1.1	<0.01	<0.2	<0.1	Req	<0.01	<0.001	<0.001	970	0.03	<0.01	<14						
1590072		TE/4A	30-Apr-15 15:15	0.11	0.02	0.36	0.15	0.05	<0.01	<0.2	<0.1	Req	0.03	0.001	0.001	660	0.05	<0.01							
1590073		TE/4B	30-Apr-15 15:15	0.06	0.04	0.34	0.13	0.07	<0.01	<0.2	<0.1	Req	0.03	0.002	0.001	680	0.04	<0.01							
1590074		AB/4	30-Apr-15 15:50	0.01	0.02	0.21	0.14	0.01	<0.01	<0.2	<0.1	Req	0.02	0.002	0.001	680	0.11	0.02							
1590075		HW/4	30-Apr-15 16:00	0.30	0.27	2.04	0.05	0.6	<0.01	<0.2	<0.1	Req	<0.01	0.001	0.001	480	0.04	<0.01	<16						
1590076		B/4	30-Apr-15 09:45	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.2	<0.1	Req	<0.01	<0.001	<0.001	<5	0.02	<0.01							
<div></div> <div>Bretby Business Park, Ashby Road</div> <div>Burton-on-Trent, Staffordshire, DE15 0YZ</div> <div>Tel +44 (0) 1283 554400</div> <div>Fax +44 (0) 1283 554422</div>				Client Name		Envireau Water						Sample Analysis													
				Contact		Ms P Jenkinson																			
				Dissolved Gasses in Waters																Date Printed		15-May-2015			
																				Report Number		EXR/198642			
																				Table Number		1			

Units : Method Codes : Method Reporting Limits : UKAS Accredited :			µg/l	µg/l	µg/l	µg/l	mg/l	mg/l										
			DISGAS1	DISGAS1	DISGAS1	DISGAS1	Sub024	Sub024										
			6	6	12	11												
			No	No	No	No	No	No										
LAB ID Number EX/	Client Sample Description	Sample Date	^Dissolved Methane	^Dissolved Propane	^Dissolved Ethane	^Dissolved Ethene	^Thorium as Th232 (Dissolved) a	^Thorium as Th232 (Total) a										
1590063	WF/4	30-Apr-15 10:50	10	<17	<11	<11	<0.003	<0.003										
1590064	CB/4	30-Apr-15 09:30					0.009	0.009										
1590065	ETF/4	30-Apr-15 10:15	<6	<17	<12	<11	0.01	0.02										
1590066	D/4	30-Apr-15 11:55					0.035	0.078										
1590067	MA1/4	30-Apr-15 11:35	<4	<11	<7	<7	0.004	0.005										
1590068	KGS/4	30-Apr-15 15:50	<4	<12	<8	<8	<0.003	0.004										
1590069	CF/4	30-Apr-15 13:45	<5	<13	<9	<8	<0.003	<0.003										
1590070	TV/4A	30-Apr-15 14:25	1957	<13	<9	<8	<0.003	0.005										
1590071	TV/4B	30-Apr-15 14:25	2252	<11	<7	<7	0.004	0.004										
1590072	TE/4A	30-Apr-15 15:15					0.004	0.009										
1590073	TE/4B	30-Apr-15 15:15					0.005	0.005										
1590074	AB/4	30-Apr-15 15:50					0.004	0.004										
1590075	HW/4	30-Apr-15 16:00	10	<12	<8	<8	<0.003	<0.003										
1590076	B/4	30-Apr-15 09:45					<0.003	<0.003										
<div></div> <div>Bretby Business Park, Ashby Road</div> <div>Burton-on-Trent, Staffordshire, DE15 0YZ</div> <div>Tel +44 (0) 1283 554400</div> <div>Fax +44 (0) 1283 554422</div>			Client Name		Envireau Water						Sample Analysis							
			Contact		Ms P Jenkinson													
			Dissolved Gasses in Waters									Date Printed					15-May-2015	
												Report Number					EXR/198642	
												Table Number					1	

# Total Petroleum Hydrocarbons (TPH) Carbon Ranges

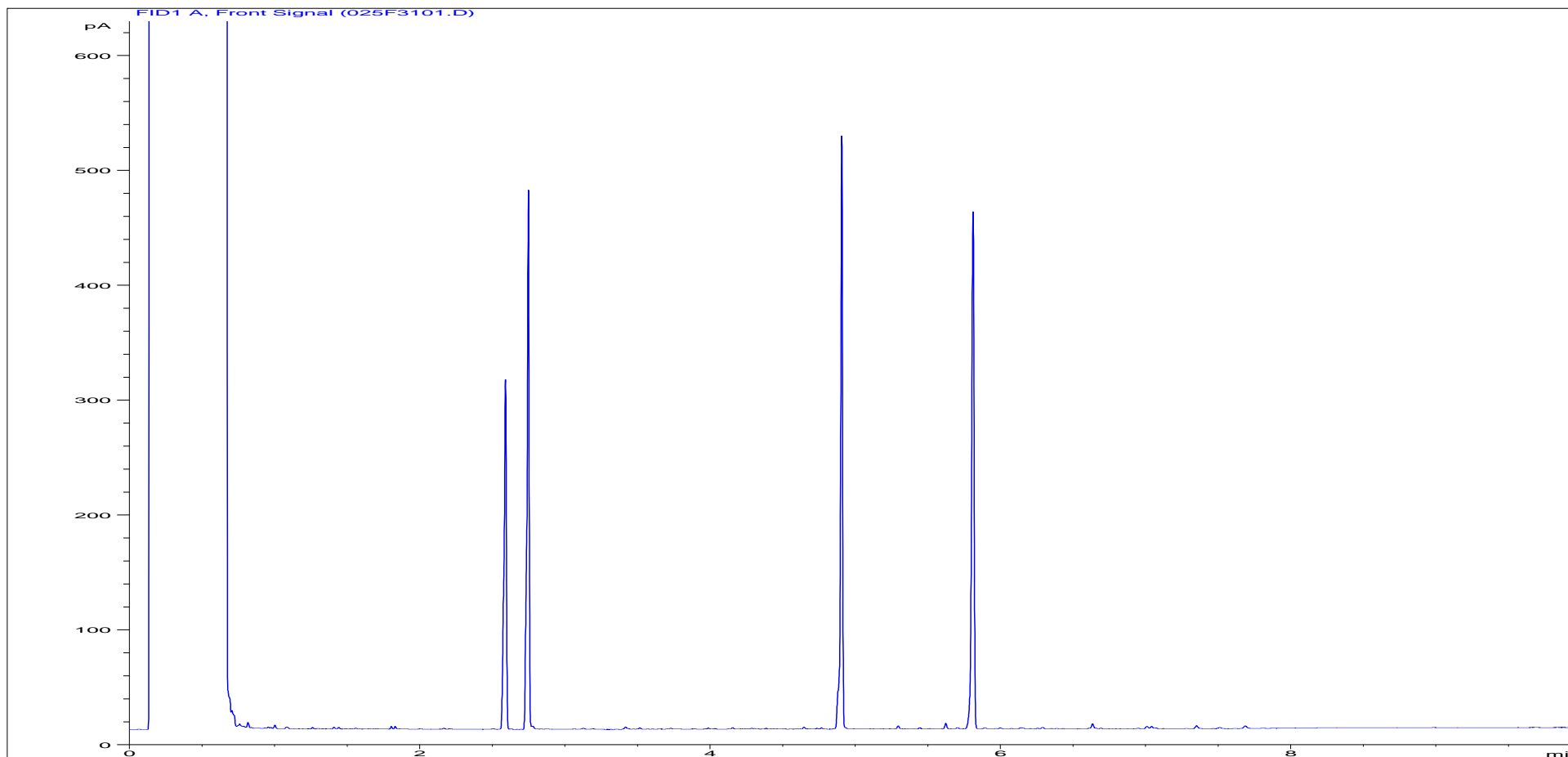
**Customer and Site Details:** Envireau Water : Dissolved Gasses in Waters  
**Job Number:** W19\_8642  
**QC Batch Number:** 150334  
**Directory:** D:\TES\DATA\Y2015\051215TPH\_GC17\051215 2015-05-12 16-08-18\038F4401.D  
**Method:** Bottle

**Matrix:** Water  
**Date Booked in:** 01-May-15  
**Date Extracted:** 12-May-15  
**Date Analysed:** 13-May-15, 05:49:39

\* Sample data with an asterisk are not UKAS accredited.

Sample ID	Client ID	Concentration, (mg/l)				
		>C8 - C10	>C10 - C12	>C12 - C16	>C16 - C21*	>C21 - C35
EX1590063	WF/4	<0.01	<0.01	<0.01	<0.01	<0.01
EX1590064	CB/4	<0.01	<0.01	<0.01	<0.01	<0.01
EX1590065	ETF/4	<0.01	<0.01	<0.01	<0.01	<0.01
EX1590066	D/4	<0.01	<0.01	<0.01	<0.01	0.021
EX1590067	MA1/4	<0.01	<0.01	<0.01	<0.01	<0.01
EX1590068	KGS/4	<0.01	<0.01	<0.01	<0.01	<0.01
EX1590069	CF/4	<0.01	<0.01	<0.01	<0.01	<0.01
EX1590070	TV/4A	<0.01	<0.01	<0.01	<0.01	<0.01
EX1590071	TV/4B	<0.01	<0.01	<0.01	<0.01	<0.01
EX1590072	TE/4A	<0.01	<0.01	<0.01	<0.01	0.018
EX1590073	TE/4B	<0.01	<0.01	<0.01	<0.01	0.019
EX1590074	AB/4	<0.01	<0.01	<0.01	<0.01	0.014
EX1590075	HW/4	<0.01	<0.01	<0.01	<0.01	<0.01
EX1590076	B/4	<0.01	<0.01	<0.01	<0.01	<0.01

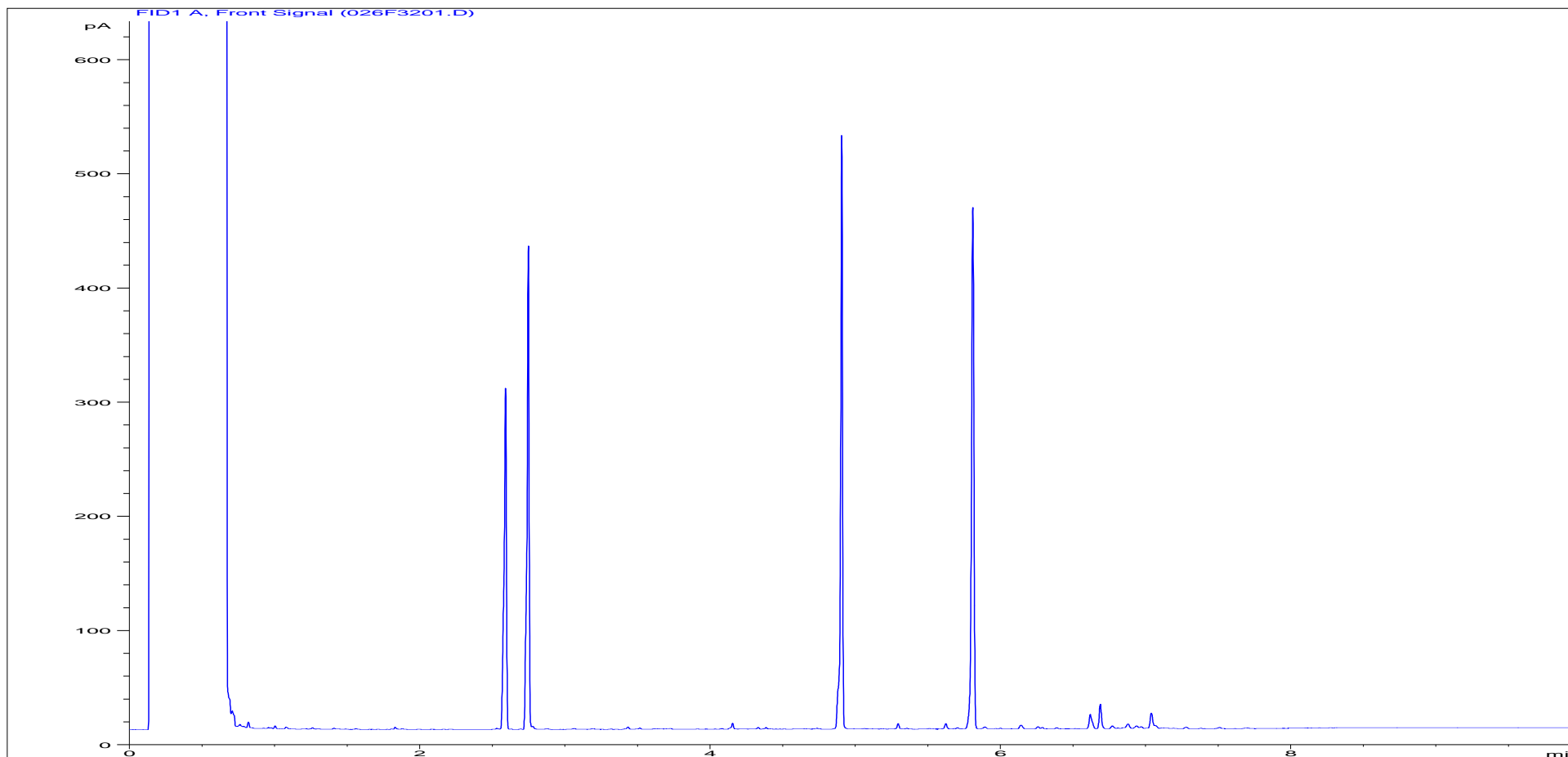
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1590063	<b>Job Number:</b>	W19_8642
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	WF/4
<b>Acquisition Date/Time:</b>	13-May-15, 01:43:20		
<b>Datafile:</b>	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\025F3101.D		

Where individual results are flagged see report notes for status.

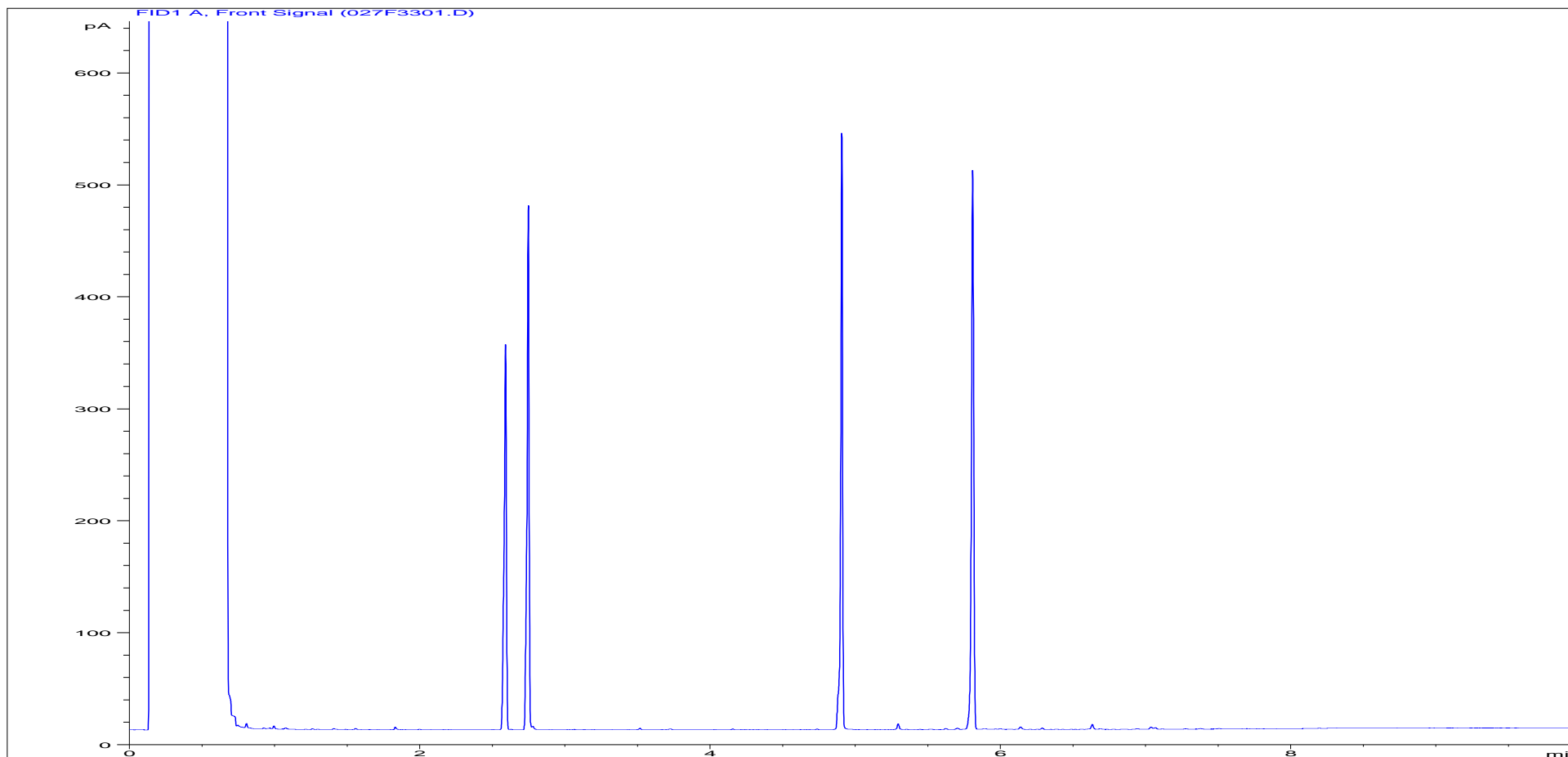
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1590064	<b>Job Number:</b>	W19_8642
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	CB/4
<b>Acquisition Date/Time:</b>	13-May-15, 02:02:08		
<b>Datafile:</b>	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\026F3201.D		

Where individual results are flagged see report notes for status.

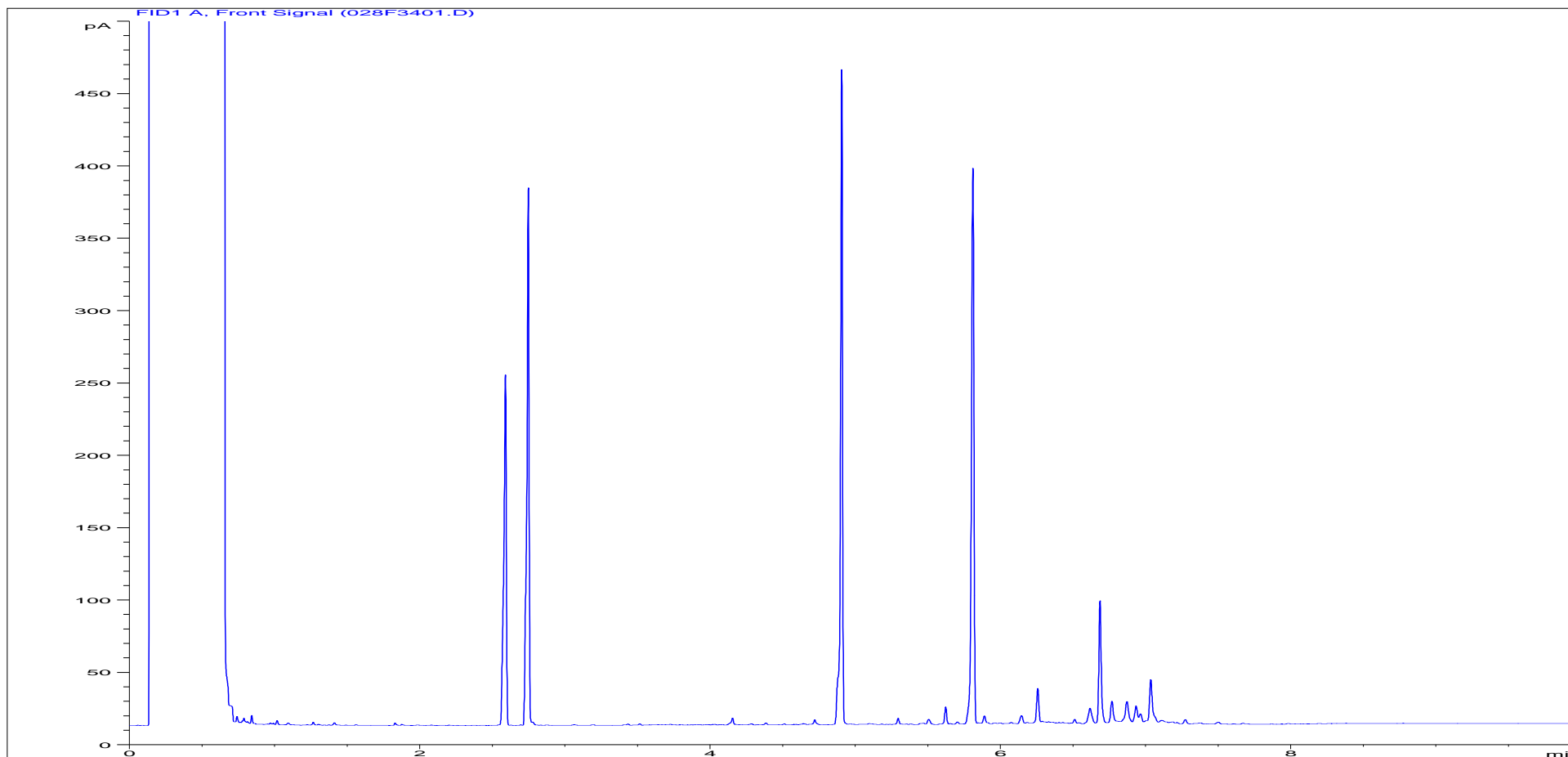
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1590065	<b>Job Number:</b>	W19_8642
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	ETF/4
<b>Acquisition Date/Time:</b>	13-May-15, 02:21:02		
<b>Datafile:</b>	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\027F3301.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID

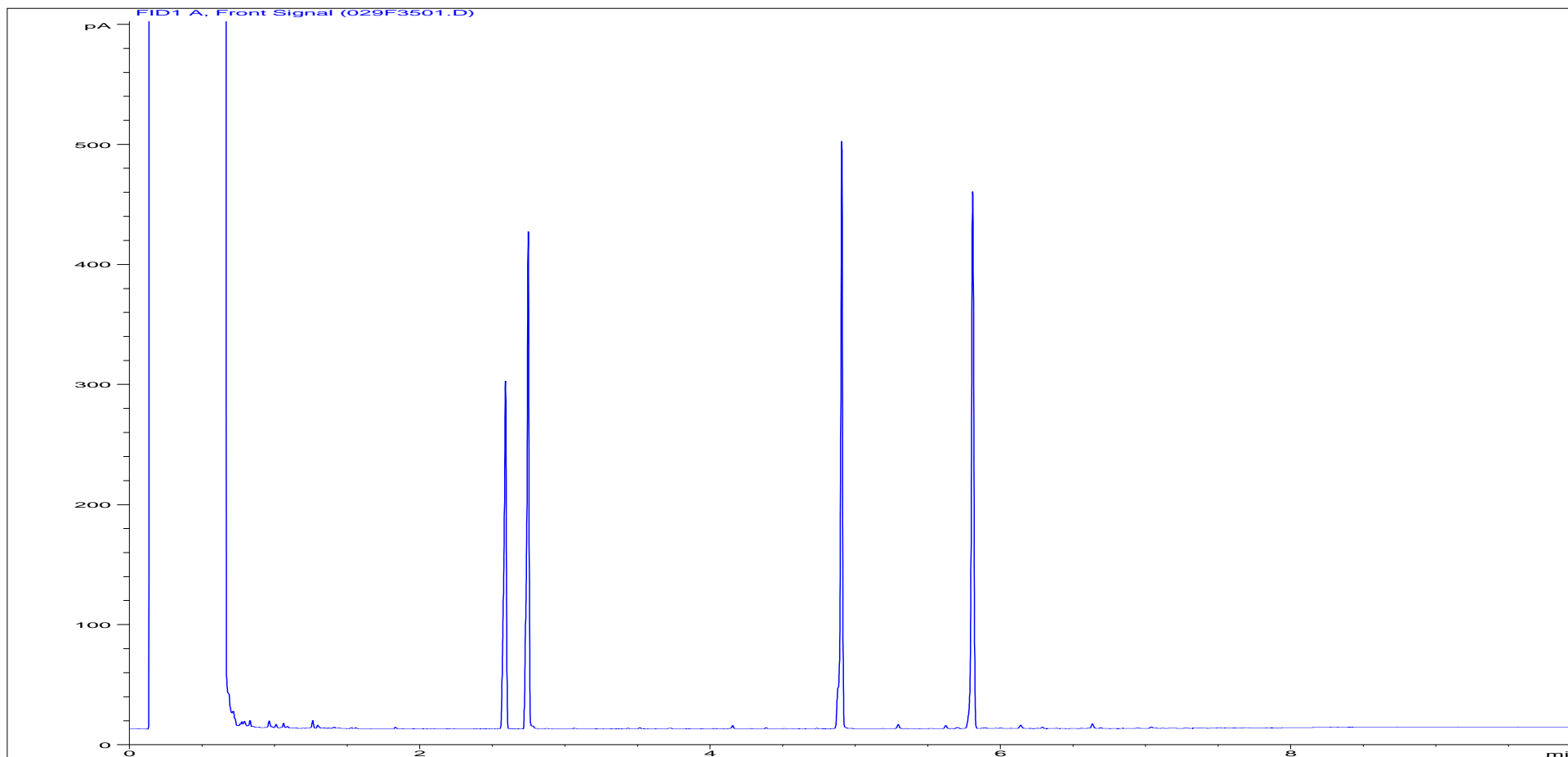


<b>Sample ID:</b>	EX1590066	<b>Job Number:</b>	W19_8642
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	D/4
<b>Acquisition Date/Time:</b>	13-May-15, 02:39:53		
<b>Datafile:</b>	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\028F3401.D		

Where individual results are flagged see report notes for status.



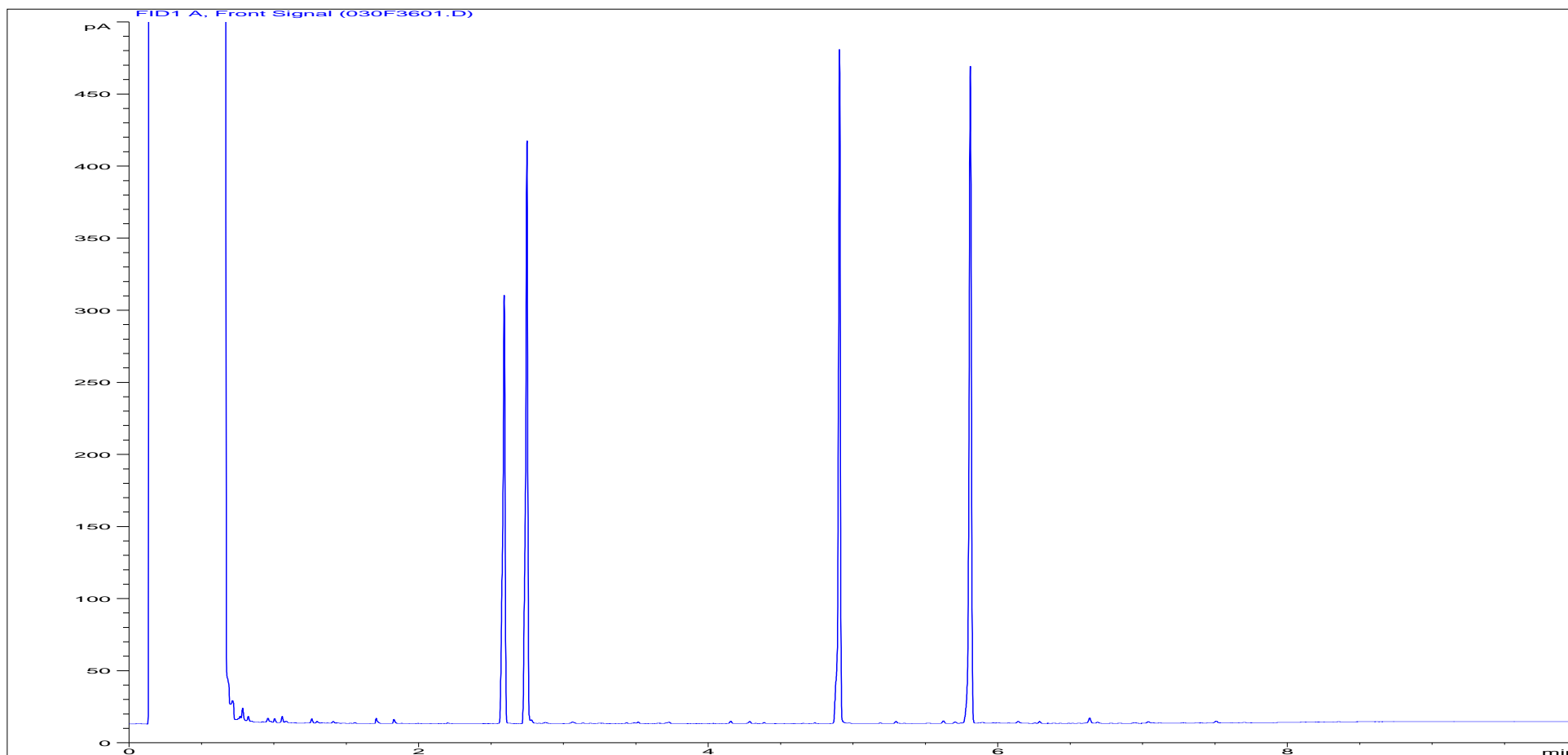
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1590067	<b>Job Number:</b>	W19_8642
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	MA1/4
<b>Acquisition Date/Time:</b>	13-May-15, 02:58:47		
<b>Datafile:</b>	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\029F3501.D		

Where individual results are flagged see report notes for status.

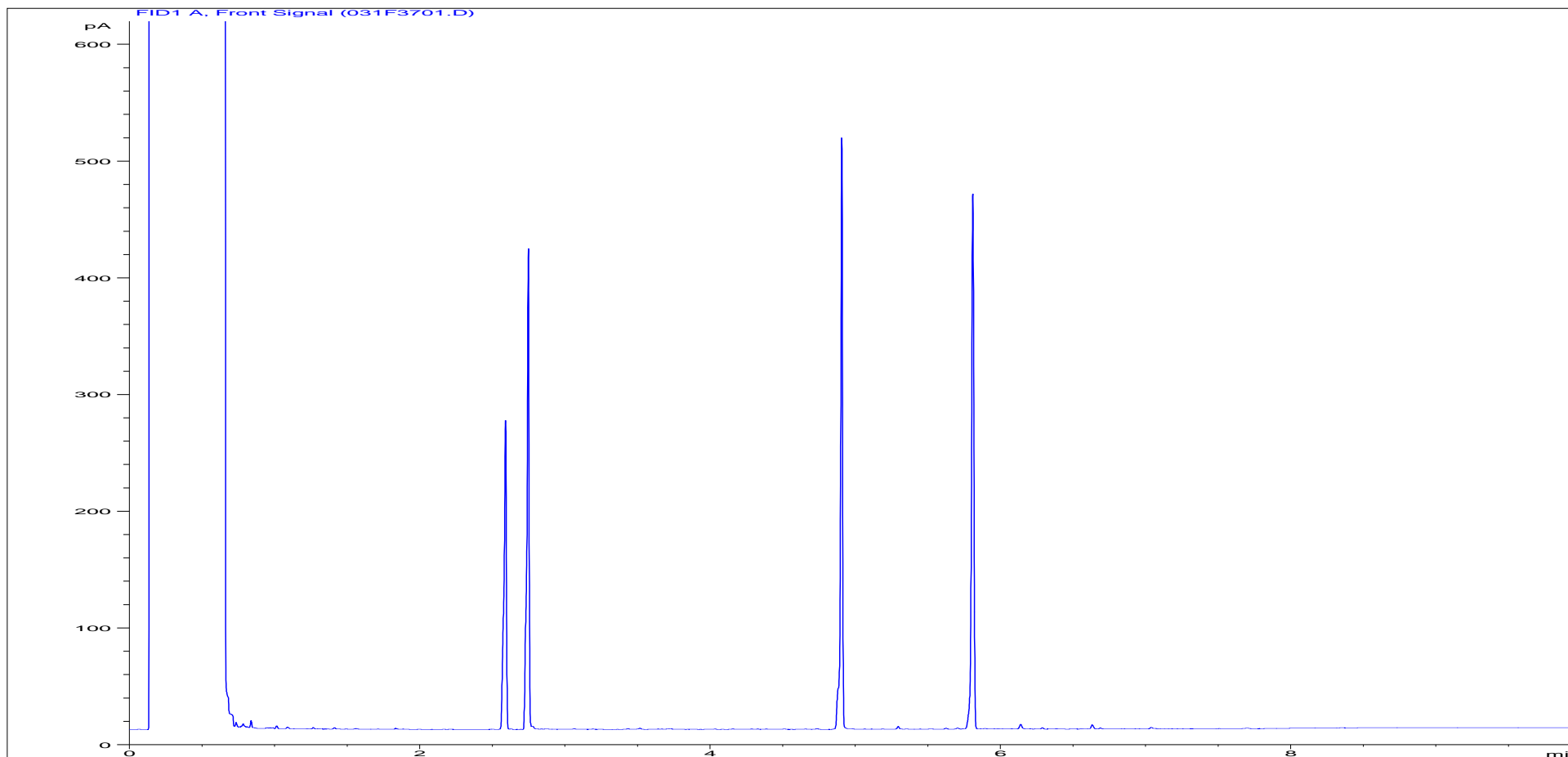
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1590068	Job Number:	W19_8642
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	KGS/4
Acquisition Date/Time:	13-May-15, 03:17:40		
Datafile:	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\030F3601.D		

Where individual results are flagged see report notes for status.

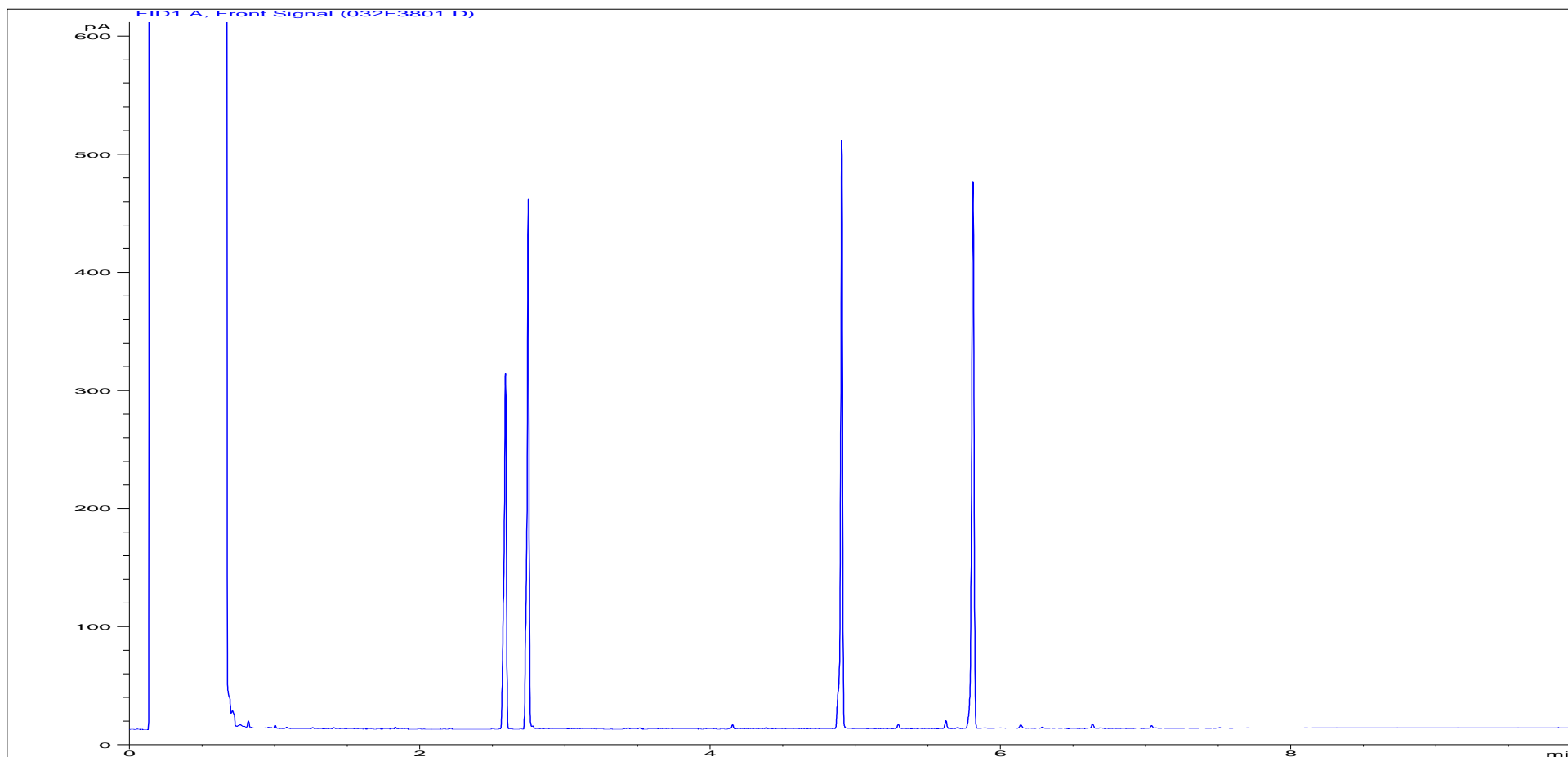
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1590069	<b>Job Number:</b>	W19_8642
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	CF/4
<b>Acquisition Date/Time:</b>	13-May-15, 03:36:35		
<b>Datafile:</b>	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\031F3701.D		

Where individual results are flagged see report notes for status.

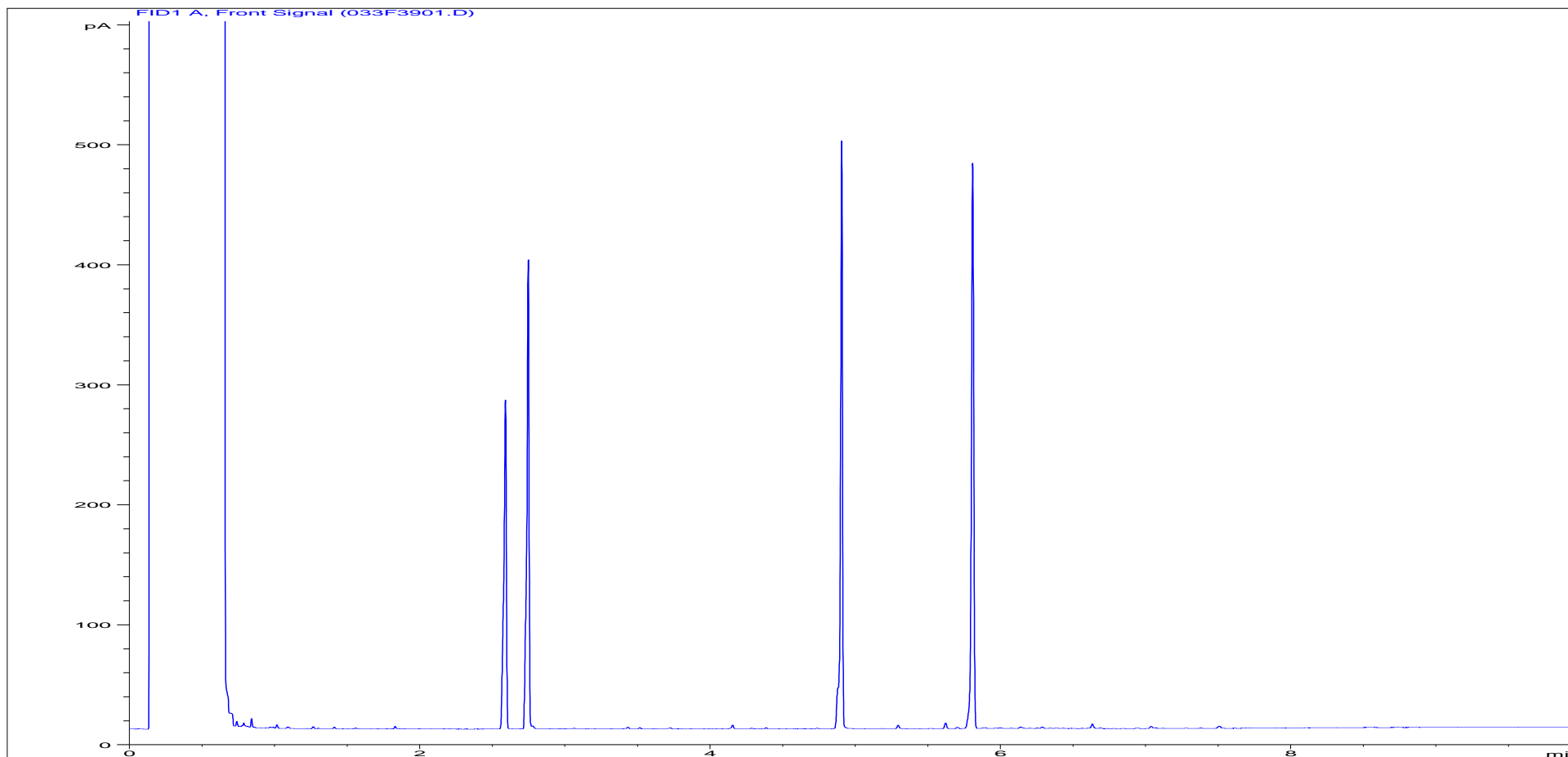
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1590070	<b>Job Number:</b>	W19_8642
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV/4A
<b>Acquisition Date/Time:</b>	13-May-15, 03:55:44		
<b>Datafile:</b>	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\032F3801.D		

Where individual results are flagged see report notes for status.

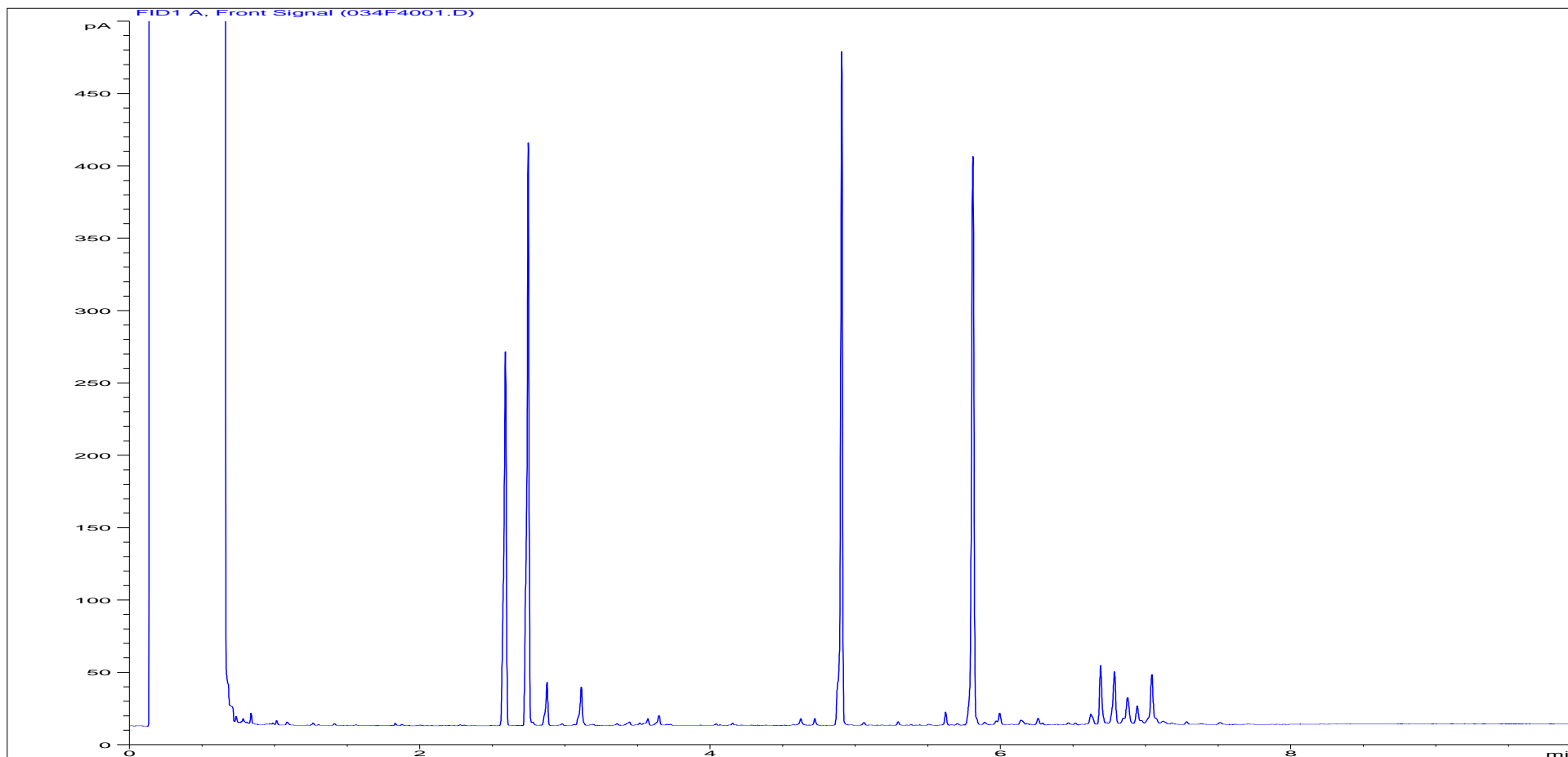
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1590071	<b>Job Number:</b>	W19_8642
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV/4B
<b>Acquisition Date/Time:</b>	13-May-15, 04:14:44		
<b>Datafile:</b>	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\033F3901.D		

Where individual results are flagged see report notes for status.

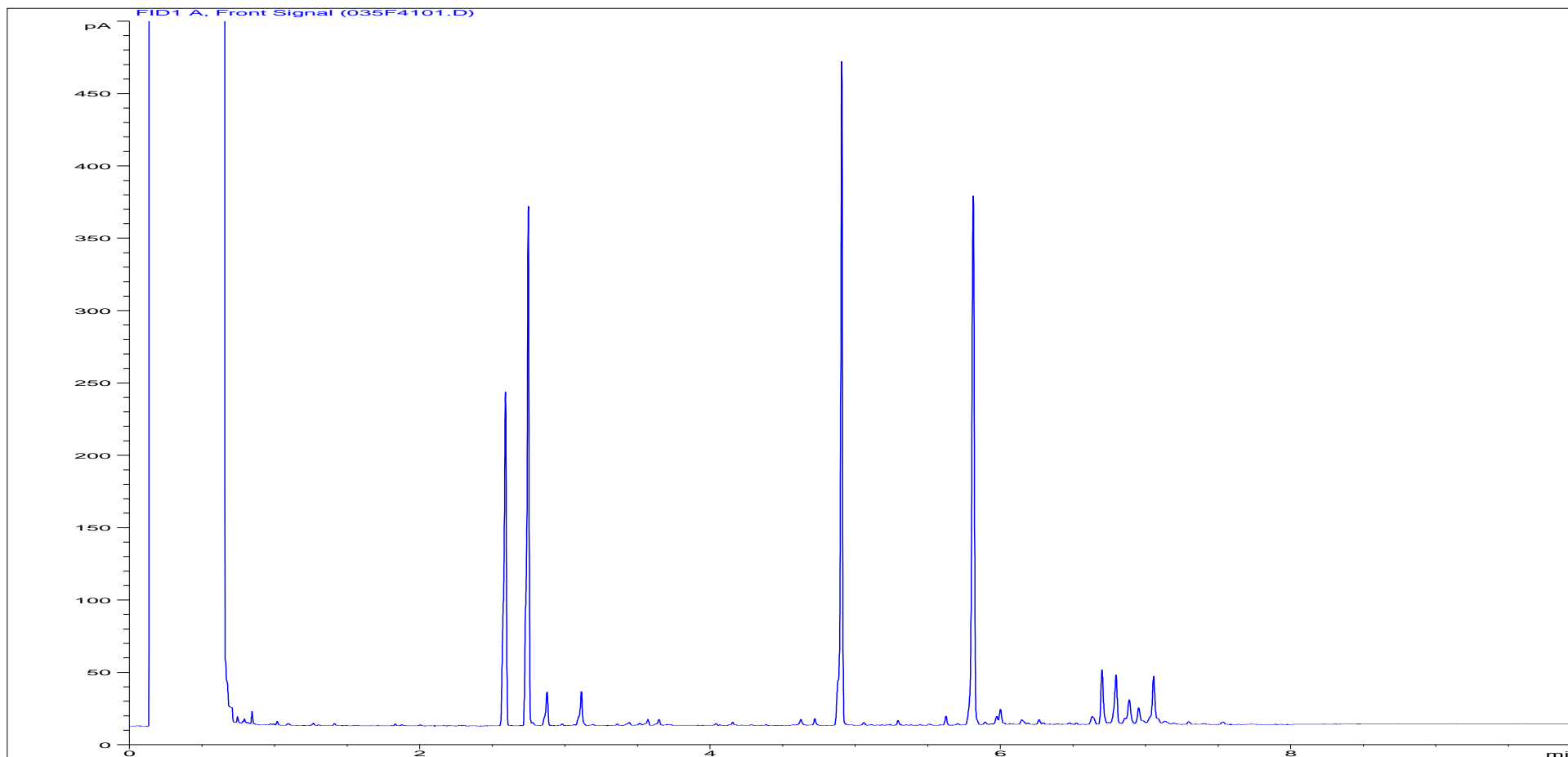
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1590072	<b>Job Number:</b>	W19_8642
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TE/4A
<b>Acquisition Date/Time:</b>	13-May-15, 04:33:28		
<b>Datafile:</b>	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\034F4001.D		

Where individual results are flagged see report notes for status.

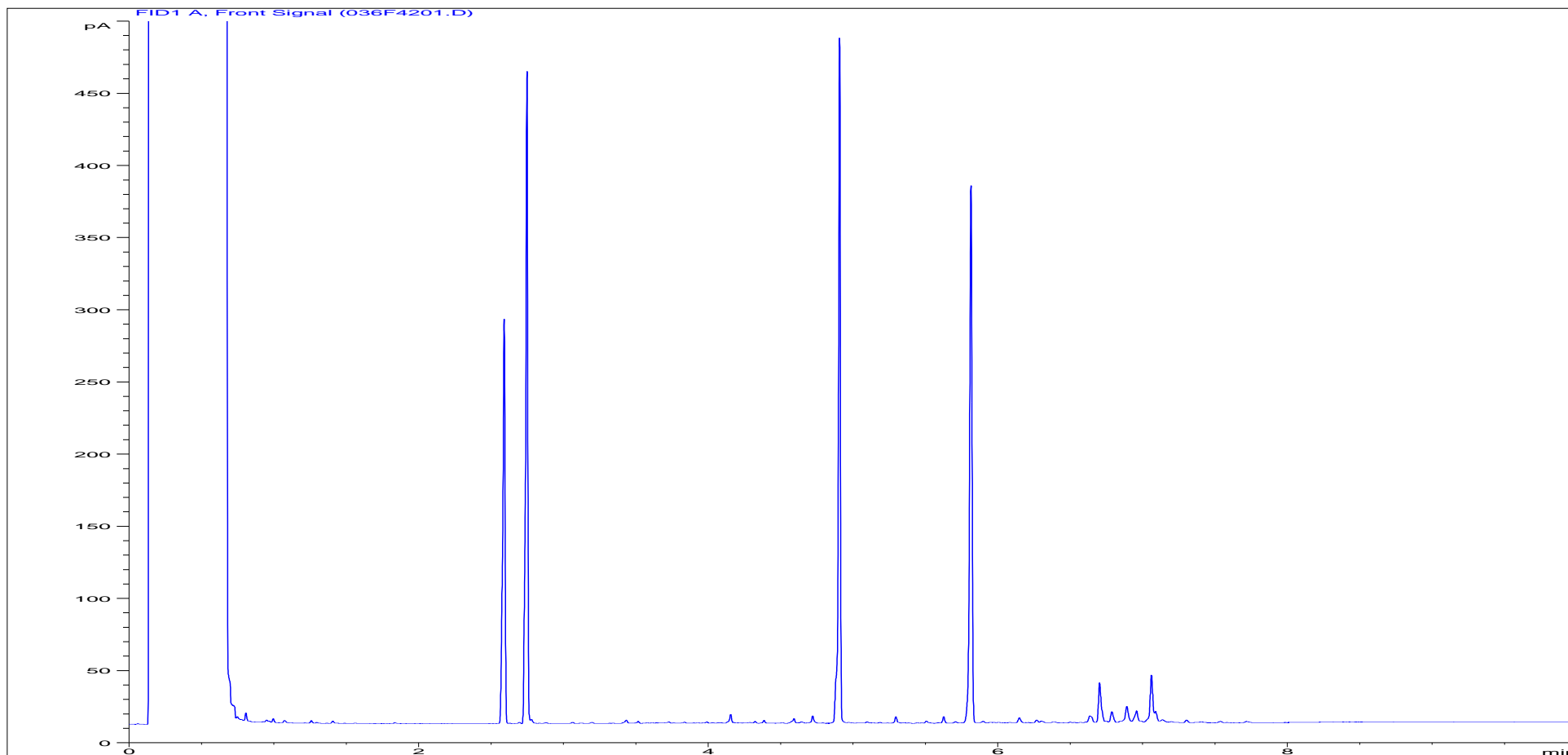
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1590073	Job Number:	W19_8642
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	TE/4B
Acquisition Date/Time:	13-May-15, 04:52:29		
Datafile:	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\035F4101.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID

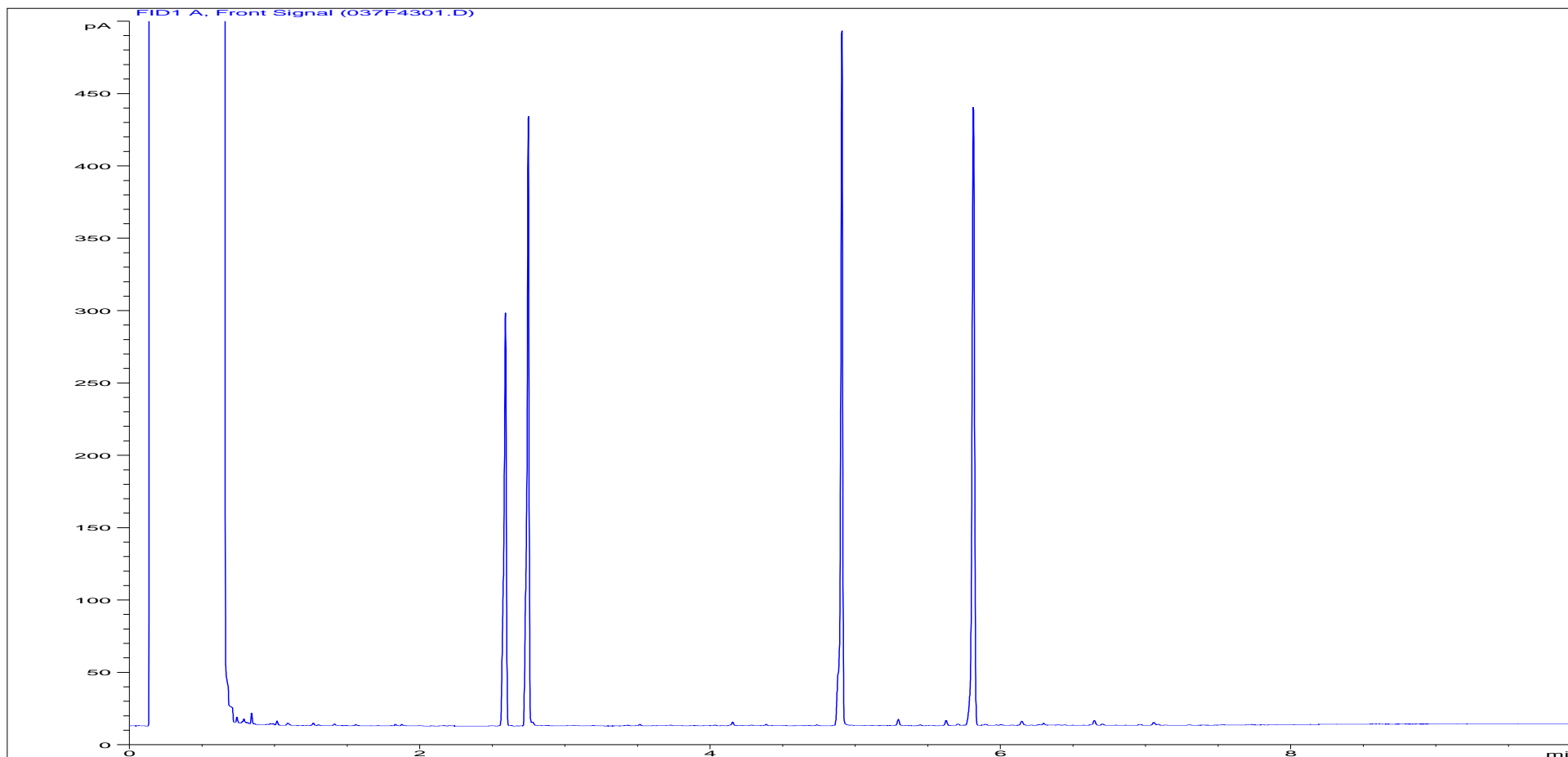


Sample ID:	EX1590074	Job Number:	W19_8642
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	AB/4
Acquisition Date/Time:	13-May-15, 05:11:41		
Datafile:	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\036F4201.D		

Where individual results are flagged see report notes for status.



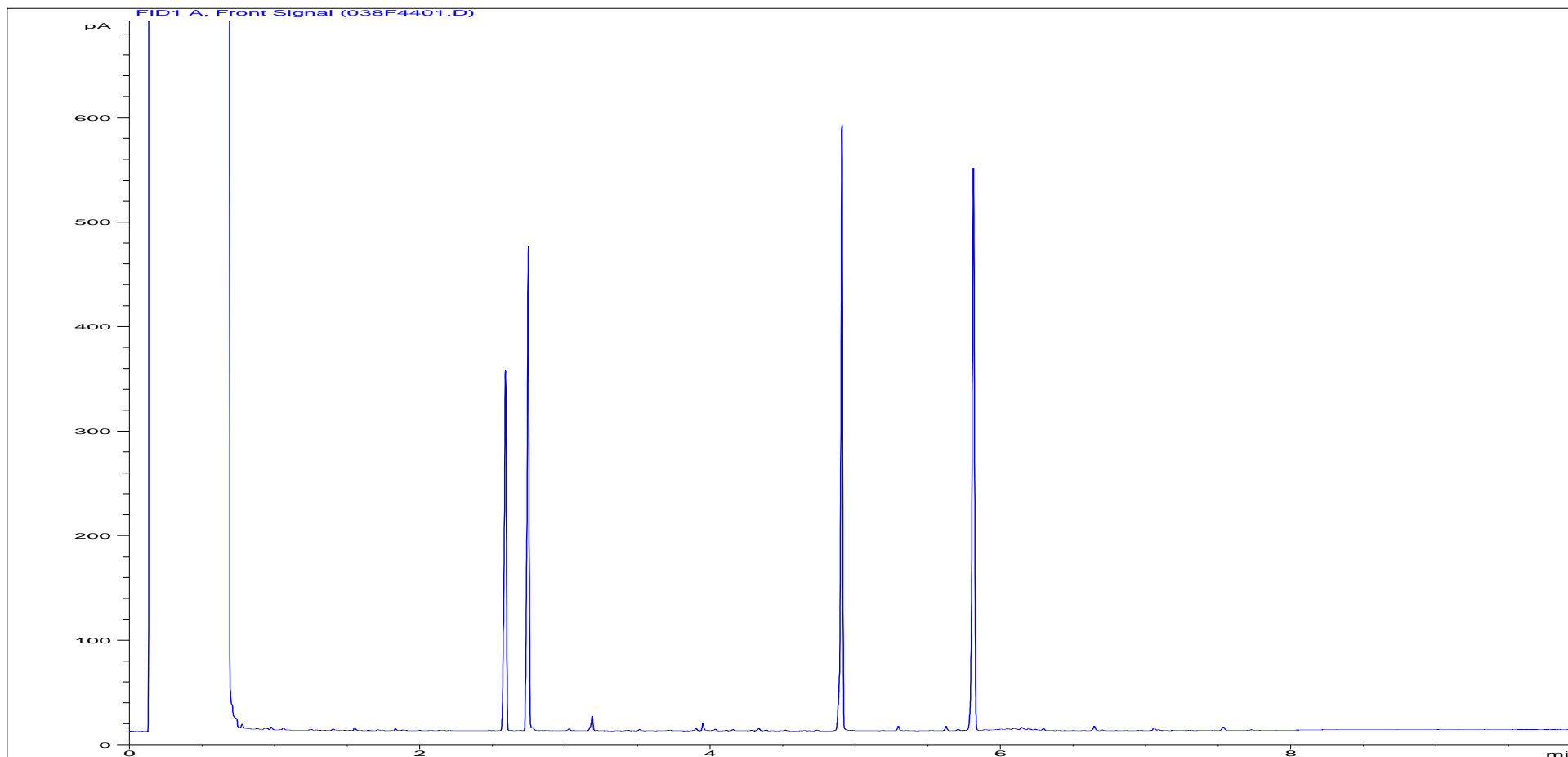
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1590075	<b>Job Number:</b>	W19_8642
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	HW/4
<b>Acquisition Date/Time:</b>	13-May-15, 05:30:42		
<b>Datafile:</b>	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\037F4301.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1590076	<b>Job Number:</b>	W19_8642
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	B/4
<b>Acquisition Date/Time:</b>	13-May-15, 05:49:39		
<b>Datafile:</b>	D:\TES\DATA\Y2015\051215TPH_GC17\051215 2015-05-12 16-08-18\038F4401.D		

Where individual results are flagged see report notes for status.

## GAS ANALYSIS

Customer: ESG - (BEC BRE), Environmental Chemistry

Date Received: 05 May 2015

Date Sampled:

Report N° GA00847

Date Analysed: 07 May 2015

Site: Envireau Water

SAMPLE REFERENCE	Analysis % V/V				
	Dissolved Methane (CH <sub>4</sub> )†	Dissolved Propane (C <sub>3</sub> H <sub>8</sub> )†	Dissolved Ethane (C <sub>2</sub> H <sub>6</sub> )†	Dissolved Butane (C <sub>4</sub> H <sub>10</sub> )†	Dissolved Ethylene (C <sub>2</sub> H <sub>4</sub> )†
Method of Analysis	9	9	9	9	9
1590063	0.0008	<0.0005	<0.0005	<0.0005	<0.0005
1590065	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1590067	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1590068	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1590069	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1590070	0.2100	<0.0005	<0.0005	<0.0005	<0.0005
1590071	0.2800	<0.0005	<0.0005	<0.0005	<0.0005
1590075	0.0011	<0.0005	<0.0005	<0.0005	<0.0005

Method of 9 Dissolved Gas  
Analysis:-

t S redited

Customer Analytical Requirements CH <sub>4</sub> , C <sub>3</sub> H <sub>8</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>4</sub> H <sub>10</sub> , C <sub>2</sub> H <sub>4</sub>	Authorised by Phil Shead
Comment Box Report number W/EXR/198642	

Authorised by:



Analyst: Dan Bignell

Issue Date: 11 May 2015

ESG accepts no responsibility for the collection of any of the samples referred to in this report.

Phil Shead, Operations Manager  
Direct Dial: 01 283 554461



## Analysis of Water Samples for Total and Soluble Thorium by ICP-MS

Customer: ESG Bretby  
Environmental Chemistry  
Etwall Building  
Bretby Business Park  
Ashby Road  
Burton Upon Trent  
DE15 0YZ

Testing Facility: Specialist Chemistry  
ESG  
Etwall Building  
Bretby Business Park  
Ashby Road  
Burton Upon Trent  
DE15 0YZ

Laboratory Reference: ASC/18755

Purchase Order Number: W198642

Samples Received: 05 May 2015

Authored by: Clare Brotherhood

Approved by:

A handwritten signature in black ink, appearing to read 'P. Batham'.

Date: 13 May 2015

Approver's name: Becky Batham

Job Title: Laboratory Manager

Test Report Date: 13 May 2015



## Introduction

Fourteen samples of water were received for the singlet measurement of total and soluble thorium by ICP-MS.

The samples were received in a satisfactory state under ambient conditions.

The samples were logged into our system upon receipt and then stored in a secure sample store, at room temperature, prior to analysis.

## Experimental

The samples were analysed following method:

- ASC/SOP/101, issue 4 - Operation and Maintenance of Inductively Coupled Plasma Mass Spectrometers (ICP-MS)

The samples were acidified with trace analysis grade concentrated nitric acid for total Th and analysed by ICP-MS. The samples were also diluted as necessary and ran by ICP-MS for soluble Th.

Measurements of Th concentration were performed by ICP-MS (Agilent 7700x), which was calibrated using the method of standard addition. Scandium, indium and bismuth were added as internal standards to monitor and correct for instrumental drift.

As a quality control measure, QC standards at 10, 20 and 40  $\mu\text{gL}^{-1}$  were prepared, using alternative source stock solutions from those used to prepare the calibration standard, and measured with the samples. The results obtained for these are shown under the heading 'QC Standard' in the table attached.

## Results

The results for the samples are detailed in the following table attached.

The results for the samples are expressed as  $\mu\text{gL}^{-1}$ .

The LOD is the limit of detection and is defined as three times the standard deviation obtained from the measurement of a series of at six instrument blanks. Measurement uncertainty for those results significantly above the LOD is estimated to be  $\pm 20\%$  and results are reported to two significant figures. Results within an order of magnitude of the LOD have a higher uncertainty and are reported to one significant figure.

## Analysis of Water Samples for Total and Soluble Thorium by ICP-MS

**Table 1**

Customer Reference	Laboratory Reference	Total Th	Soluble Th
	<b>LOD</b>	0.003	
W1590063 (WF/4)	ASC/18755.001	<0.003	<0.003
W1590064 (CB/4)	ASC/18755.002	0.009	0.009
W1590065 (ETF/4)	ASC/18755.003	0.02	0.01
W1590066 (D/4)	ASC/18755.004	0.078	0.035
W1590067 (MA1/4)	ASC/18755.005	0.005	0.004
W1590068 (KGS/4)	ASC/18755.006	0.004	<0.003
W1590069 (CF/4)	ASC/18755.007	<0.003	<0.003
W1590070 (TV/4A)	ASC/18755.008	0.005	<0.003
W1590071 (TV/4B)	ASC/18755.009	0.004	0.004
W1590072 (TE/4A)	ASC/18755.010	0.009	0.004
W1590073 (TE/4B)	ASC/18755.011	0.005	0.005
W1590074 (AB/4)	ASC/18755.012	0.004	0.004
W1590075 (HW/4)	ASC/18755.013	<0.003	<0.003
W1590076 (B/4)	ASC/18755.014	<0.003	<0.003
<b>QC Standard 10<math>\mu</math>L<sup>-1</sup></b>		9.0	
<b>QC Standard 20<math>\mu</math>L<sup>-1</sup></b>		20	
<b>QC Standard 40<math>\mu</math>L<sup>-1</sup></b>		40	

1. Results are expressed as  $\mu\text{g L}^{-1}$  in the sample as received.
2. Results over an order of magnitude above the LOD are estimated to have an uncertainty of  $\pm 20\%$ . Results within one order of magnitude of the LOD have higher uncertainty and are reported to one significant figure.
3. The QC Standards are expected to be 10, 20 or 40  $\mu\text{g L}^{-1} \pm 20\%$ .

Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W198642

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W198642

Consignment No W87567  
Date Logged 01-May-2015

Report Due 15-May-2015

ID Number	Description	Matrix Type	MethodID Sampled	Calc_HD	CUSTSERV	DISGAS1	GRO-HSA	ICPMSW	ICPMSWT	ICPMSWTR	Total Sulphur as SO4 (Diss) VAR	Calcium as Ca (Dissolved) VAR	Magnesium as Mg (Dissolved) VAR	Sodium as Na (Dissolved) VAR	Potassium as K (Dissolved) VAR	Manganese as Mn (Dissolved) VAR	Iron as Fe (Dissolved) VAR	Aluminium as Al (Dissolved) VAR
				Total Hardness as CaCO3 (CALC)	Report B	^Dissolved Butane		Uranium as U MS (Dissolved)	Uranium as U MS (Total)									
EX/1590063	WF/4	Groundwater	30/04/15	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
EX/1590064	CB/4	Surface Water	30/04/15					✓										
EX/1590065	ETF/4	Groundwater	30/04/15					✓										
EX/1590066	D/4	Surface Water	30/04/15					✓										
EX/1590067	MA1/4	Groundwater	30/04/15					✓										
EX/1590068	KGS/4	Groundwater	30/04/15					✓										
EX/1590069	CF/4	Groundwater	30/04/15					✓										
EX/1590070	TV/4A	Groundwater	30/04/15					✓										
EX/1590071	TV/4B	Groundwater	30/04/15					✓										
EX/1590072	TE/4A	Surface Water	30/04/15					✓										
EX/1590073	TE/4B	Surface Water	30/04/15					✓										
EX/1590074	AB/4	Surface Water	30/04/15					✓										
EX/1590075	HW/4	Groundwater	30/04/15					✓										
EX/1590076	B/4	Groundwater	30/04/15					✓										

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - Note: due date may be affected if triggered
	No analysis scheduled
^	Analysis Subcontracted - Note: due date may vary

Report Due 15-May-2015

[illegible]



# Sample Analysis

## ESG Environmental Chemistry Analytical and Deviating Sample Overview

W198642

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W198642

Consignment No W87567

Date Logged 01-May-2015

Report Due 15-May-2015

ID Number	Description	MethodID		WSL M2	WSL M27	WSL M3
		Matrix Type	Sampled	Conductivity uS/cm @ 25C	Total Dissolved Solids	pH units
				✓		✓
EX/1590063	WF/4	Groundwater	30/04/15			
EX/1590064	CB/4	Surface Water	30/04/15			
EX/1590065	ETF/4	Groundwater	30/04/15			
EX/1590066	D/4	Surface Water	30/04/15			
EX/1590067	MA1/4	Groundwater	30/04/15			
EX/1590068	KGS/4	Groundwater	30/04/15			
EX/1590069	CF/4	Groundwater	30/04/15			
EX/1590070	TV/4A	Groundwater	30/04/15			
EX/1590071	TV/4B	Groundwater	30/04/15			
EX/1590072	TE/4A	Surface Water	30/04/15			
EX/1590073	TE/4B	Surface Water	30/04/15			
EX/1590074	AB/4	Surface Water	30/04/15			
EX/1590075	HW/4	Groundwater	30/04/15			
EX/1590076	B/4	Groundwater	30/04/15			

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

**In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.**

### Deviating Sample Key

- A The sample was received in an inappropriate container for this analysis
- B The sample was received without the correct preservation for this analysis
- C Headspace present in the sample container
- D The sampling date was not supplied so holding time may be compromised - applicable to all analysis
- E Sample processing did not commence within the appropriate holding time
- F Sample processing did not commence within the appropriate handling time

### Requested Analysis Key

- Analysis Required
- Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
- No analysis scheduled
- Analysis Subcontracted - **Note: due date may vary**

## Additional Report Notes

[illegible]

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	Calc_HD	As Received	Calculation based on Dissolved metals analysis by ICPOES
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	GROHSA	As Received	Determination of Total Gasoline Range Organics Hydrocarbons (GRO) by Headspace FID
Water	ICPMSW	As Received	Direct quantitative determination of Metals in water samples using ICPMS
Water	ICPMSWT	As Received	Determination of Total Metals in water samples using nitric acid digestion and ICPMS quantitation
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	ICPWATVART	As Received	Determination of Total Metals in water samples using nitric acid digestion and ICPOES quantitation
Water	ISEF	As Received	Determination of Fluoride in water samples by Ion Selective Electrode (ISE)
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	SubCon*	*	Contact Laboratory for details of the methodology used by the sub-contractor.
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM17	As Received	Titration with Sodium Hydroxide to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Where individual results are flagged see report notes for status.

# Report Notes

## Generic Notes

### Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### Waters Analysis

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup>@ 15°C

### Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

### Asbestos Analysis

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

**^** Sub-contracted analysis.

**\$\$** Unable to analyse due to the nature of the sample

**¶** Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

**¥** Results for guidance only due to possible interference

**&** Blank corrected result

**I.S** Insufficient sample to complete requested analysis

**I.S(g)** Insufficient sample to re-analyse, results for guidance only

**Intf** Unable to analyse due to interferences

**N.D** Not determined

**N.Det** Not detected

**N.F** No Flow

**NS** Information Not Supplied

**Req** Analysis requested, see attached sheets for results

**▯** Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** Dissolved Gasses in Waters  
**Report Number :** W19\_8642

[illegible]

## Water Analysis Test Certificate

Round 5

Our Ref: EXR/200082 (Ver. 1)

Your Ref:

June 12, 2015



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Ms P Jenkinson  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Ms P Jenkinson

Dear Ms Jenkinson

**Sample Analysis - Dissolved Gasses in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

A handwritten signature in black ink, appearing to read 'D. Brasington', written in a cursive style.

D Brasington  
Project Co-ordinator  
01283 554493

# TEST REPORT



Report No. EXR/200082 (Ver. 1)

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

## Site: Dissolved Gasses in Waters

The 13 samples described in this report were registered for analysis by ESG on 30-May-2015. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 12-Jun-2015

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Pages 2 to 4)  
Table of TPH Texas banding (0.01) (Page 5)  
GC-FID Chromatograms (Pages 6 to 18)  
Sub Contracted Analysis Results (Pages 19 to 22)  
Analytical and Deviating Sample Overview (Pages 23 to 25)  
Table of Method Descriptions (Page 26)  
Table of Report Notes (Page 27)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns

Managing Director  
Multi-Sector Services


Date of Issue: 12-Jun-2015


Tests marked 'N' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

ESG accepts no responsibility for any sampling not carried out by our personnel.



			Units :	pH units	uS/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l			
			Method Codes :	WSLM3	WSLM2	WSLM12	WSLM17	Calc_HD	KONENS	ISEF	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR			
			Method Reporting Limits :		100		2	7	1	0.1	3	1	1	1	1	1	1			
			UKAS Accredited :	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
LAB ID Number EX/	Client Sample Description	Sample Date	pH units w	Conductivity uS/cm @ 25C w	Total Alkalinity as CaCO3 w	Total Acidity as CaCO3 w	Total Hardness as CaCO3	Chloride as Cl w	Fluoride as F a	Total Sulphur as SO4 (Dissolved) a	Calcium as Ca (Total) a	Calcium as Ca (Dissolved) a	Magnesium as Mg (Total) a	Magnesium as Mg (Dissolved) a	Sodium as Na (Total) a	Sodium as Na (Dissolved) a	Potassium as K (Total) a	Potassium as K (Dissolved) a		
1597119	WF/5	29-May-15 10:00	7.7	930	448	Nil	114	29	0.2	28	35	34	7	7	175	175	3	3		
1597120	CB/5	29-May-15 09:15	7.5	605	194	Nil	274	31	0.1	44	100	98	8	7	16	15	2	2		
1597121	ETF/5A	29-May-15 10:35	8.3	3000	680	Nil	276	104	1.1	780	60	61	30	30	568	593	7	7		
1597122	ETF/5B	29-May-15 10:35	7.7	2980	692	Nil	287	104	1.1	780	63	64	30	31	564	580	7	7		
1597123	D/5	29-May-15 11:00	7.9	685	183	Nil	264	67	0.3	43	94	96	5	6	30	33	4	5		
1597124	MA1/5	29-May-15 11:30	7.4	644	211	Nil	308	32	0.1	50	115	110	8	8	12	12	2	2		
1597125	CF/5A	29-May-15 11:50	7.7	1140	491	Nil	97	27	0.3	85	29	29	7	6	240	240	3	3		
1597126	CF/5B	29-May-15 11:50	7.7	1140	505	Nil	101	27	0.3	86	26	29	6	7	215	240	3	3		
1597127	TV/5	29-May-15 12:20	7.8	1580	648	Nil	82	50	0.6	140	23	23	6	6	375	375	4	4		
1597128	TE/5	29-May-15 12:50	7.5	1090	469	Nil	85	25	0.3	75	25	24	6	6	220	230	3	2		
1597129	AB/5	29-May-15 13:20	8.0	1040	243	Nil	378	144	0.3	52	125	130	13	13	67	70	3	3		
1597130	HW/5	29-May-15 13:30	8.0	825	410	Nil	91	23	0.3	17	28	28	5	5	150	160	3	3		
1597131	B/5	29-May-15 09:30	7.6	<100	Nil	Nil	<7	1	<0.1	<3	<1	<1	<1	<1	<1	<1	<1	<1		
<div></div> <div>Bretby Business Park, Ashby Road</div> <div>Burton-on-Trent, Staffordshire, DE15 0YZ</div> <div>Tel +44 (0) 1283 554400</div> <div>Fax +44 (0) 1283 554422</div>			Client Name		Envireau Water						Sample Analysis									
			Contact		Ms P Jenkinson															
			Dissolved Gasses in Waters										Date Printed					12-Jun-2015		
													Report Number					EXR/200082		
													Table Number					1		

			Units :	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	µg/l		
			Method Codes :	ICPWATVART	ICPWATVAR	ICPWATVART	ICPWATVAR	KONENS	KONENS	KONENS	GROHSA	TPHFID	TPHFID	ICPMSWT	ICPMSW	WSLM27	ICPWATVART	ICPWATVAR	DISGAS1
			Method Reporting Limits :	0.01	0.01	0.01	0.01	0.01	0.01	0.2	0.1	0.01	0.01	0.001	0.001	5	0.01	0.01	15
			UKAS Accredited :	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
LAB ID Number EX/	Client Sample Description	Sample Date	Manganese as Mn (Total) a	Manganese as MN (Dissolved) a	Iron as Fe (Total) a	Iron as Fe (Dissolved) a	Ammoniacal Nitrogen as N	Nitrite as N	Nitrate as N	GRO-HSA o	Carbon Banding	TPH GC	Uranium as U (Total)	Uranium as U (Dissolved)	Total Dissolved Solids w	Aluminium as Al (Total) a	Aluminium as Al (Dissolved) a	^Dissolved Butane	
1597119	WF/5	29-May-15 10:00	0.34	0.33	1.31	0.06	0.7	<0.01	<0.2	<0.1	Req	0.01	0.001	0.001	520	0.03	<0.01	<22	
1597120	CB/5	29-May-15 09:15	<0.01	<0.01	0.47	0.16	0.13	0.05	6.4	<0.1	Req	0.02	<0.001	<0.001	330	0.19	0.02		
1597121	ETF/5A	29-May-15 10:35	0.01	0.01	1.16	0.07	2.3	<0.01	<0.2	<0.1	Req	0.01	<0.001	<0.001	2040	0.42	0.01	<22	
1597122	ETF/5B	29-May-15 10:35	0.02	<0.01	1.78	0.08	2.3	<0.01	<0.2	<0.1	Req	0.01	<0.001	<0.001	2050	0.40	0.01	<22	
1597123	D/5	29-May-15 11:00	<0.01	<0.01	0.32	0.11	0.01	<0.01	4.7	<0.1	Req	0.02	0.001	<0.001	420	0.23	0.02		
1597124	MA1/5	29-May-15 11:30	<0.01	<0.01	0.14	0.11	<0.01	<0.01	6.4	<0.1	Req	<0.01	<0.001	<0.001	390	0.03	0.02	<22	
1597125	CF/5A	29-May-15 11:50	0.23	0.23	0.26	0.04	0.7	<0.01	<0.2	<0.1	Req	0.02	0.001	0.001	690	0.03	<0.01	<22	
1597126	CF/5B	29-May-15 11:50	0.20	0.23	0.23	0.05	0.6	<0.01	<0.2	<0.1	Req	0.02	0.001	0.001	670	0.03	0.02	<22	
1597127	TV/5	29-May-15 12:20	0.03	0.03	0.18	0.03	1.1	<0.01	<0.2	<0.1	Req	0.01	<0.001	<0.001	950	0.02	<0.01	<22	
1597128	TE/5	29-May-15 12:50	0.07	0.07	0.31	0.19	0.3	<0.01	<0.2	<0.1	Req	0.04	<0.001	<0.001	650	0.02	<0.01		
1597129	AB/5	29-May-15 13:20	0.06	0.01	0.50	0.14	0.02	<0.01	0.3	<0.1	Req	0.02	0.001	0.001	610	0.30	0.02		
1597130	HW/5	29-May-15 13:30	0.27	0.27	0.45	0.06	0.6	<0.01	<0.2	<0.1	Req	0.04	0.001	0.001	470	0.06	<0.01	<22	
1597131	B/5	29-May-15 09:30	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	<0.2	<0.1	Req	0.01	<0.001	<0.001	84	0.03	<0.01		
<div></div> <div>Bretby Business Park, Ashby Road</div> <div>Burton-on-Trent, Staffordshire, DE15 0YZ</div> <div>Tel +44 (0) 1283 554400</div> <div>Fax +44 (0) 1283 554422</div>			Client Name		Envireau Water						Sample Analysis								
			Contact		Ms P Jenkinson														
			Dissolved Gasses in Waters										Date Printed					12-Jun-2015	
													Report Number					EXR/200082	
													Table Number					1	



# Total Petroleum Hydrocarbons (TPH) Carbon Ranges

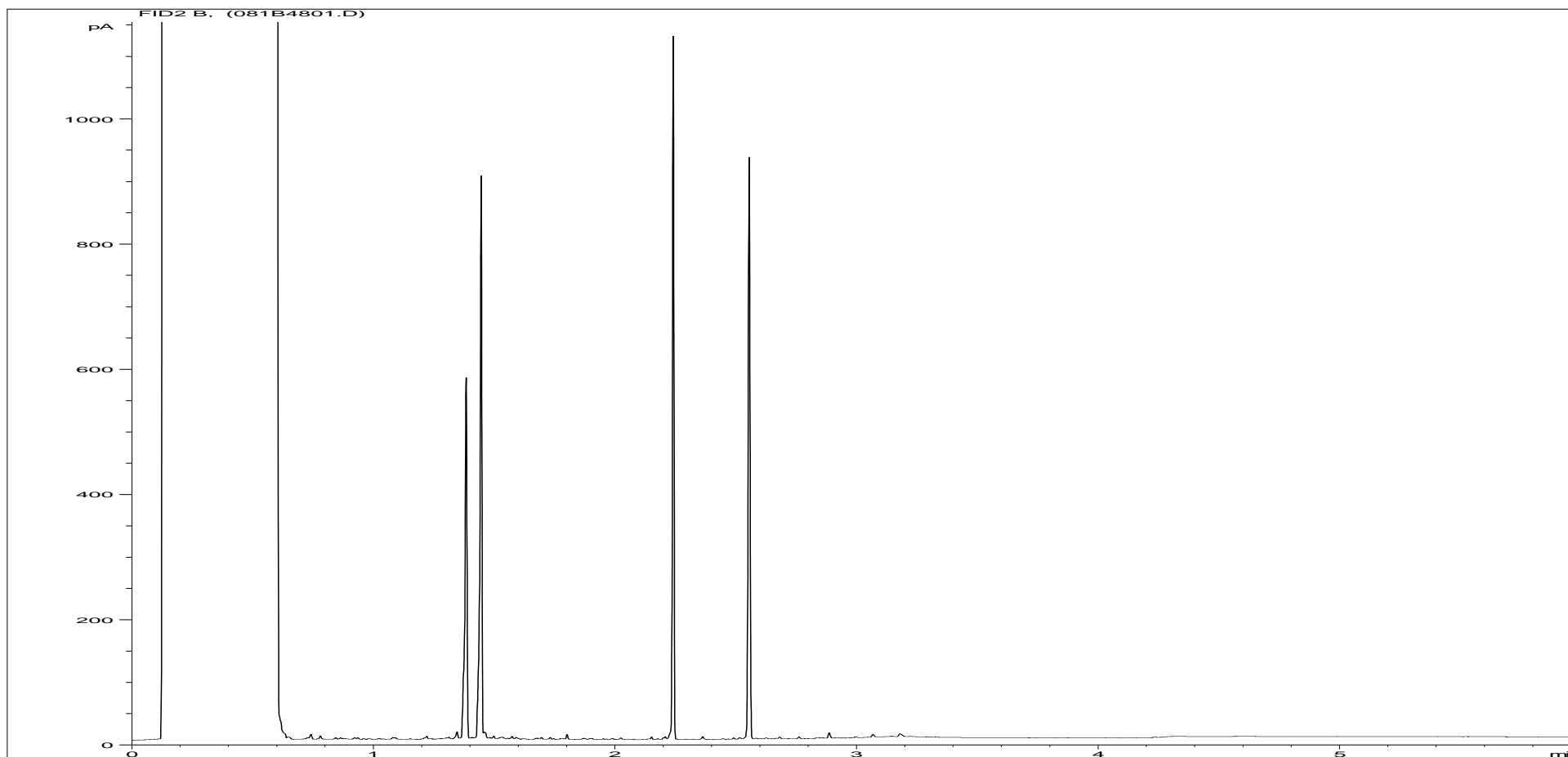
**Customer and Site Details:** Envireau Water : Dissolved Gasses in Waters  
**Job Number:** W20\_0082  
**QC Batch Number:** 150401  
**Directory:** D:\TES\DATA\Y2015\061115TPH\_GC4\061115 2015-06-11 10-53-19\093B6001.D  
**Method:** Bottle

**Matrix:** Water  
**Date Booked in:** 30-May-15  
**Date Extracted:** 11-Jun-15  
**Date Analysed:** 12-Jun-15, 01:35:35

\* Sample data with an asterisk are not UKAS accredited.

Sample ID	Client ID	Concentration, (mg/l)				
		>C8 - C10	>C10 - C12	>C12 - C16	>C16 - C21	>C21 - C35
EX1597119	WF/5	<0.01	<0.01	<0.01	<0.01	<0.01
EX1597120	CB/5	<0.01	<0.01	<0.01	<0.01	<0.01
EX1597121	ETF/5A	<0.01	<0.01	<0.01	<0.01	<0.01
EX1597122	ETF/5B	<0.01	<0.01	<0.01	<0.01	<0.01
EX1597123	D/5	<0.01	<0.01	<0.01	<0.01	0.011
EX1597124	MA1/5	<0.01	<0.01	<0.01	<0.01	<0.01
EX1597125	CF/5A	<0.01	<0.01	<0.01	<0.01	<0.01
EX1597126	CF/5B	<0.01	<0.01	<0.01	<0.01	<0.01
EX1597127	TV/5	<0.01	<0.01	<0.01	<0.01	<0.01
EX1597128	TE/5	<0.01	<0.01	<0.01	<0.01	0.032
EX1597129	AB/5	<0.01	<0.01	<0.01	<0.01	0.014
EX1597130	HW/5	<0.01	<0.01	<0.01	<0.01	0.026
EX1597131	B/5	<0.01	<0.01	<0.01	<0.01	<0.01

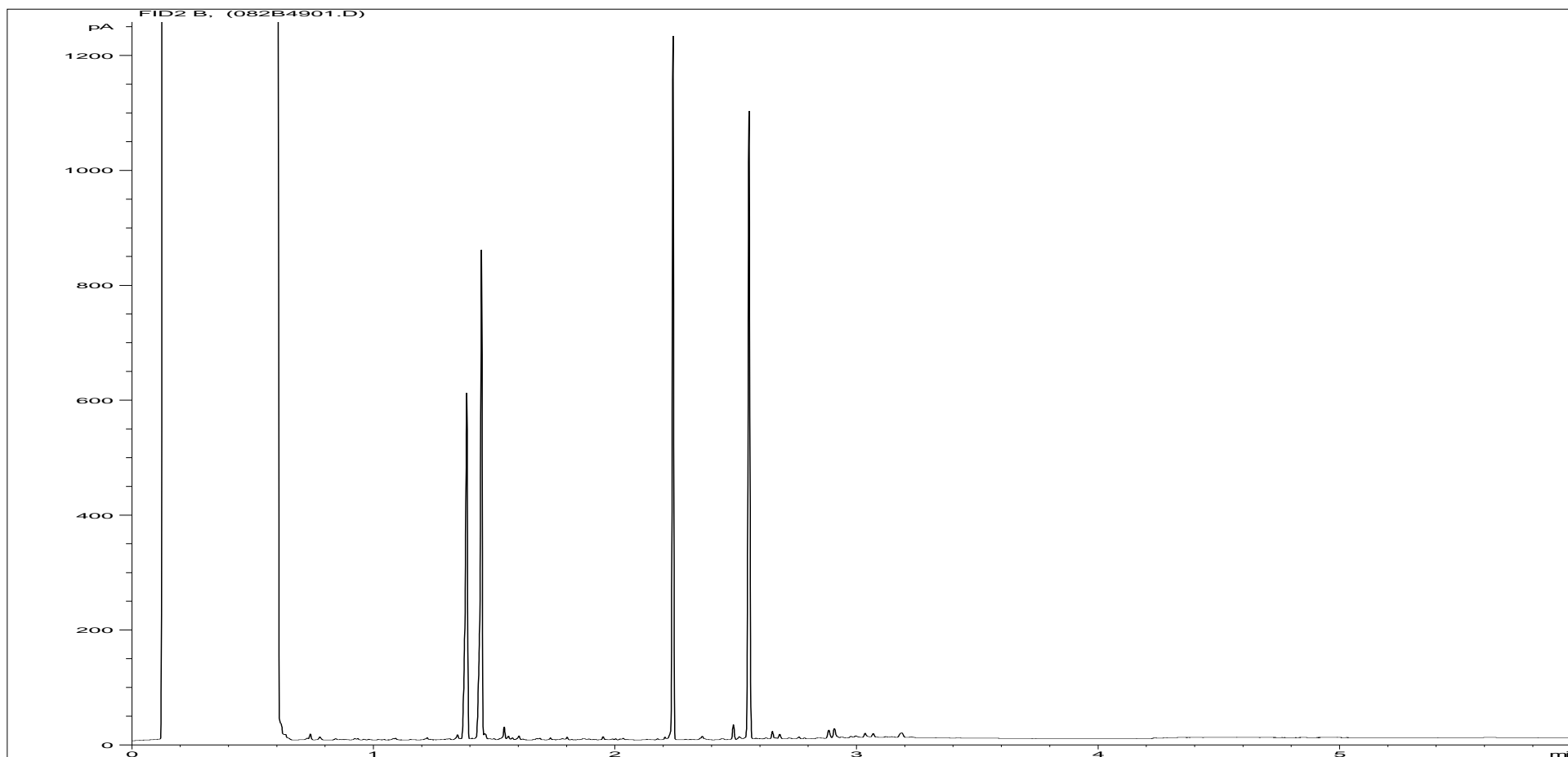
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1597119	<b>Job Number:</b>	W20_0082
<b>Multiplier:</b>	8	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	WF/5
<b>Acquisition Date/Time:</b>	11-Jun-15, 22:55:58		
<b>Datafile:</b>	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\081B4801.D		

Where individual results are flagged see report notes for status.

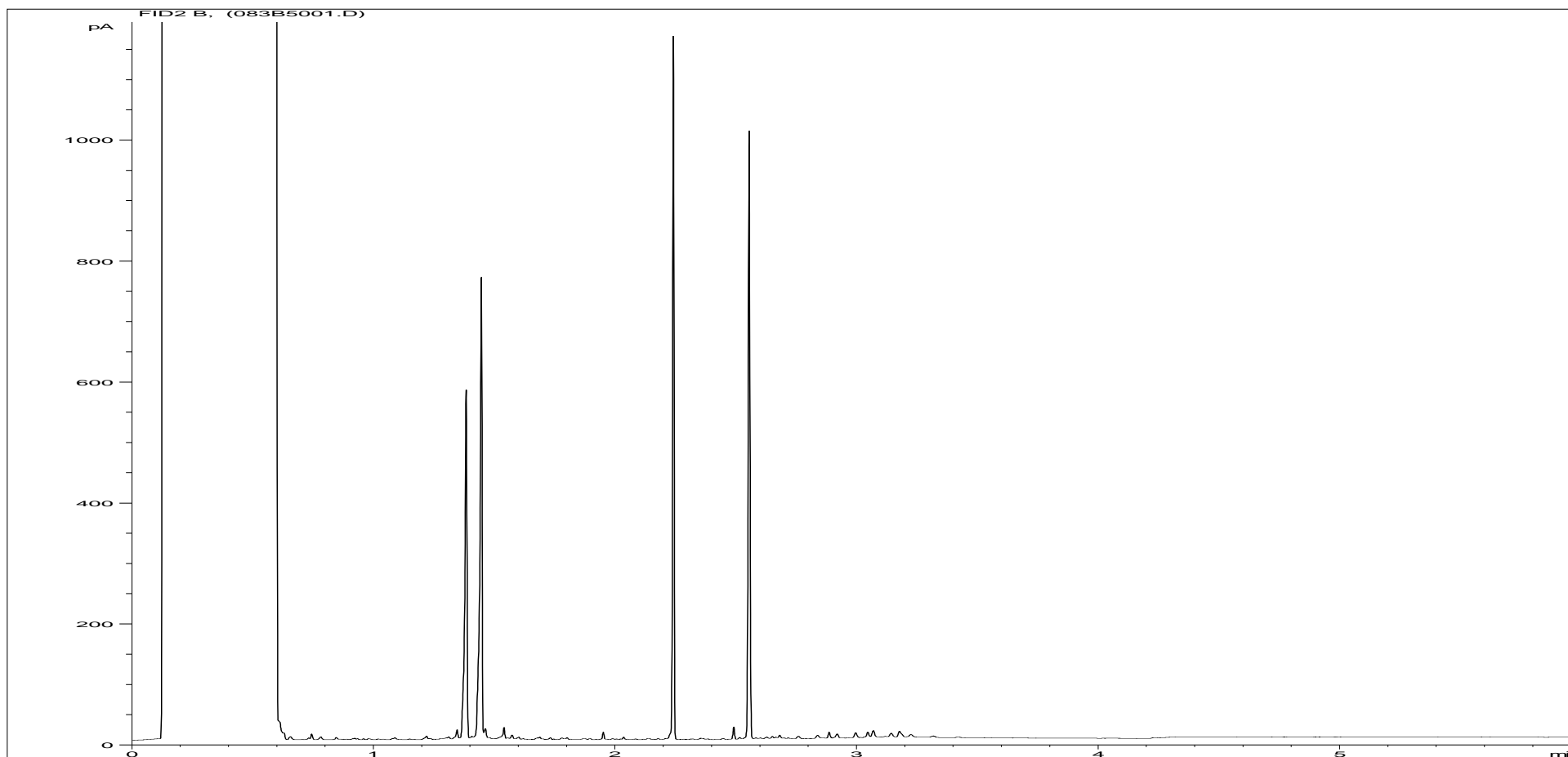
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1597120	<b>Job Number:</b>	W20_0082
<b>Multiplier:</b>	8	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	CB/5
<b>Acquisition Date/Time:</b>	11-Jun-15, 23:09:47		
<b>Datafile:</b>	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\082B4901.D		

Where individual results are flagged see report notes for status.

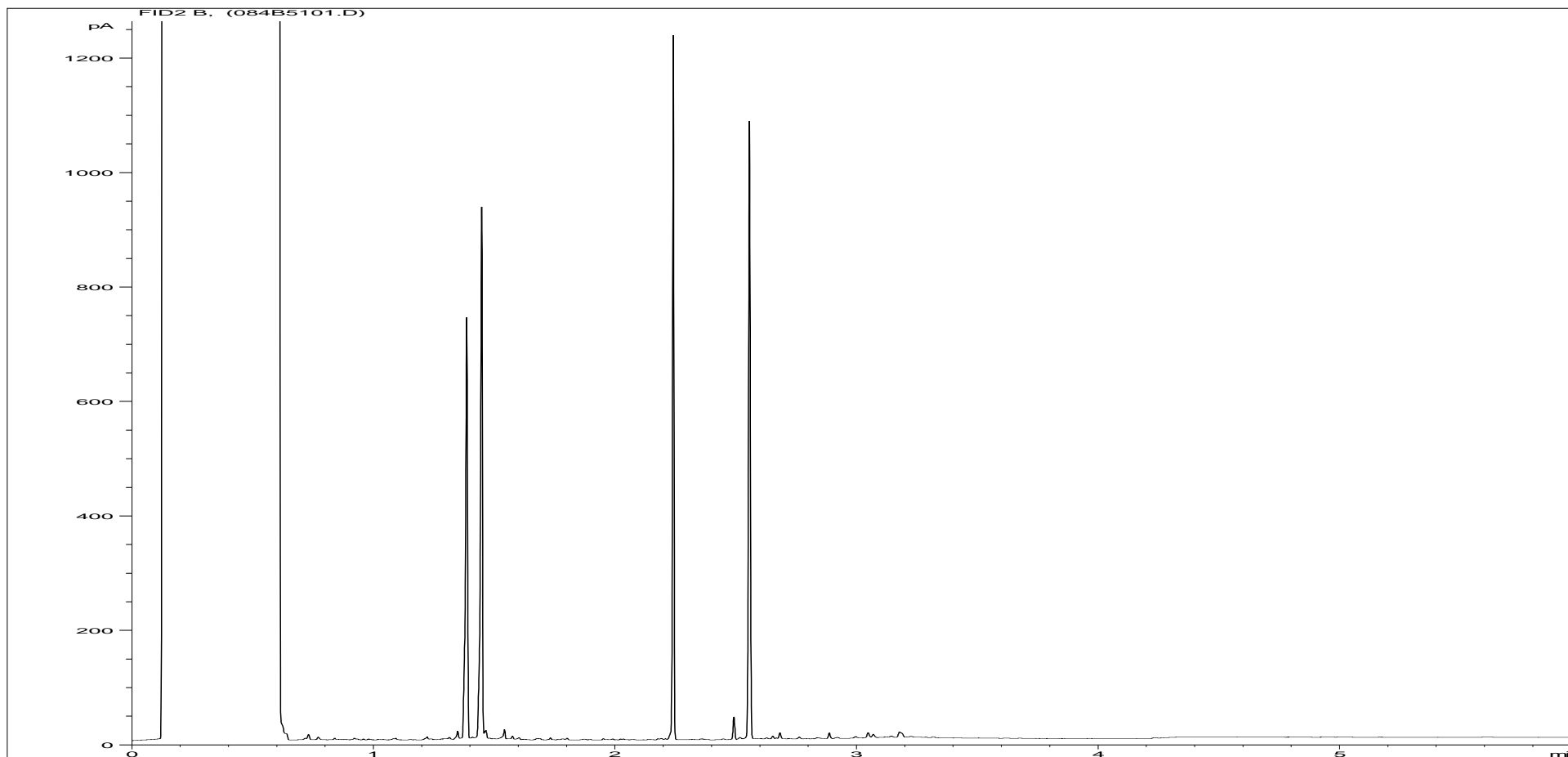
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1597121	<b>Job Number:</b>	W20_0082
<b>Multiplier:</b>	8	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	ETF/5A
<b>Acquisition Date/Time:</b>	11-Jun-15, 23:23:05		
<b>Datafile:</b>	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\083B5001.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID

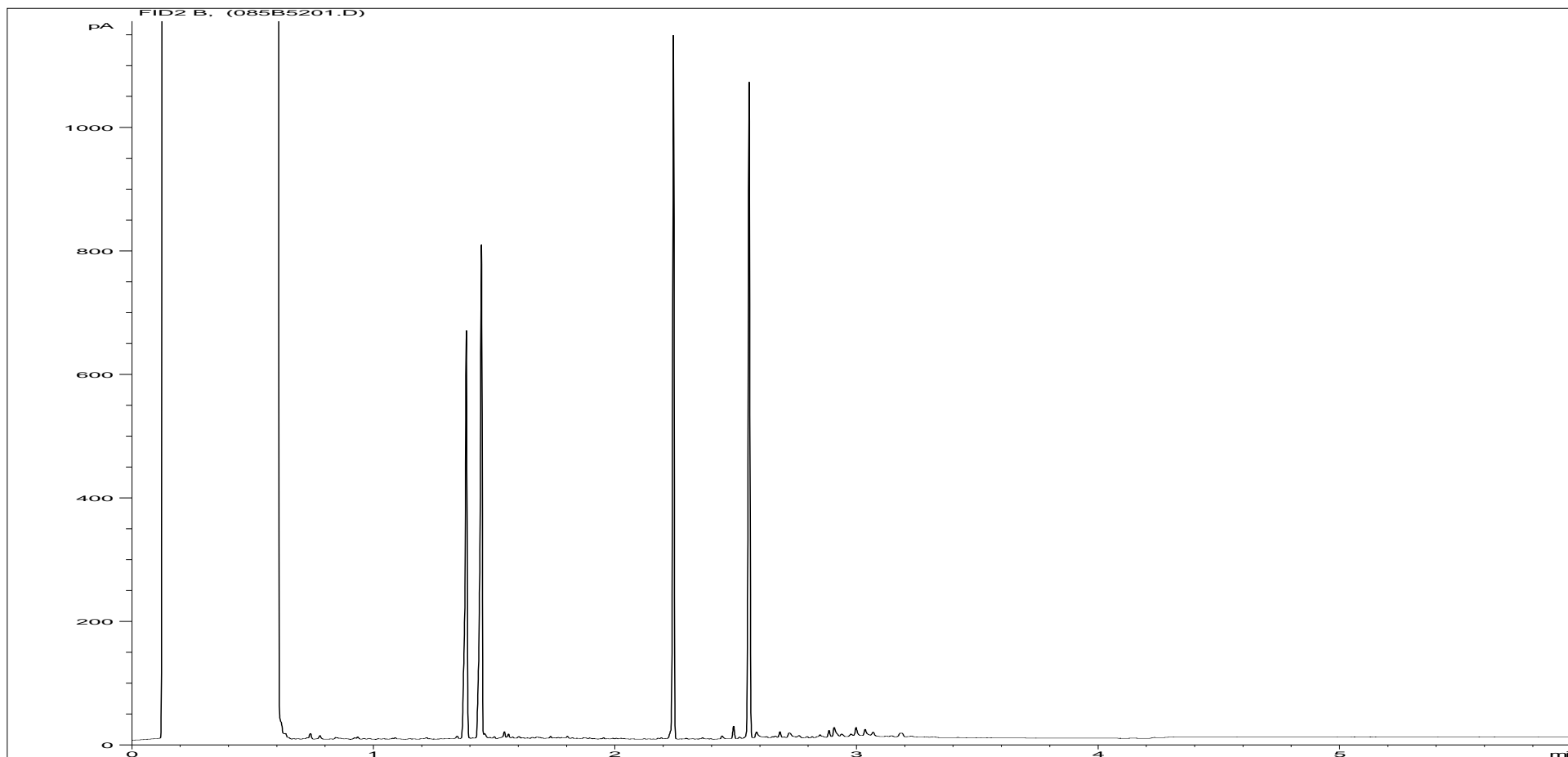


<b>Sample ID:</b>	EX1597122	<b>Job Number:</b>	W20_0082
<b>Multiplier:</b>	8	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	ETF/5B
<b>Acquisition Date/Time:</b>	11-Jun-15, 23:36:23		
<b>Datafile:</b>	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\084B5101.D		

Where individual results are flagged see report notes for status.



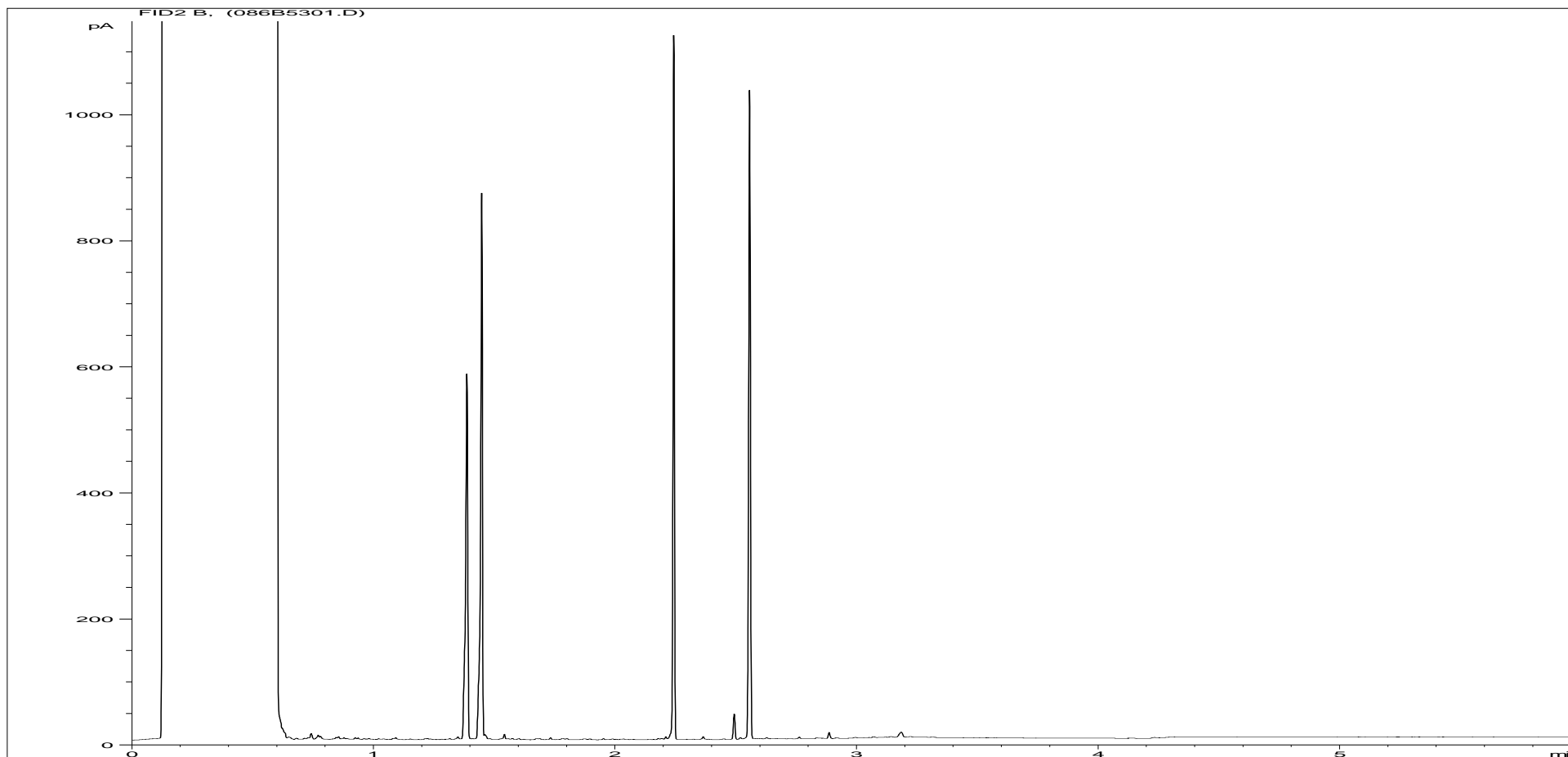
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1597123	<b>Job Number:</b>	W20_0082
<b>Multiplier:</b>	8	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	D/5
<b>Acquisition Date/Time:</b>	11-Jun-15, 23:49:42		
<b>Datafile:</b>	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\085B5201.D		

Where individual results are flagged see report notes for status.

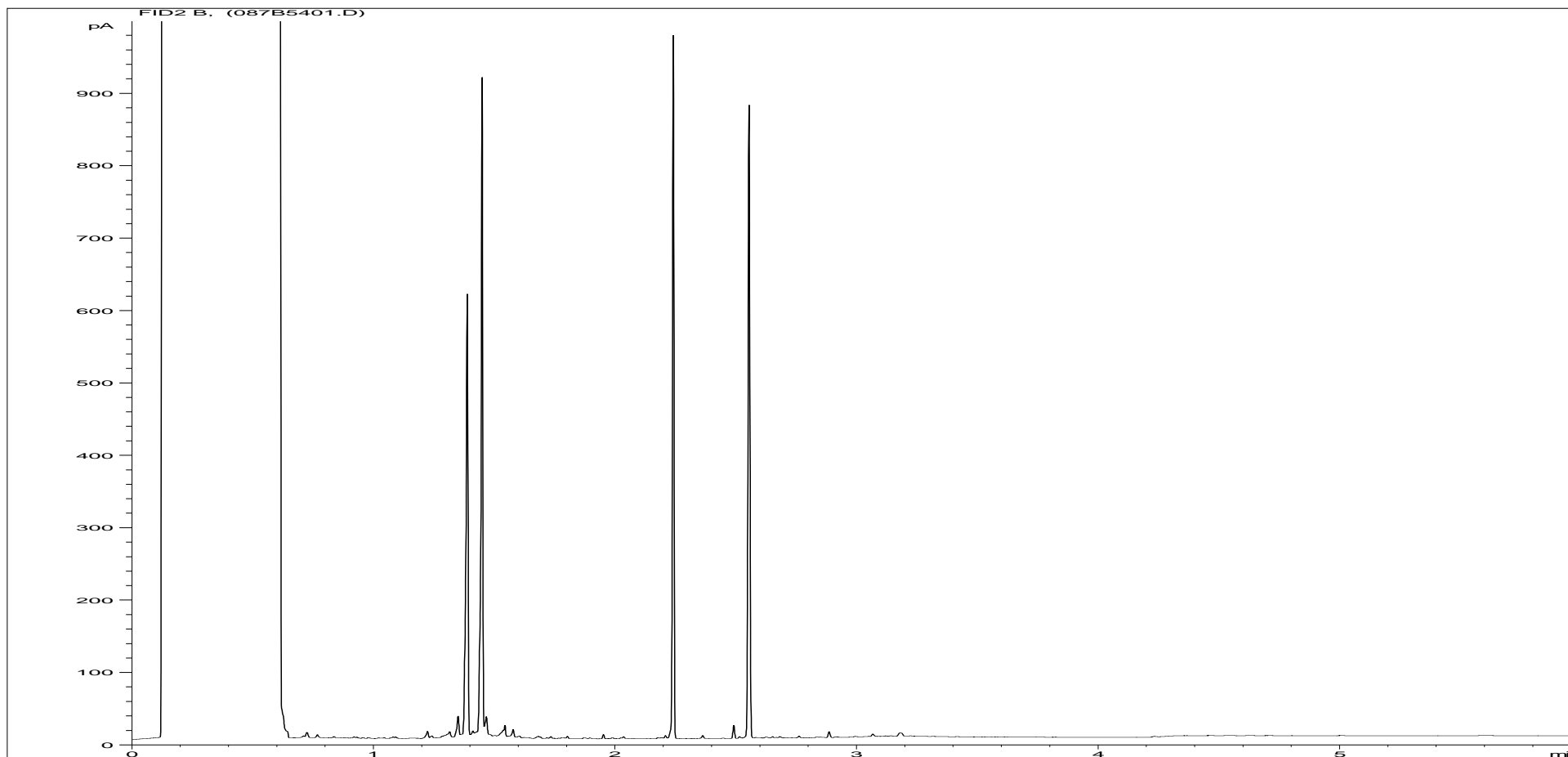
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1597124	<b>Job Number:</b>	W20_0082
<b>Multiplier:</b>	8	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	MA1/5
<b>Acquisition Date/Time:</b>	12-Jun-15, 00:03:01		
<b>Datafile:</b>	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\086B5301.D		

Where individual results are flagged see report notes for status.

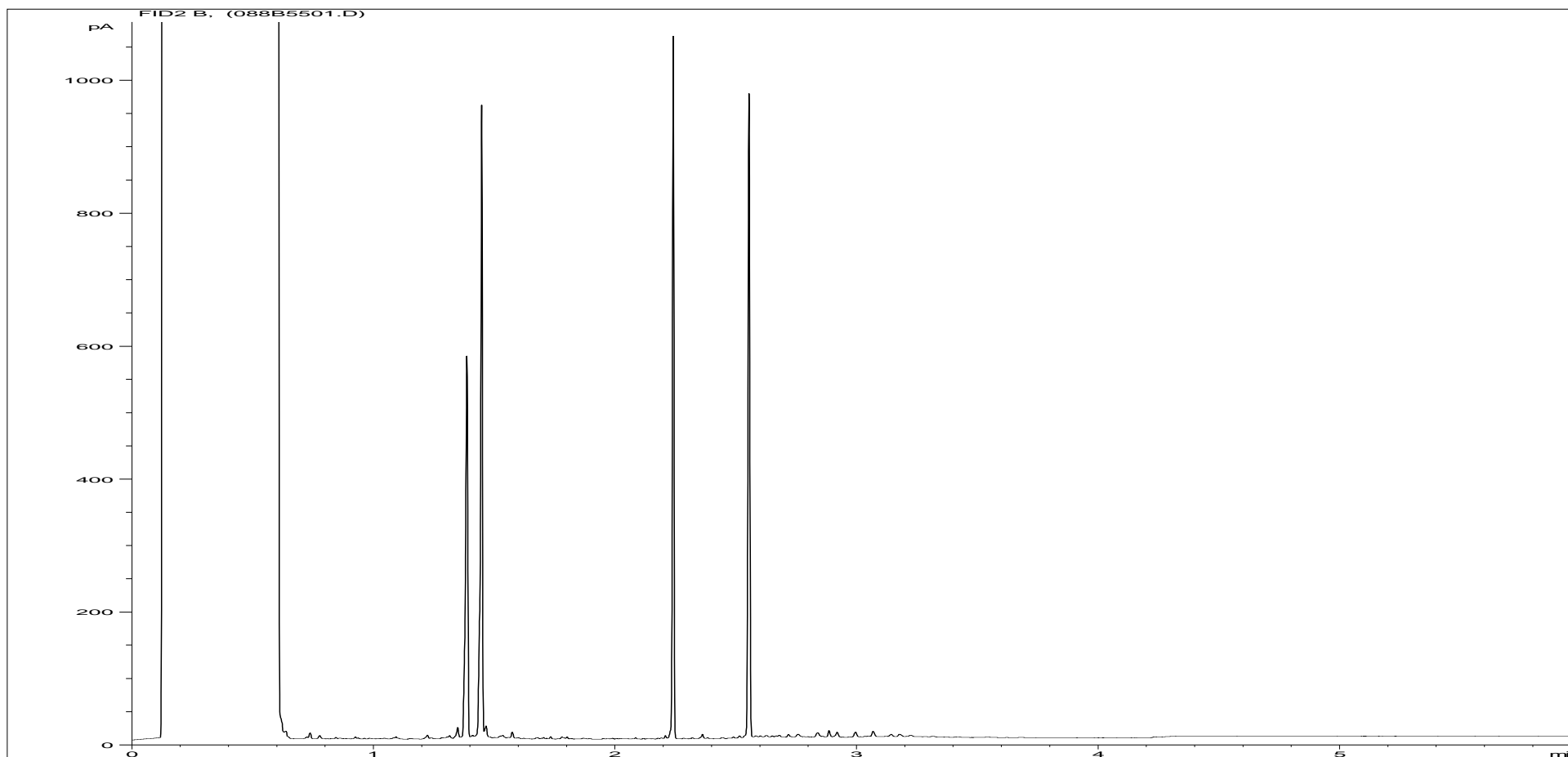
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1597125	<b>Job Number:</b>	W20_0082
<b>Multiplier:</b>	8	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	CF/5A
<b>Acquisition Date/Time:</b>	12-Jun-15, 00:16:33		
<b>Datafile:</b>	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\087B5401.D		

Where individual results are flagged see report notes for status.

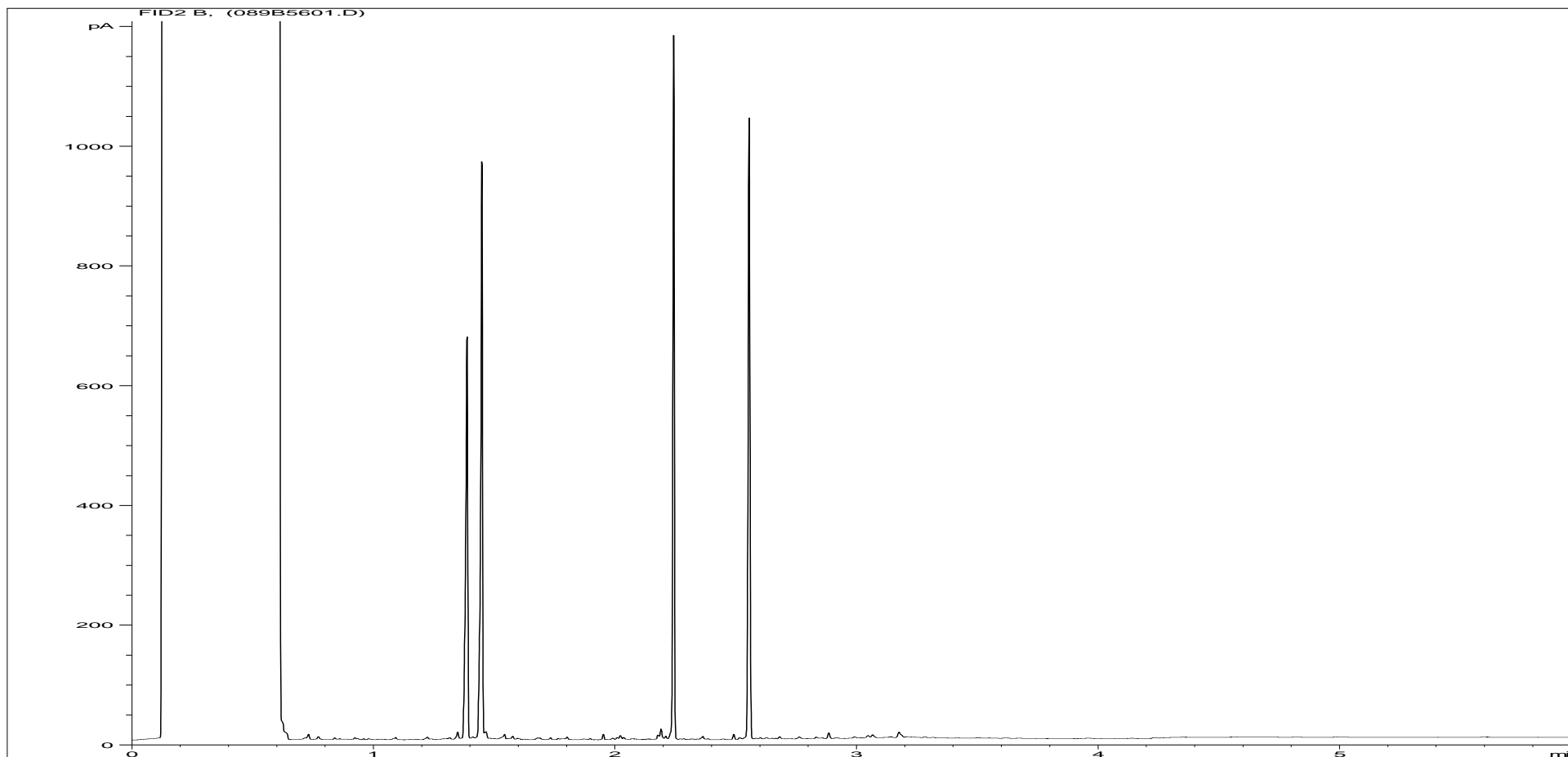
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1597126	<b>Job Number:</b>	W20_0082
<b>Multiplier:</b>	8	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	CF/5B
<b>Acquisition Date/Time:</b>	12-Jun-15, 00:29:47		
<b>Datafile:</b>	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\088B5501.D		

Where individual results are flagged see report notes for status.

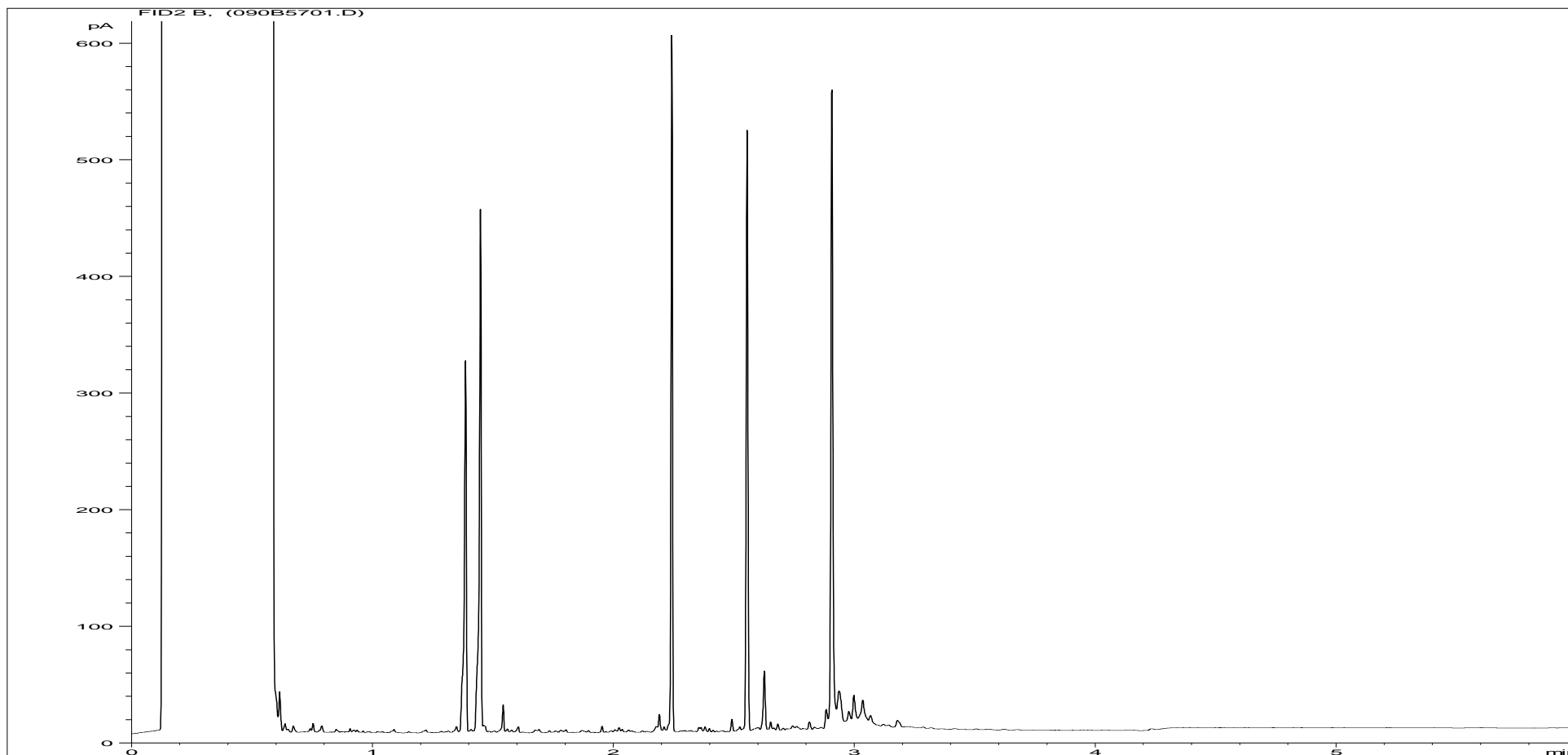
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1597127	<b>Job Number:</b>	W20_0082
<b>Multiplier:</b>	8	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	TV/5
<b>Acquisition Date/Time:</b>	12-Jun-15, 00:43:00		
<b>Datafile:</b>	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\089B5601.D		

Where individual results are flagged see report notes for status.

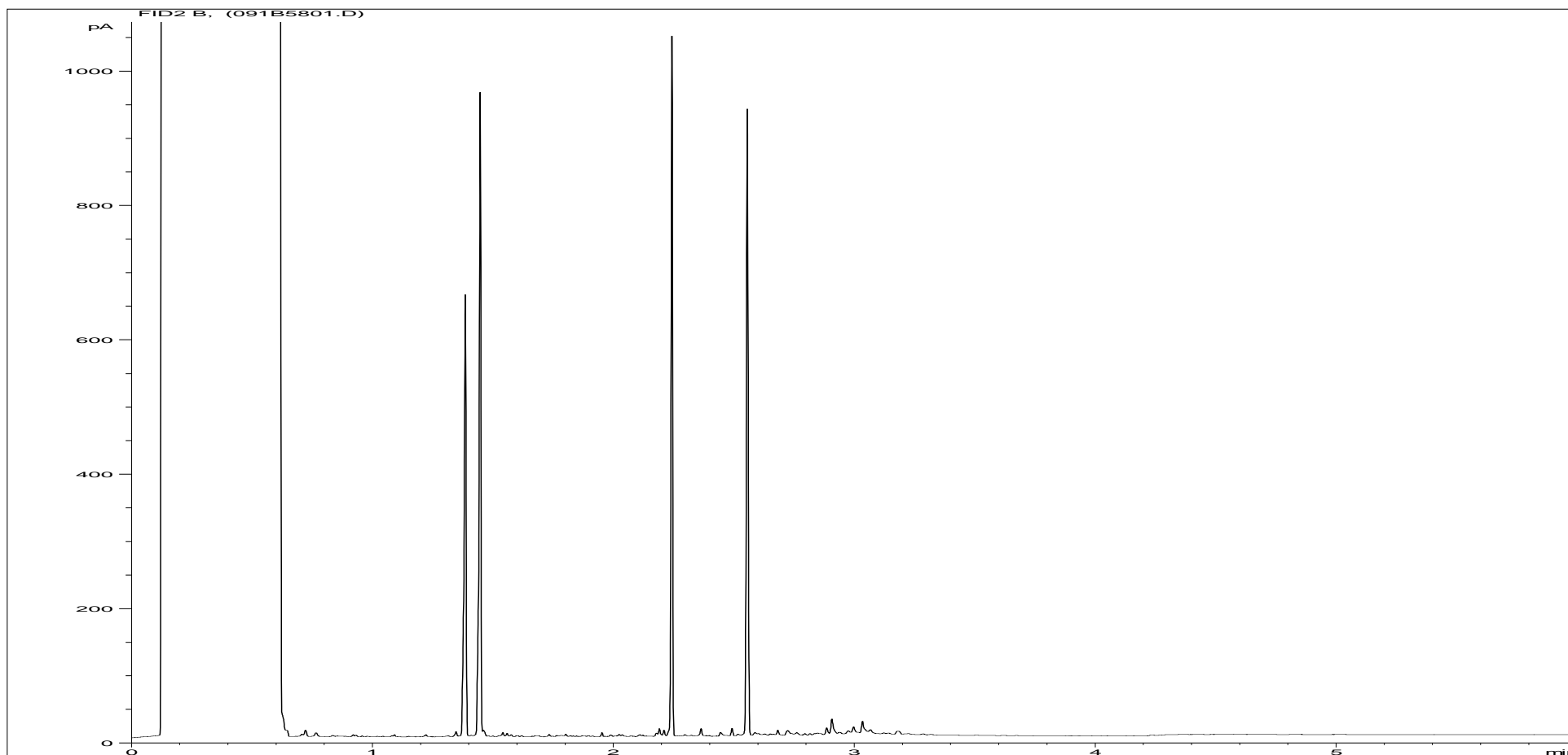
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1597128	Job Number:	W20_0082
Multiplier:	8	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	5UL_RUNF.M	Client Sample Ref:	TE/5
Acquisition Date/Time:	12-Jun-15, 00:56:17		
Datafile:	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\090B5701.D		

Where individual results are flagged see report notes for status.

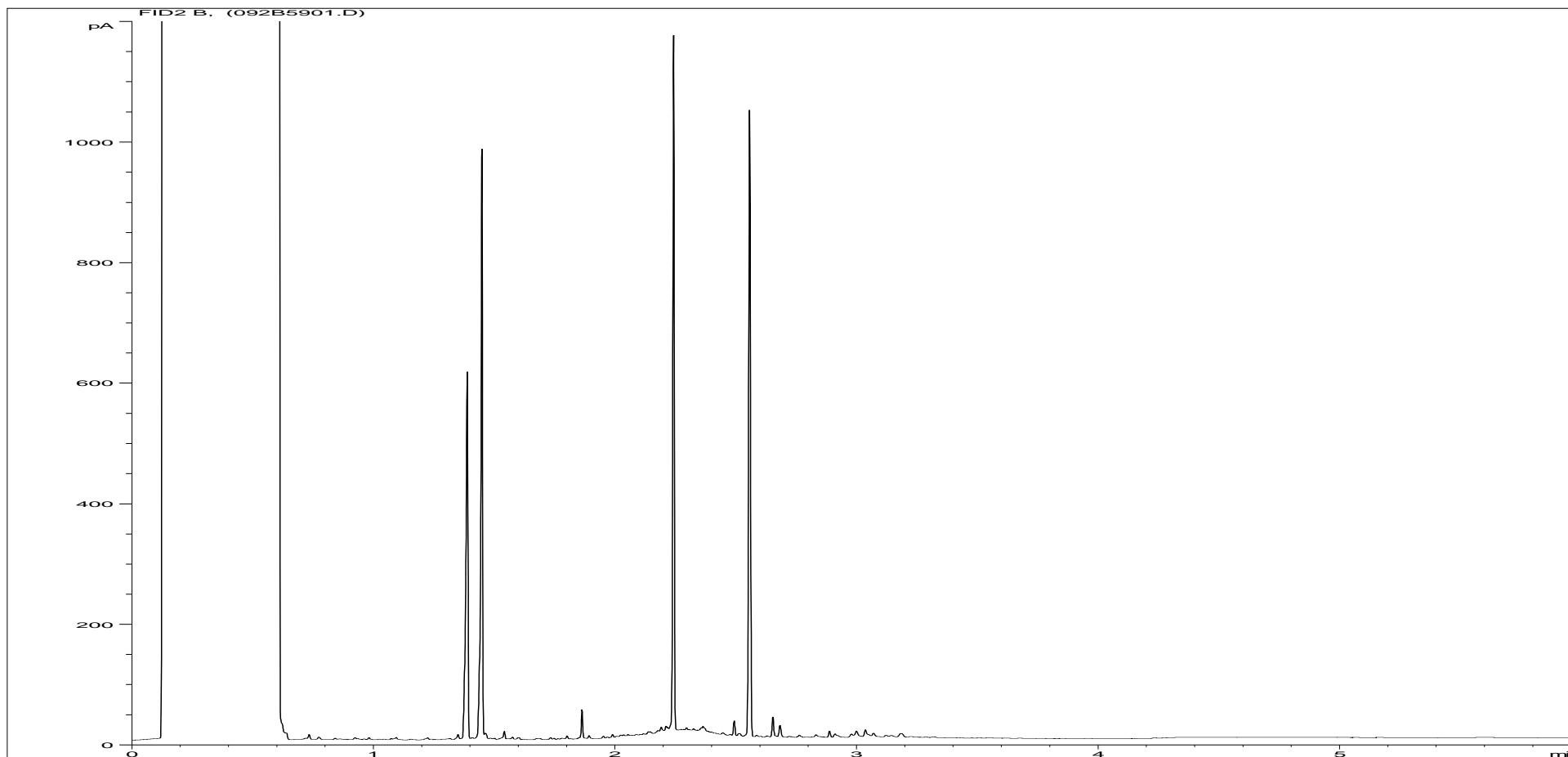
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1597129	<b>Job Number:</b>	W20_0082
<b>Multiplier:</b>	8	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	AB/5
<b>Acquisition Date/Time:</b>	12-Jun-15, 01:09:20		
<b>Datafile:</b>	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\091B5801.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID

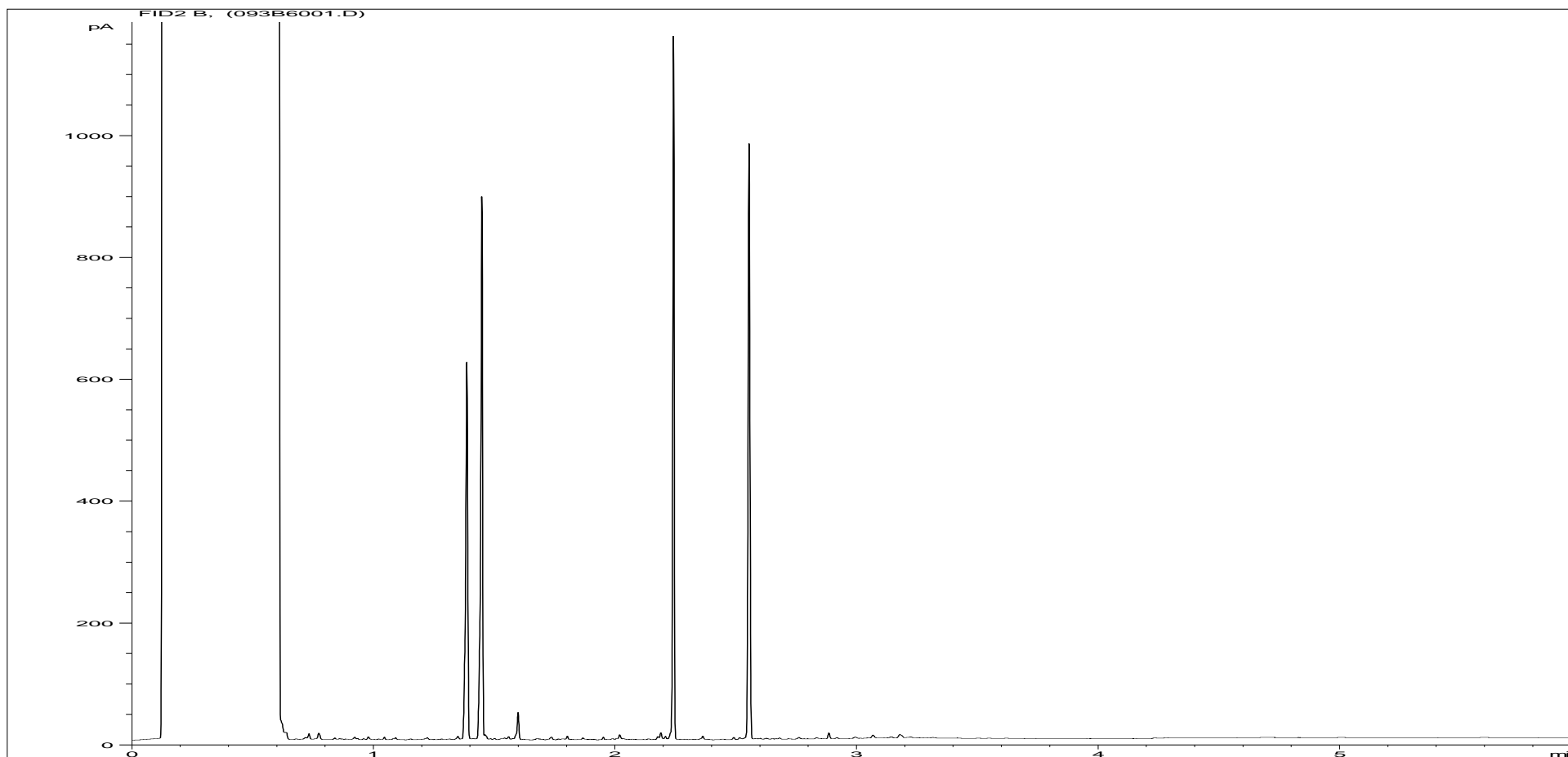


<b>Sample ID:</b>	EX1597130	<b>Job Number:</b>	W20_0082
<b>Multiplier:</b>	8	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	HW/5
<b>Acquisition Date/Time:</b>	12-Jun-15, 01:22:30		
<b>Datafile:</b>	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\092B5901.D		

Where individual results are flagged see report notes for status.



# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1597131	<b>Job Number:</b>	W20_0082
<b>Multiplier:</b>	8	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	B/5
<b>Acquisition Date/Time:</b>	12-Jun-15, 01:35:35		
<b>Datafile:</b>	D:\TES\DATA\Y2015\061115TPH_GC4\061115 2015-06-11 10-53-19\093B6001.D		

Where individual results are flagged see report notes for status.

## GAS ANALYSIS

Customer: ESG - (BEC BRE), Environmental Chemistry

Date Received: 01 June 2015

Date Sampled:

Report N° GA00864

Date Analysed: 08 June 2015

Site: Envireau Water

SAMPLE REFERENCE	Analysis % V/V				
	Dissolved Methane (CH <sub>4</sub> )†	Dissolved Propane (C <sub>3</sub> H <sub>8</sub> )†	Dissolved Ethane (C <sub>2</sub> H <sub>6</sub> )†	Dissolved Butane (C <sub>4</sub> H <sub>10</sub> )†	Dissolved Ethylene (C <sub>2</sub> H <sub>4</sub> )†
Method of Analysis	9	9	9	9	9
EX/1597119	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EX/1597121	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EX/1597122	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EX/1597124	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EX/1597125	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EX/1597126	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EX/1597127	0.1738	0.0005	<0.0005	<0.0005	<0.0005
EX/1597130	0.0010	<0.0005	<0.0005	<0.0005	<0.0005

Method of 9 Dissolved Gas  
Analysis:-

† Not UKAS Accredited

<b>Customer Analytical Requirements</b> CH <sub>4</sub> , C <sub>3</sub> H <sub>8</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>4</sub> H <sub>10</sub> , C <sub>2</sub> H <sub>4</sub>	<b>Authorised by</b> Phil Shead
<b>Comment Box</b> Report number W/EXR200082	

Authorised by:



Analyst: Alan Smith

Issue Date: 10 June 2015

ESG accepts no responsibility for the collection of any of the samples referred to in this report.

-----  
Phil Shead, Operations Manager  
Direct Dial: 01 283 554461

## The Analysis of Ground/Surface Water Samples for Th232

Customer: Environmental Chemistry  
ESG  
Etwell Building  
Bretby Business Park  
Ashby Road  
Burton Upon Trent  
DE15 0YZ

Testing Facility: Specialist Chemistry  
ESG  
Etwell Building  
Bretby Business Park  
Ashby Road  
Burton Upon Trent  
DE15 0YZ

Laboratory Reference: ASC/19082

Purchase Order Number: W200082

Samples Received: 01 June 2015

Approved by: 

Date: 09 June 2015

Approver's name: Michelle Smith

Job Title: Senior Analyst

Report Issue Date: 09 June 2015

## Introduction

Thirteen samples of ground/surface water were received for the measurement of dissolved Th232 and total Th232 by ICP-MS.

The samples were received in a satisfactory state under cold conditions.

The samples were logged into our system upon receipt and then stored in a secure sample store, at room temperature prior to analysis.

## Experimental

The samples were analysed following method:

- ASC/SOP/101, issue 4 - Operation and Maintenance of Inductively Coupled Plasma Mass Spectrometers (ICP-MS)

Portions of the samples were prepared for analysis by acidification with trace analysis grade nitric acid for total Th232. The samples were analysed as received for dissolved Th232.

The samples were then further prepared for analysis, by diluting, one in duplicate, as necessary with trace analysis grade hydrochloric acid.

Measurements of Th232 concentration were performed by ICP-MS (Agilent 7700x), which was calibrated using the method of standard addition. Scandium, indium and bismuth were added as internal standards to monitor and correct for instrumental drift.

As a quality control measure, QC standards at 10, 20 and 40  $\mu\text{gL}^{-1}$  were prepared, using alternative source stock solutions from those used to prepare the calibration standard, and measured with the samples. The results obtained for these are shown under the heading 'QC Standard' in the table attached.

## Results

The results for the samples are detailed in the following table attached.

The results for dissolved Th232 are expressed as  $\text{mgL}^{-1}$  in the samples as received.

The results for total Th232 are expressed as  $\text{mgL}^{-1}$  in the acidified samples.

The LOD is the limit of detection and is defined as three times the standard deviation obtained from the measurement of a series of at six instrument blanks. Measurement uncertainty for those results significantly above the LOD is estimated to be  $\pm 20\%$  and results are reported to two significant figures. Results within an order of magnitude of the LOD have a higher uncertainty and are reported to one significant figure.

## The Analysis of Ground/Surface Water Samples for Th232

Customer Reference	Laboratory Reference	Th232 Dissolved	Th232 Total
	<b>LOD</b>	0.0003	0.0003
W1597119	ASC/19082.001	<0.0003	<0.0003
W1597120	ASC/19082.002	<0.0003	<0.0003
W1597121	ASC/19082.003	<0.0003	<0.0003
W1597122	ASC/19082.004	<0.0003	0.0005
W1597123	ASC/19082.005	<0.0003	<0.0003
W1597124	ASC/19082.006	<0.0003	<0.0003
W1597125	ASC/19082.007	<0.0003	<0.0003
W1597126	ASC/19082.008	<0.0003	<0.0003
W1597127	ASC/19082.009	<0.0003	<0.0003
W1597128	ASC/19082.010	<0.0003	<0.0003
W1597129	ASC/19082.011	<0.0003	<0.0003
W1597130	ASC/19082.012	<0.0003	<0.0003
W1597131	ASC/19082.013	<0.0003	<0.0003
	ASC/19082.013D	<0.0003	<0.0003
<b>QC Standard 10<math>\mu</math>L<sup>-1</sup></b>		8.5	8.5
<b>QC Standard 20<math>\mu</math>L<sup>-1</sup></b>		21	21
<b>QC Standard 40<math>\mu</math>L<sup>-1</sup></b>		39	39

1. The results for dissolved Th232 are expressed as mgL<sup>-1</sup> in the samples as received.
2. The results for total Th232 are expressed as mgL<sup>-1</sup> in the acidified samples.
3. Results over an order of magnitude above the LOD are estimated to have an uncertainty of  $\pm 20\%$ . Results within one order of magnitude of the LOD have higher uncertainty and are reported to one significant figure.
4. The QC Standards are expected to be 10, 20 or 40 $\mu$ L<sup>-1</sup>  $\pm 20\%$ .
5. Suffix D denotes duplicate sample preparation and analysis.

Report Due 12-Jun-2015

[illegible]

Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W200082

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W200082

Consignment No W88768  
Date Logged 30-May-2015

Report Due 12-Jun-2015

ID Number	Description	Matrix Type	MethodID	ISEF	KONENS	Ammoniacal Nitrogen (Kone)	Nitrite as N (Kone)	Nitrate as N (Kone calc)	Sub024 ^Thorium as Th232 (Dissolved)	TPHFID ^Thorium as Th232 (Total)	TPH GC TPH Carbon Banding	WSL M12 Total Alkalinity as CaCO3	WSL M17 Total Acidity as CaCO3
EX/1597119	WF/5	Groundwater	29/05/15										
EX/1597120	CB/5	Surface Water	29/05/15										
EX/1597121	ETF/5A	Groundwater	29/05/15										
EX/1597122	ETF/5B	Groundwater	29/05/15										
EX/1597123	D/5	Surface Water	29/05/15										
EX/1597124	MA1/5	Groundwater	29/05/15										
EX/1597125	CF/5A	Groundwater	29/05/15										
EX/1597126	CF/5B	Groundwater	29/05/15										
EX/1597127	TV/5	Groundwater	29/05/15										
EX/1597128	TE/5	Surface Water	29/05/15										
EX/1597129	AB/5	Surface Water	29/05/15										
EX/1597130	HW/5	Groundwater	29/05/15										
EX/1597131	B/5	Groundwater	29/05/15										

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - Note: due date may be affected if triggered
	No analysis scheduled
	Analysis Subcontracted - Note: due date may vary

# Sample Analysis

## ESG Environmental Chemistry Analytical and Deviating Sample Overview

W200082

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W200082

Consignment No W88768

Date Logged 30-May-2015

Report Due 12-Jun-2015

ID Number	Description	MethodID		WSL M2	WSL M27	WSL M3
		Matrix Type	Sampled	Conductivity uS/cm @ 25C	Total Dissolved Solids	pH units
				✓		✓
EX/1597119	WF/5	Groundwater	29/05/15			
EX/1597120	CB/5	Surface Water	29/05/15			
EX/1597121	ETF/5A	Groundwater	29/05/15			
EX/1597122	ETF/5B	Groundwater	29/05/15			
EX/1597123	D/5	Surface Water	29/05/15			
EX/1597124	MA1/5	Groundwater	29/05/15			
EX/1597125	CF/5A	Groundwater	29/05/15			
EX/1597126	CF/5B	Groundwater	29/05/15			
EX/1597127	TV/5	Groundwater	29/05/15			
EX/1597128	TE/5	Surface Water	29/05/15			
EX/1597129	AB/5	Surface Water	29/05/15			
EX/1597130	HW/5	Groundwater	29/05/15			
EX/1597131	B/5	Groundwater	29/05/15			

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

**In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.**

### Deviating Sample Key

- A The sample was received in an inappropriate container for this analysis
- B The sample was received without the correct preservation for this analysis
- C Headspace present in the sample container
- D The sampling date was not supplied so holding time may be compromised - applicable to all analysis
- E Sample processing did not commence within the appropriate holding time
- F Sample processing did not commence within the appropriate handling time

### Requested Analysis Key

- Analysis Required
- Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
- No analysis scheduled
- Analysis Subcontracted - **Note: due date may vary**



# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	Calc_HD	As Received	Calculation based on Dissolved metals analysis by ICPOES
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	GROHSA	As Received	Determination of Total Gasoline Range Organics Hydrocarbons (GRO) by Headspace FID
Water	ICPMSW	As Received	Direct quantitative determination of Metals in water samples using ICPMS
Water	ICPMSWT	As Received	Determination of Total Metals in water samples using nitric acid digestion and ICPMS quantitation
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	ICPWATVART	As Received	Determination of Total Metals in water samples using nitric acid digestion and ICPOES quantitation
Water	ISEF	As Received	Determination of Fluoride in water samples by Ion Selective Electrode (ISE)
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	SubCon*	*	Contact Laboratory for details of the methodology used by the sub-contractor.
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM17	As Received	Titration with Sodium Hydroxide to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Where individual results are flagged see report notes for status.

# Report Notes

## Generic Notes

### Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### Waters Analysis

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup>@ 15°C

### Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

### Asbestos Analysis

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

**^** Sub-contracted analysis.

**\$\$** Unable to analyse due to the nature of the sample

**¶** Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

**¥** Results for guidance only due to possible interference

**&** Blank corrected result

**I.S** Insufficient sample to complete requested analysis

**I.S(g)** Insufficient sample to re-analyse, results for guidance only

**Intf** Unable to analyse due to interferences

**N.D** Not determined

**N.Det** Not detected

**N.F** No Flow

**NS** Information Not Supplied

**Req** Analysis requested, see attached sheets for results

**▯** Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** Dissolved Gasses in Waters  
**Report Number :** W20\_0082

[illegible]

## Water Analysis Test Certificate

Round 6

Our Ref: EXR/201779 (Ver. 1)

Your Ref:

July 10, 2015



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Ms P Jenkinson  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Ms P Jenkinson

Dear Ms Jenkinson

**Sample Analysis - Dissolved Gases in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

A handwritten signature in black ink, consisting of a stylized 'L' followed by a large, loopy 'T' and a horizontal line extending to the right.

L Thompson  
Project Co-ordinator  
01283 554467

# TEST REPORT



Report No. EXR/201779 (Ver. 1)

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

## Site: Dissolved Gases in Waters

The 6 samples described in this report were registered for analysis by ESG on 30-Jun-2015. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 10-Jul-2015

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Pages 2 to 3)  
Table of TPH Texas banding (0.01) (Page 4)  
GC-FID Chromatograms (Pages 5 to 10)  
Analytical and Deviating Sample Overview (Pages 11 to 12)  
Table of Method Descriptions (Page 13)  
Table of Report Notes (Page 14)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns

  
Managing Director  
Multi-Sector Services


Date of Issue: 10-Jul-2015

Tests marked '^' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

ESG accepts no responsibility for any sampling not carried out by our personnel.



<b>Units :</b> µg/l <b>Method Codes :</b> DISGAS1 <b>Method Reporting Limits :</b> 6 <b>UKAS Accredited :</b> No																					
LAB ID Number    EX/	Client Sample Description	Sample Date	^ Dissolved Methane																		
				 Bretby Business Park, Ashby Road Burton-on-Trent, Staffordshire, DE15 0YZ  Tel +44 (0) 1283 554400  Fax +44 (0) 1283 554422			<b>Client Name</b> Envireau Water  <b>Contact</b> Ms P Jenkinson	<b>Dissolved Gases in Waters</b>										<b>Sample Analysis</b>			
										<b>Date Printed</b>	10-Jul-2015										
										<b>Report Number</b>	EXR/201779										
										<b>Table Number</b>	1										



## Total Petroleum Hydrocarbons (TPH) Carbon Ranges

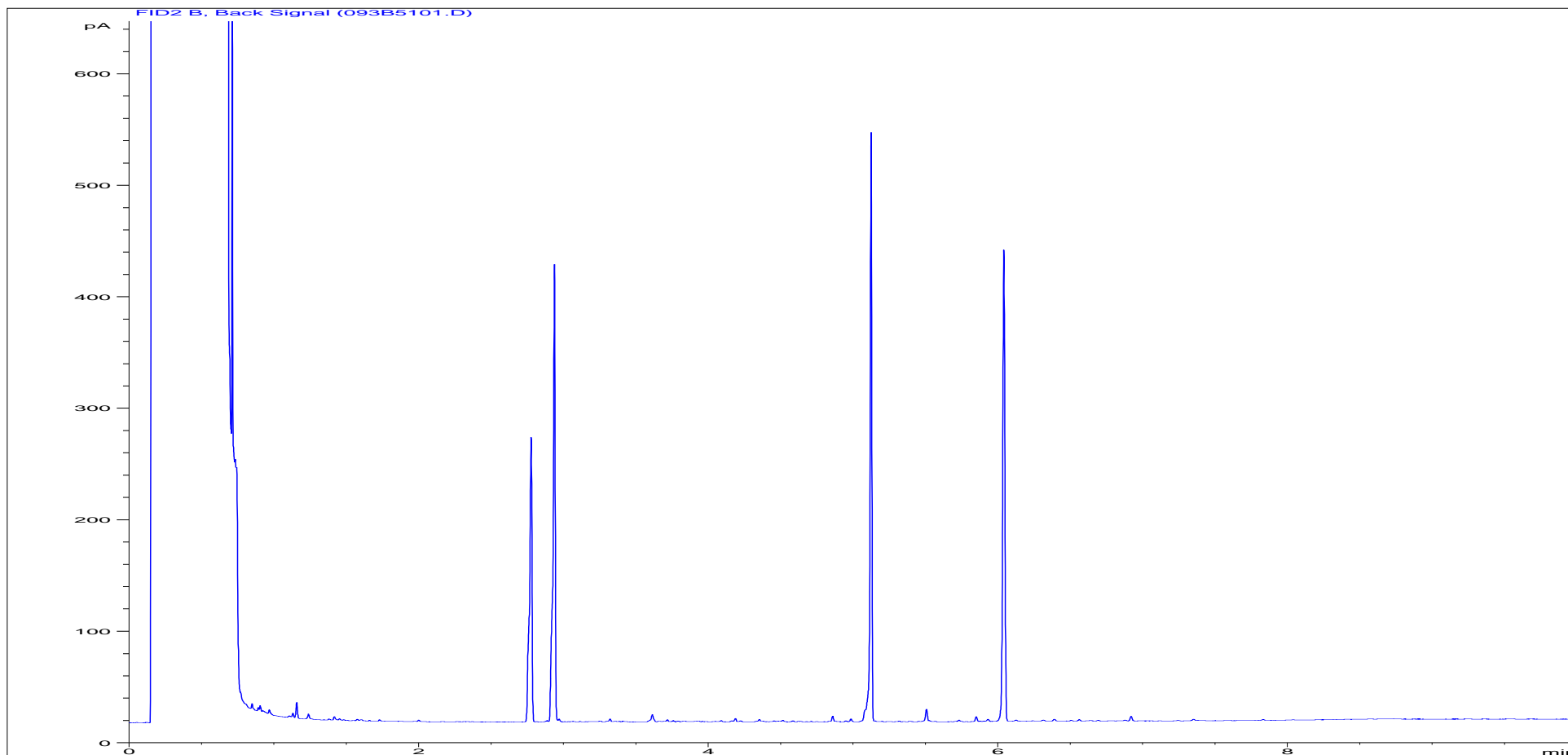
**Customer and Site Details:** Envireau Water : Dissolved Gasses in Waters  
**Job Number:** W20\_1779  
**QC Batch Number:** 150462  
**Directory:** D:\TES\DATA\Y2015\070215TPH\_GC17\070215 2015-07-02 15-14-54\003B6201.D  
**Method:** Bottle

**Matrix:** Water  
**Date Booked in:** 30-Jun-15  
**Date Extracted:** 02-Jul-15  
**Date Analysed:** 03-Jul-15, 10:57:00

**\* Sample data with an asterisk are not UKAS accredited.**

[illegible]

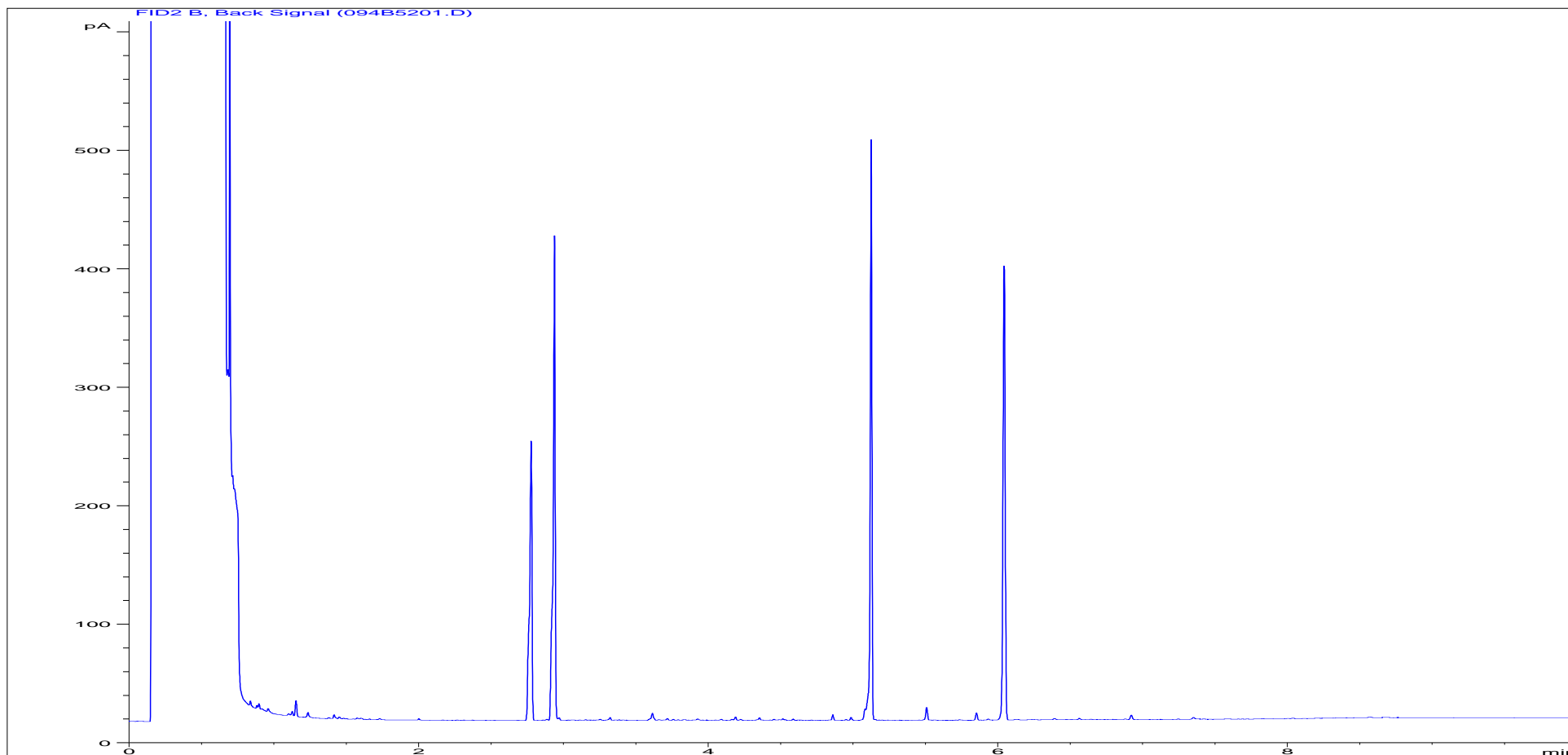
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1604716	Job Number:	W20_1779
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	WF/6A
Acquisition Date/Time:	04-Jul-15, 06:56:29		
Datafile:	D:\TES\DATA\Y2015\062915TPH_GC17\070315 2015-07-03 14-36-31\093B5101.D		

Where individual results are flagged see report notes for status.

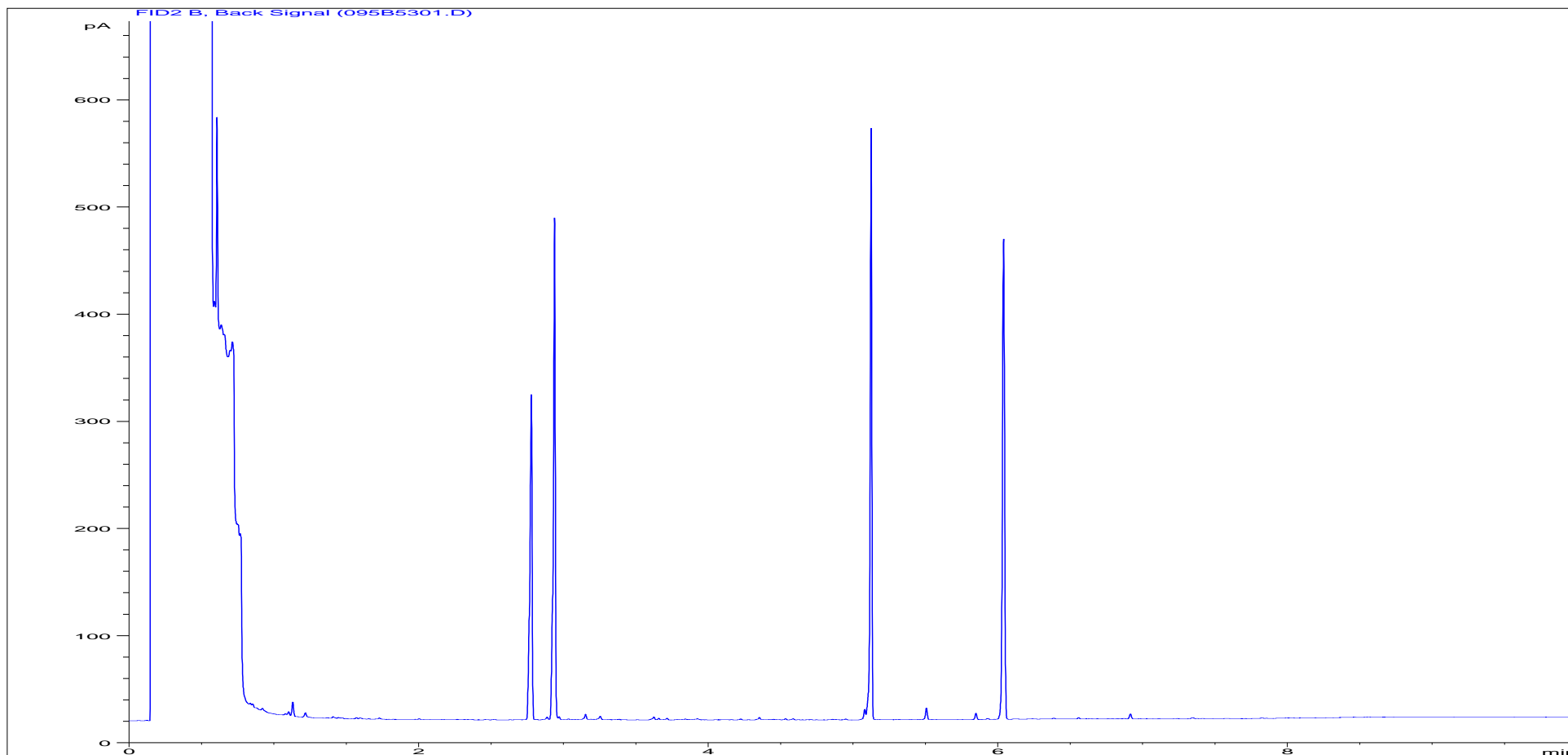
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1604717	<b>Job Number:</b>	W20_1779
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	WF/6B
<b>Acquisition Date/Time:</b>	04-Jul-15, 07:16:38		
<b>Datafile:</b>	D:\TES\DATA\Y2015\062915TPH_GC17\070315 2015-07-03 14-36-31\094B5201.D		

Where individual results are flagged see report notes for status.

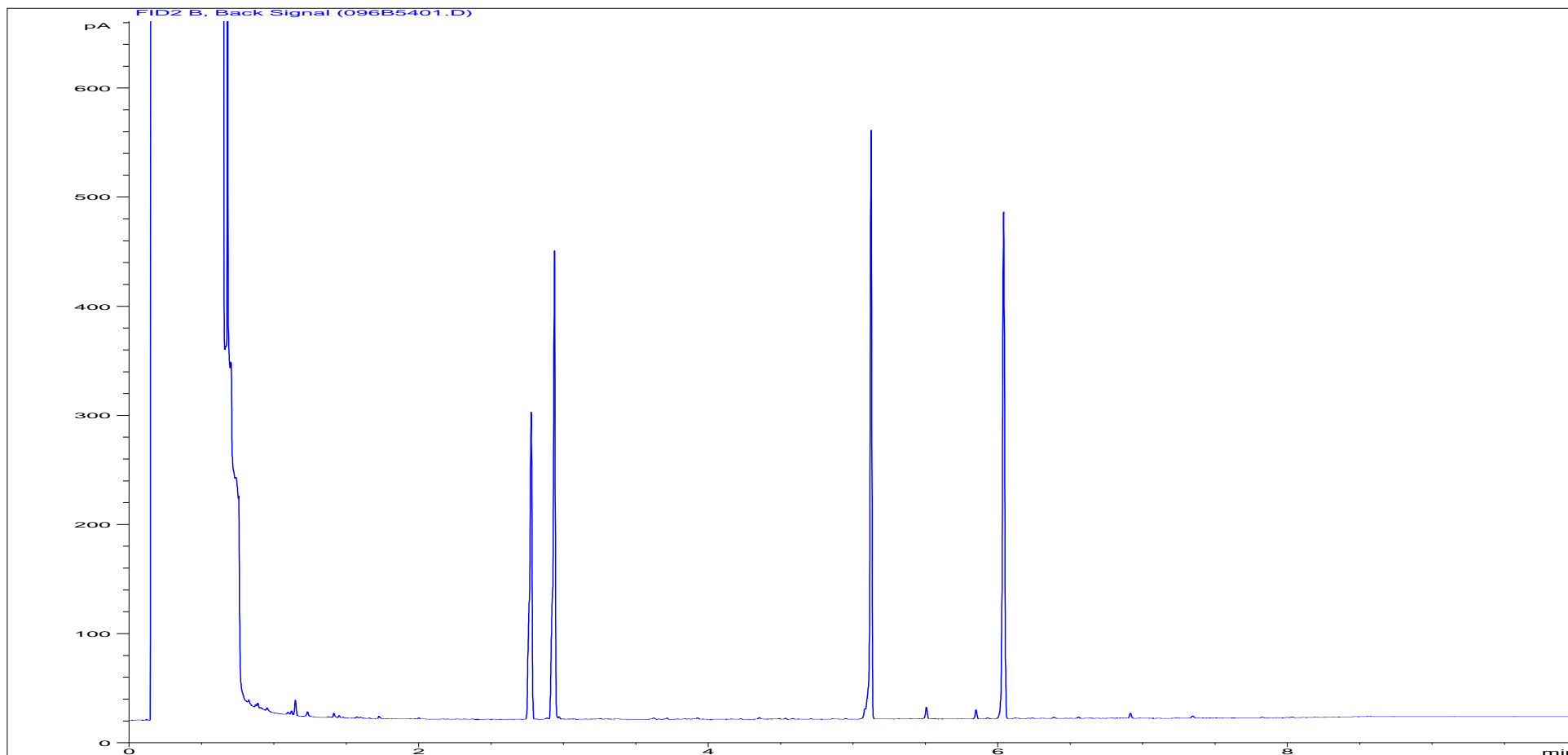
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1604718	Job Number:	W20_1779
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	ETF/6
Acquisition Date/Time:	04-Jul-15, 07:36:48		
Datafile:	D:\TES\DATA\Y2015\062915TPH_GC17\070315 2015-07-03 14-36-31\095B5301.D		

Where individual results are flagged see report notes for status.

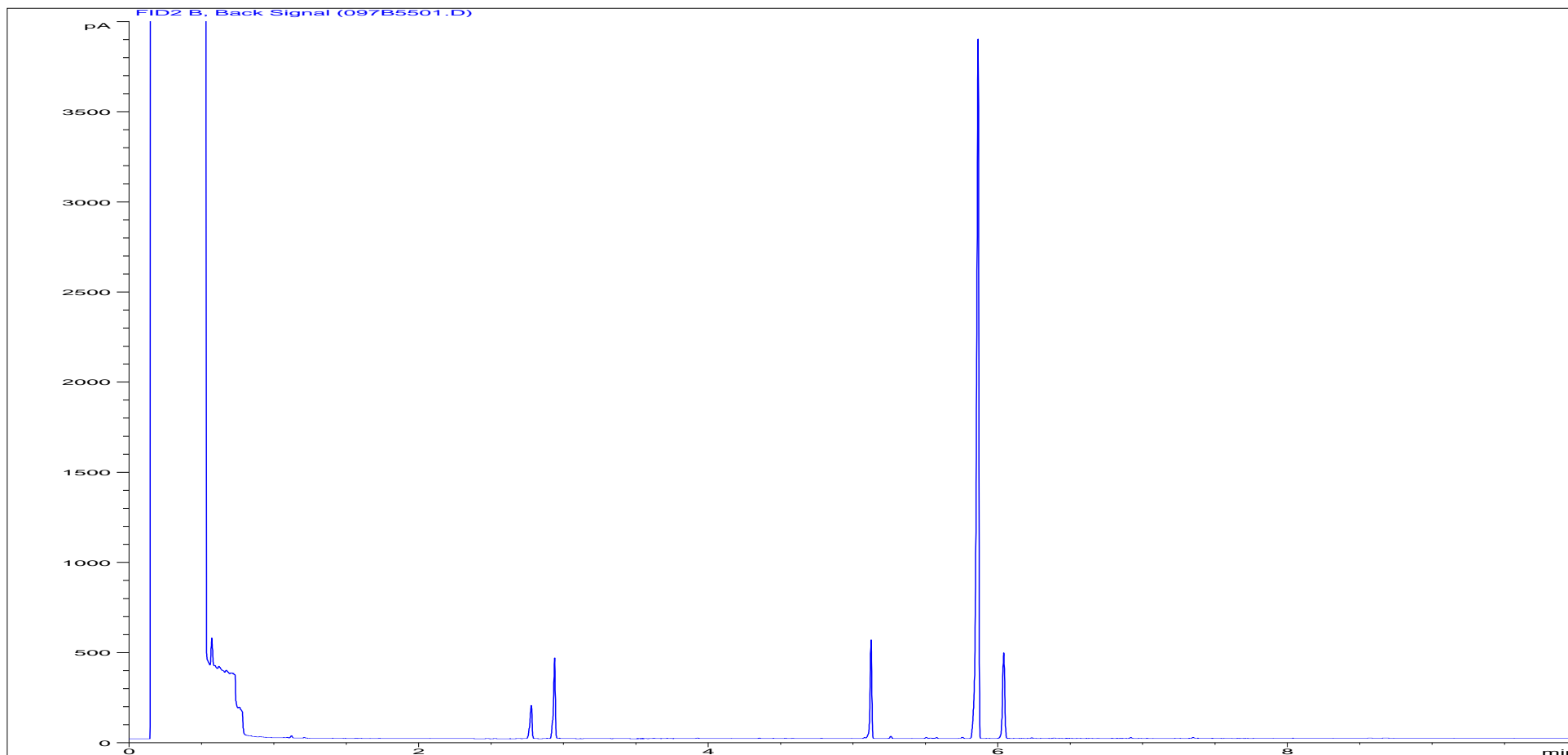
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1604719	<b>Job Number:</b>	W20_1779
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV/6
<b>Acquisition Date/Time:</b>	04-Jul-15, 07:57:00		
<b>Datafile:</b>	D:\TES\DATA\Y2015\062915TPH_GC17\070315 2015-07-03 14-36-31\096B5401.D		

Where individual results are flagged see report notes for status.

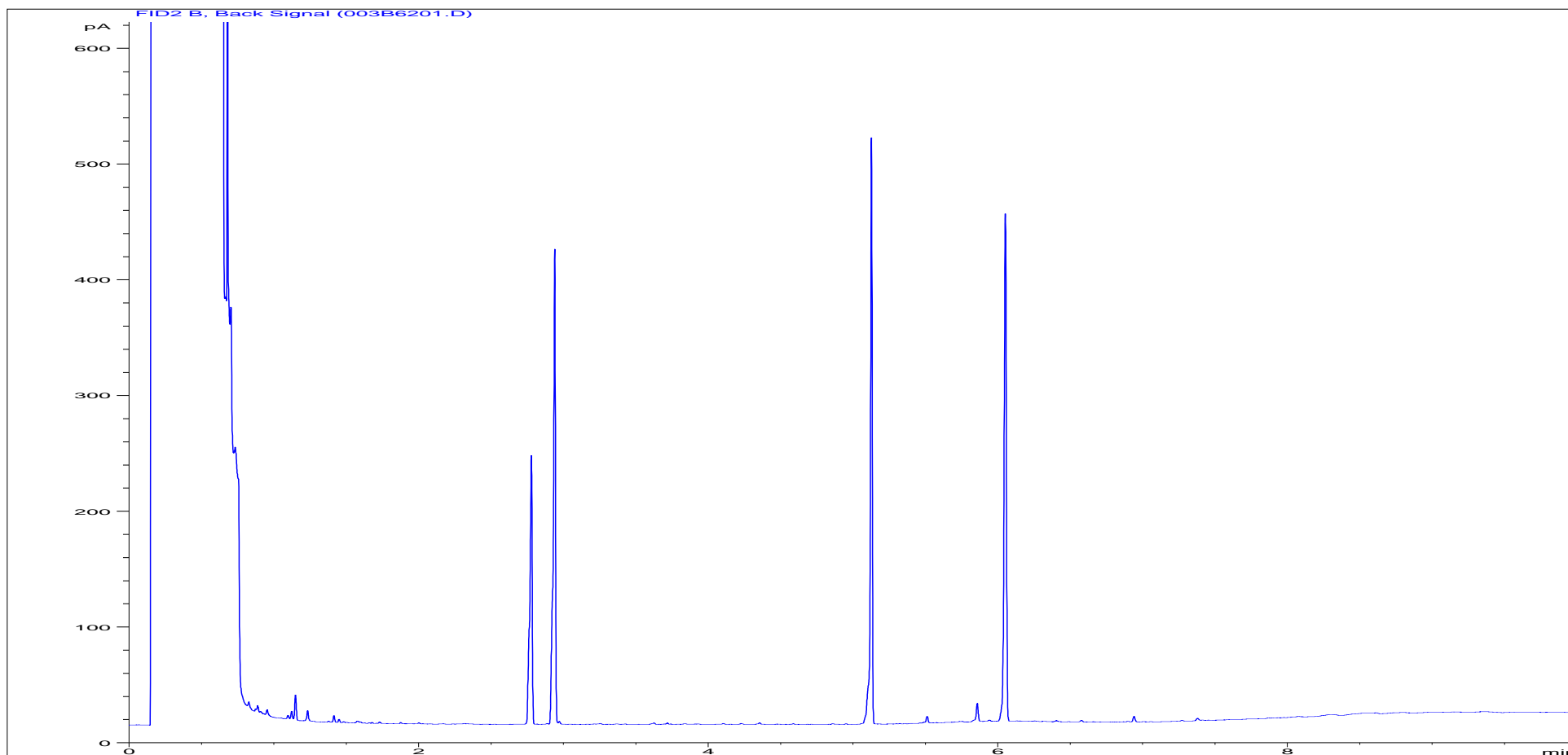
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1604720	<b>Job Number:</b>	W20_1779
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	HW/6
<b>Acquisition Date/Time:</b>	04-Jul-15, 08:17:14		
<b>Datafile:</b>	D:\TES\DATA\Y2015\062915TPH_GC17\070315 2015-07-03 14-36-31\097B5501.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1604721	<b>Job Number:</b>	W20_1779
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	B/6
<b>Acquisition Date/Time:</b>	03-Jul-15, 10:57:00		
<b>Datafile:</b>	D:\TES\DATA\Y2015\070215TPH_GC17\070215 2015-07-02 15-14-54\003B6201.D		

Where individual results are flagged see report notes for status.

Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W201779

Customer Envireau Water  
Site Dissolved Gases in Waters  
Report No W201779

Consignment No W90162  
Date Logged 30-Jun-2015

Report Due 13-Jul-2015

WSL/M3	pH units	✓																						
WSL/M27	Total Dissolved Solids																							
WSL/M2	Conductivity uS/cm @ 25C	✓																						
	Bicarbonate Alkalinity as CaCO3	✓																						
	Total Alkalinity as CaCO3	✓																						
	P Alkalinity as CaCO3	✓																						
WSL/M12	TPH GC	✓																						
TPH/FID	TPH Carbon Banding	✓																						
	Chloride as Cl (Kone)	✓																						
KONENS	Aluminium as Al (Dissolved) VAR																							
	Iron as Fe (Dissolved) VAR	✓																						
	Manganese as Mn (Dissolved) VAR	✓																						
	Potassium as K (Dissolved) VAR	✓																						
	Sodium as Na (Dissolved) VAR	✓																						
	Magnesium as Mg (Dissolved) VAR	✓																						
	Calcium as Ca (Dissolved) VAR	✓																						
	Total Sulphur as SO4 (Diss) VAR	✓																						
	DISGAS1	^Dissolved Methane																						
	CUST SERV	Report B																						
MethodID	Sampled	Matrix Type																						
ID Number	Description																							
EX/1604716	WF/6A	Groundwater	29/06/15																					
EX/1604717	WF/6B	Groundwater	29/06/15																					
EX/1604718	ETF/6	Groundwater	29/06/15																					
EX/1604719	TV/6	Groundwater	29/06/15																					
EX/1604720	HW/6	Groundwater	29/06/15																					
EX/1604721	B/6	Surface Water	29/06/15																					

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

**In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.**

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
	Analysis Subcontracted - <b>Note: due date may vary</b>



Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W201779

Customer      Envireau Water  
Site            Dissolved Gases in Waters  
Report No     W201779

Consignment No W90162  
Date Logged 30-Jun-2015

Report Due 13-Jul-2015

ID Number	Description	MethodID		WSLM3
		Matrix Type	Sampled	pH units
				✓
EX/1604716	WF/6A	Groundwater	29/06/15	
EX/1604717	WF/6B	Groundwater	29/06/15	
EX/1604718	ETF/6	Groundwater	29/06/15	
EX/1604719	TV/6	Groundwater	29/06/15	
EX/1604720	HW/6	Groundwater	29/06/15	
EX/1604721	B/6	Surface Water	29/06/15	

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

**In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.**

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
	Analysis Subcontracted - <b>Note: due date may vary</b>

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Where individual results are flagged see report notes for status.

# Report Notes

## Generic Notes

### Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### Waters Analysis

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup>@ 15°C

### Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

### Asbestos Analysis

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

**^** Sub-contracted analysis.

**\$\$** Unable to analyse due to the nature of the sample

**¶** Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

**¥** Results for guidance only due to possible interference

**&** Blank corrected result

**I.S** Insufficient sample to complete requested analysis

**I.S(g)** Insufficient sample to re-analyse, results for guidance only

**Intf** Unable to analyse due to interferences

**N.D** Not determined

**N.Det** Not detected

**N.F** No Flow

**NS** Information Not Supplied

**Req** Analysis requested, see attached sheets for results

**▯** Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** Dissolved Gasses in Waters  
**Report Number :** W20\_1779

## Water Analysis Test Certificate

Round 7

Our Ref: EXR/203106 (Ver. 2)

Your Ref: 1788

August 5, 2015



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Ms P Jenkinson  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Ms P Jenkinson

Dear Ms Jenkinson

**Sample Analysis - Dissolved Gasses in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

J Colbourne  
Project Co-ordinator  
01283 554547

# TEST REPORT



Report No. EXR/203106 (Ver. 2)

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

## Site: Dissolved Gasses in Waters

The 6 samples described in this report were registered for analysis by ESG on 24-Jul-2015. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 05-Aug-2015

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Pages 2 to 3)  
Table of TPH Texas banding (0.01) (Page 4)  
GC-FID Chromatograms (Pages 5 to 10)  
Analytical and Deviating Sample Overview (Pages 11 to 12)  
Table of Additional Report Notes (Page 13)  
Table of Method Descriptions (Page 14)  
Table of Report Notes (Page 15)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns

  
Managing Director  
Multi-Sector Services

Date of Issue: 05-Aug-2015

Tests marked '^' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.





			Units :		µg/l																	
			Method Codes :		DISGAS1																	
			Method Reporting Limits :		6																	
			UKAS Accredited :		No																	
LAB ID Number EX/	Client Sample Description	Sample Date	^Dissolved Methane																			
				1610807	WF/7	23-Jul-15 09:45	11															
				1610808	HW/7A	23-Jul-15 13:30	<6															
				1610809	ETF/7	23-Jul-15 12:10	<4															
				1610810	TV/7	23-Jul-15 15:00	2966															
				1610811	HW/7B	23-Jul-15 13:30	9															
				1610812	B/7	23-Jul-15 14:30																
				<div><div>ESG</div><div>Bretby Business Park, Ashby Road Burton-on-Trent, Staffordshire, DE15 0YZ Tel +44 (0) 1283 554400 Fax +44 (0) 1283 554422</div></div>				Client Name		Envireau Water						Sample Analysis						
								Contact		Ms P Jenkinson												
Dissolved Gasses in Waters								Date Printed		05-Aug-2015												
								Report Number		EXR/203106												
								Table Number		1												

## Total Petroleum Hydrocarbons (TPH) Carbon Ranges

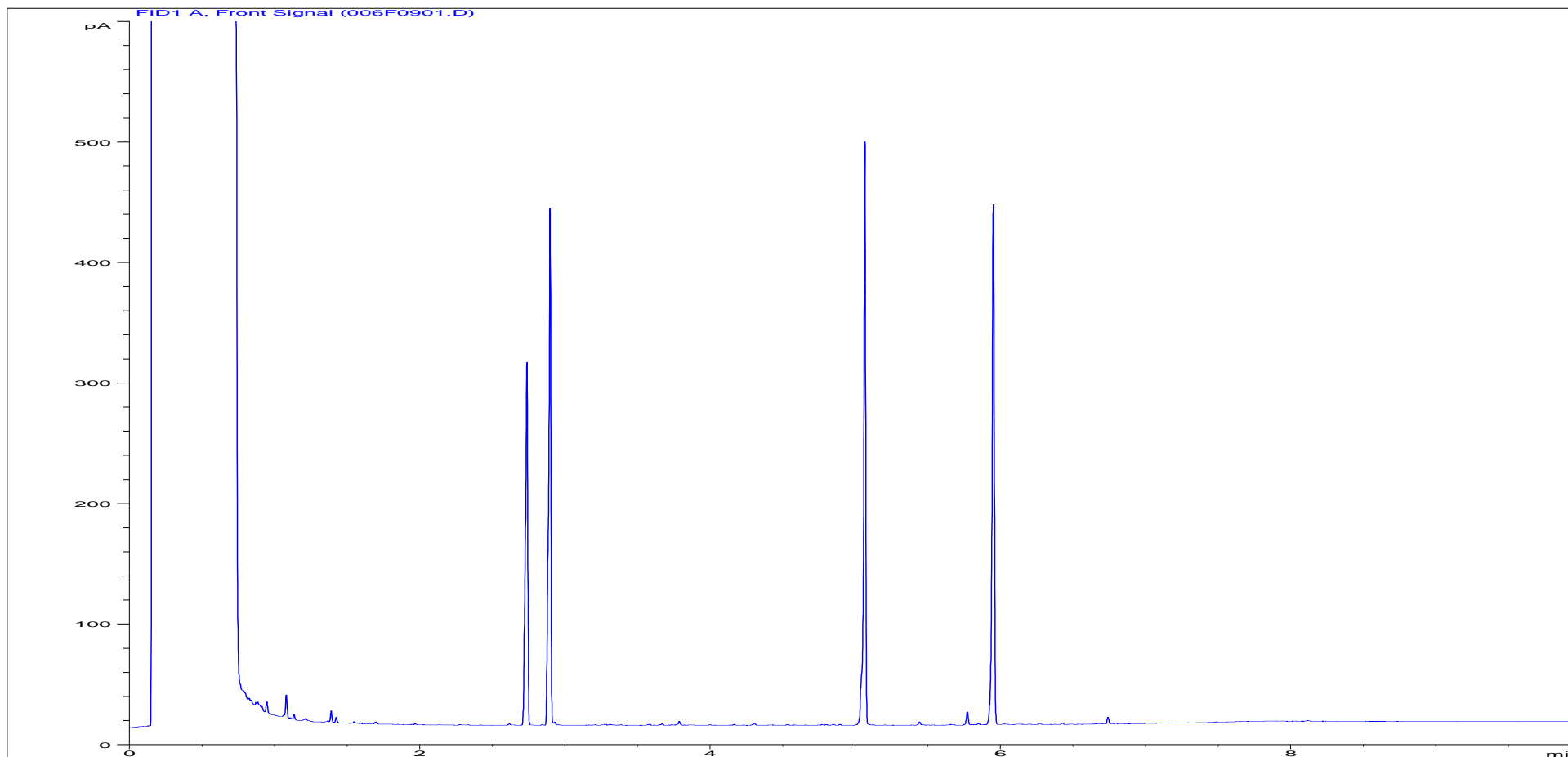
<b>Customer and Site Details:</b>	Envireau Water : Dissolved Gasses in Waters
<b>Job Number:</b>	W20_3106
<b>QC Batch Number:</b>	150527
<b>Directory:</b>	D:\TES\DATA\Y2015\080415TPH_GC15\080415 2015-08-04 16-56-35\011F1401.D
<b>Method:</b>	Bottle

**Matrix:** Water  
**Date Booked in:** 24-Jul-15  
**Date Extracted:** 04-Aug-15  
**Date Analysed:** 04-Aug-15, 20:38:57

\* Sample data with an asterisk are not UKAS accredited.

[illegible]

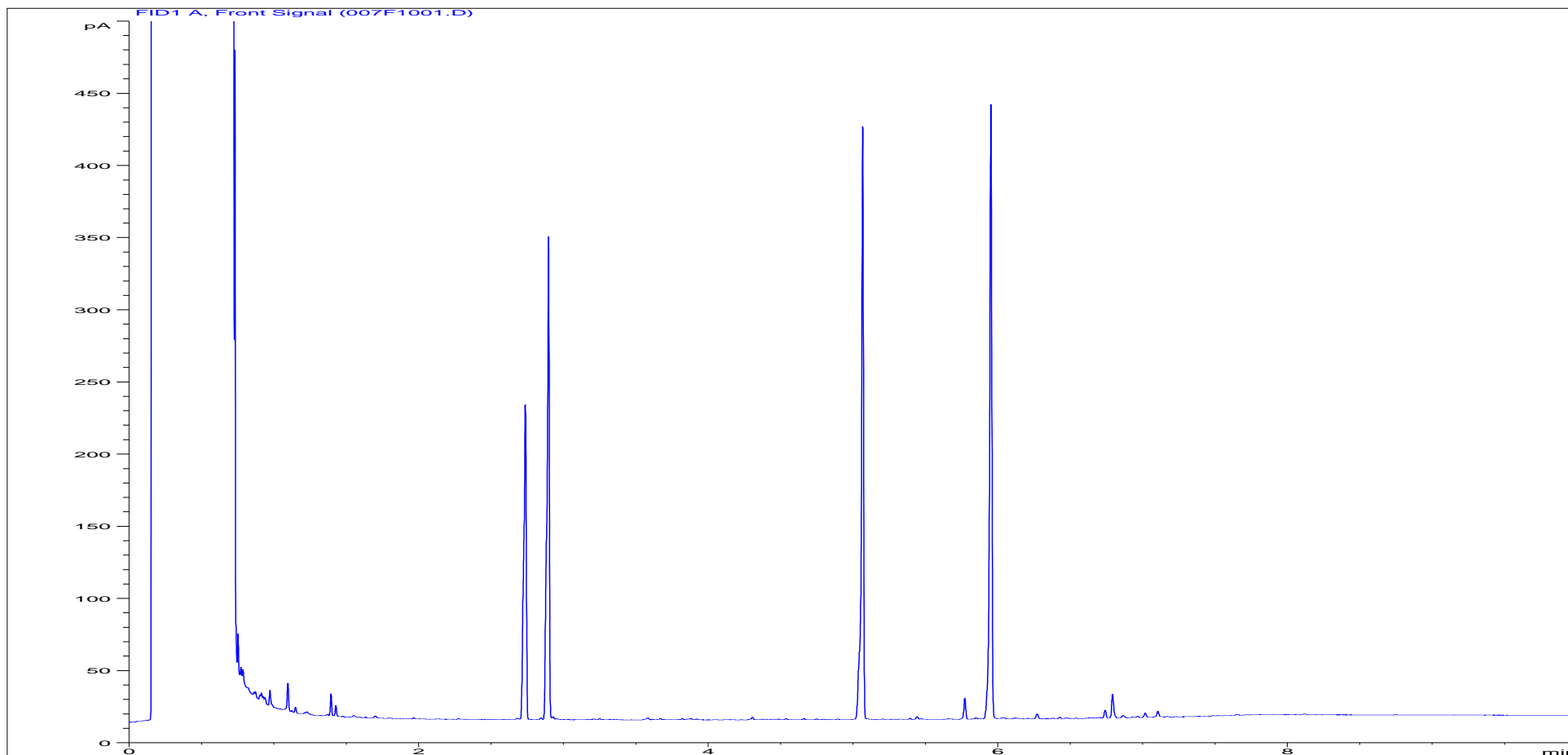
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1610807	<b>Job Number:</b>	W20_3106
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	WF/7
<b>Acquisition Date/Time:</b>	04-Aug-15, 19:14:11		
<b>Datafile:</b>	D:\TES\DATA\Y2015\080415TPH_GC15\080415 2015-08-04 16-56-35\006F0901.D		

Where individual results are flagged see report notes for status.

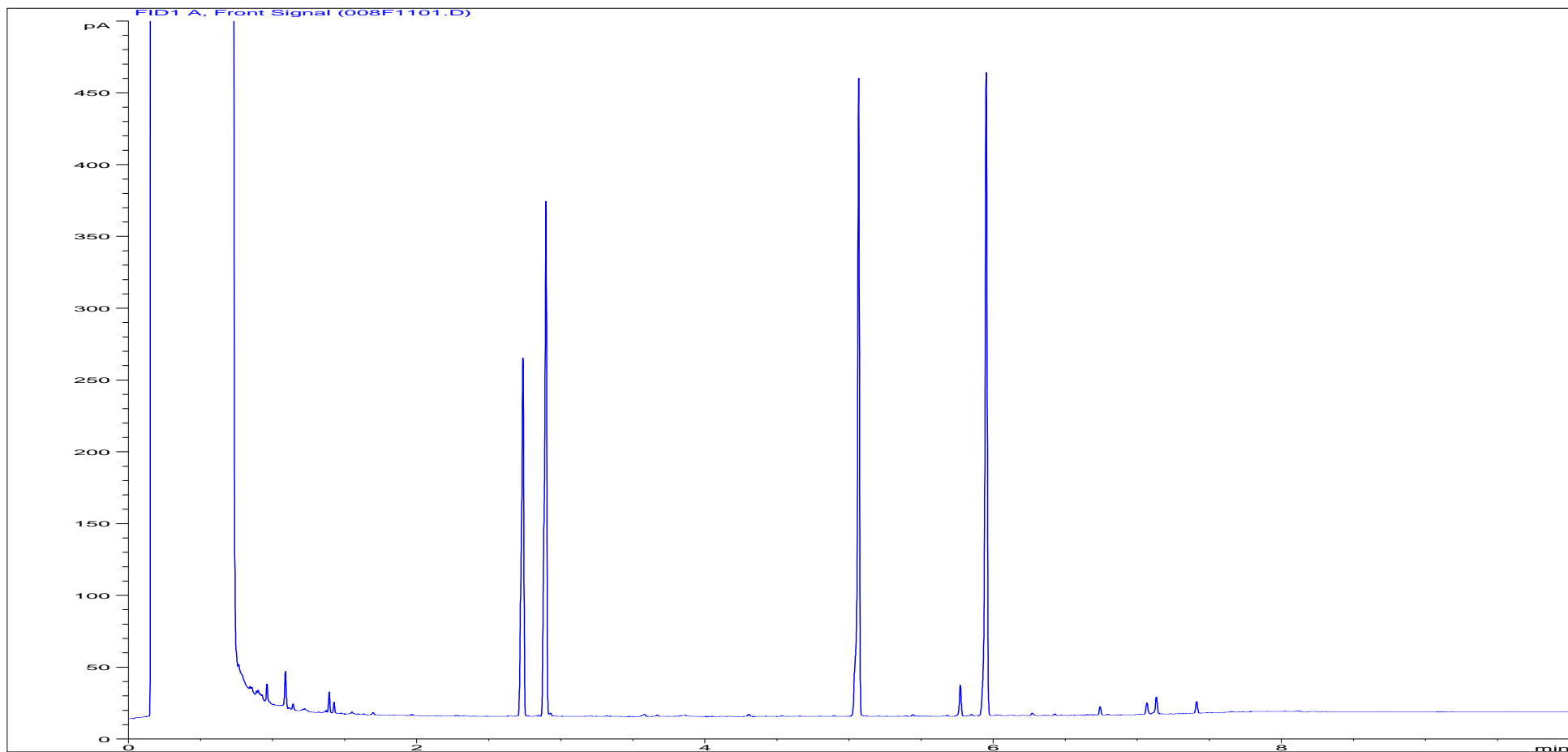
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1610808	<b>Job Number:</b>	W20_3106
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	HW/7A
<b>Acquisition Date/Time:</b>	04-Aug-15, 19:31:07		
<b>Datafile:</b>	D:\TES\DATA\Y2015\080415TPH_GC15\080415 2015-08-04 16-56-35\007F1001.D		

Where individual results are flagged see report notes for status.

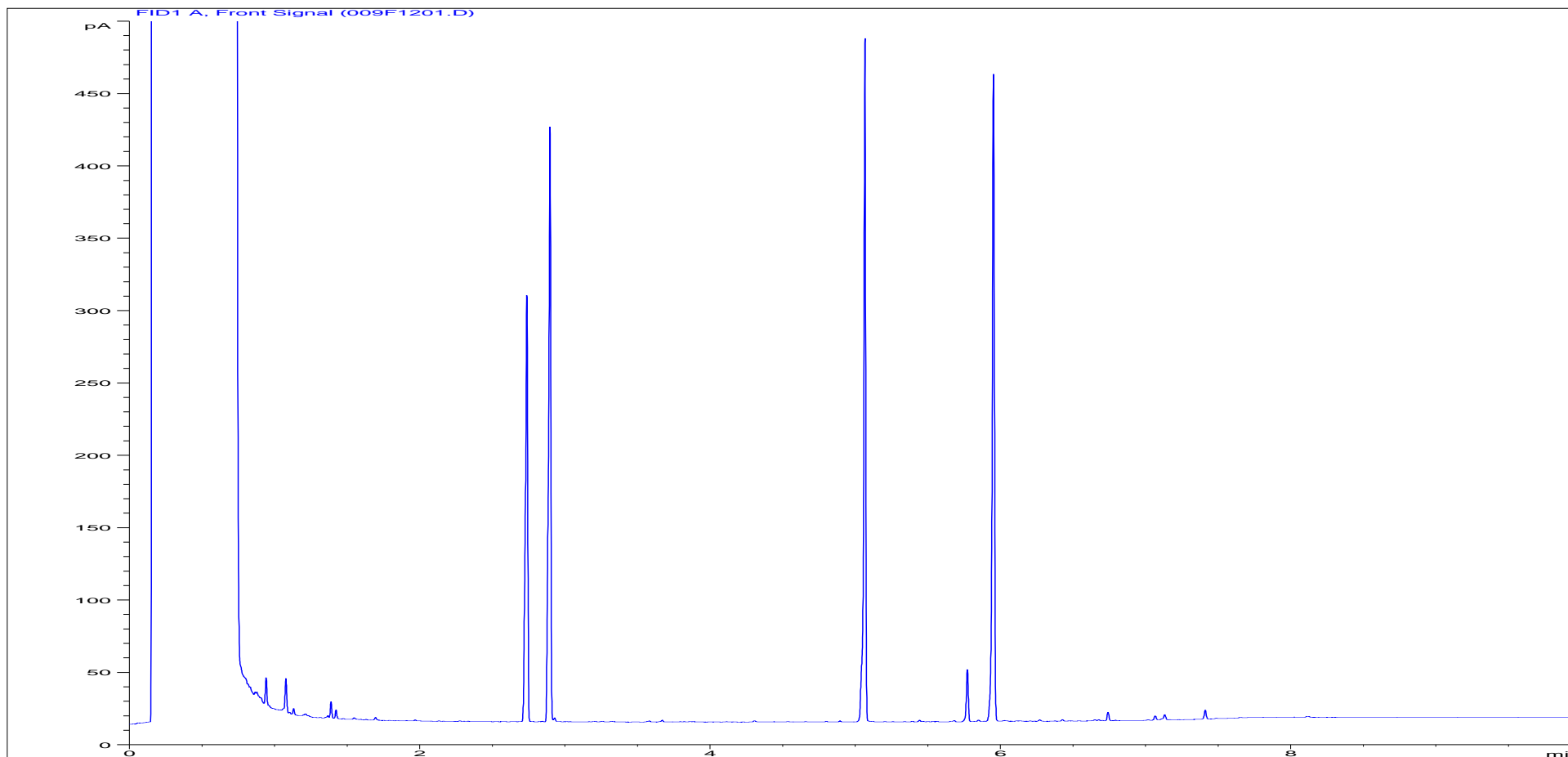
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1610809	<b>Job Number:</b>	W20_3106
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	ETF/7
<b>Acquisition Date/Time:</b>	04-Aug-15, 19:48:03		
<b>Datafile:</b>	D:\TES\DATA\Y2015\080415TPH_GC15\080415 2015-08-04 16-56-35\008F1101.D		

Where individual results are flagged see report notes for status.

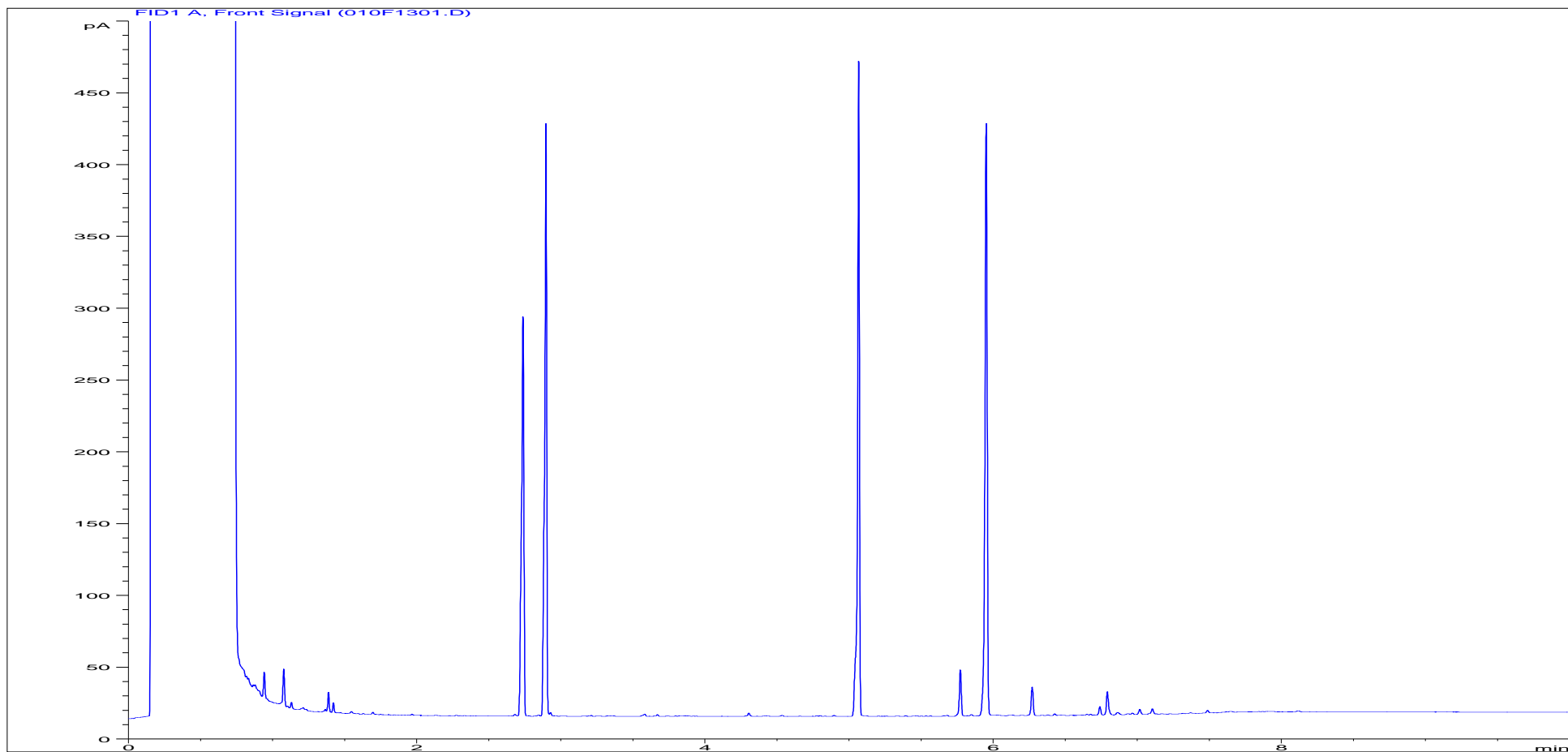
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1610810	<b>Job Number:</b>	W20_3106
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV/7
<b>Acquisition Date/Time:</b>	04-Aug-15, 20:04:58		
<b>Datafile:</b>	D:\TES\DATA\Y2015\080415TPH_GC15\080415 2015-08-04 16-56-35\009F1201.D		

Where individual results are flagged see report notes for status.

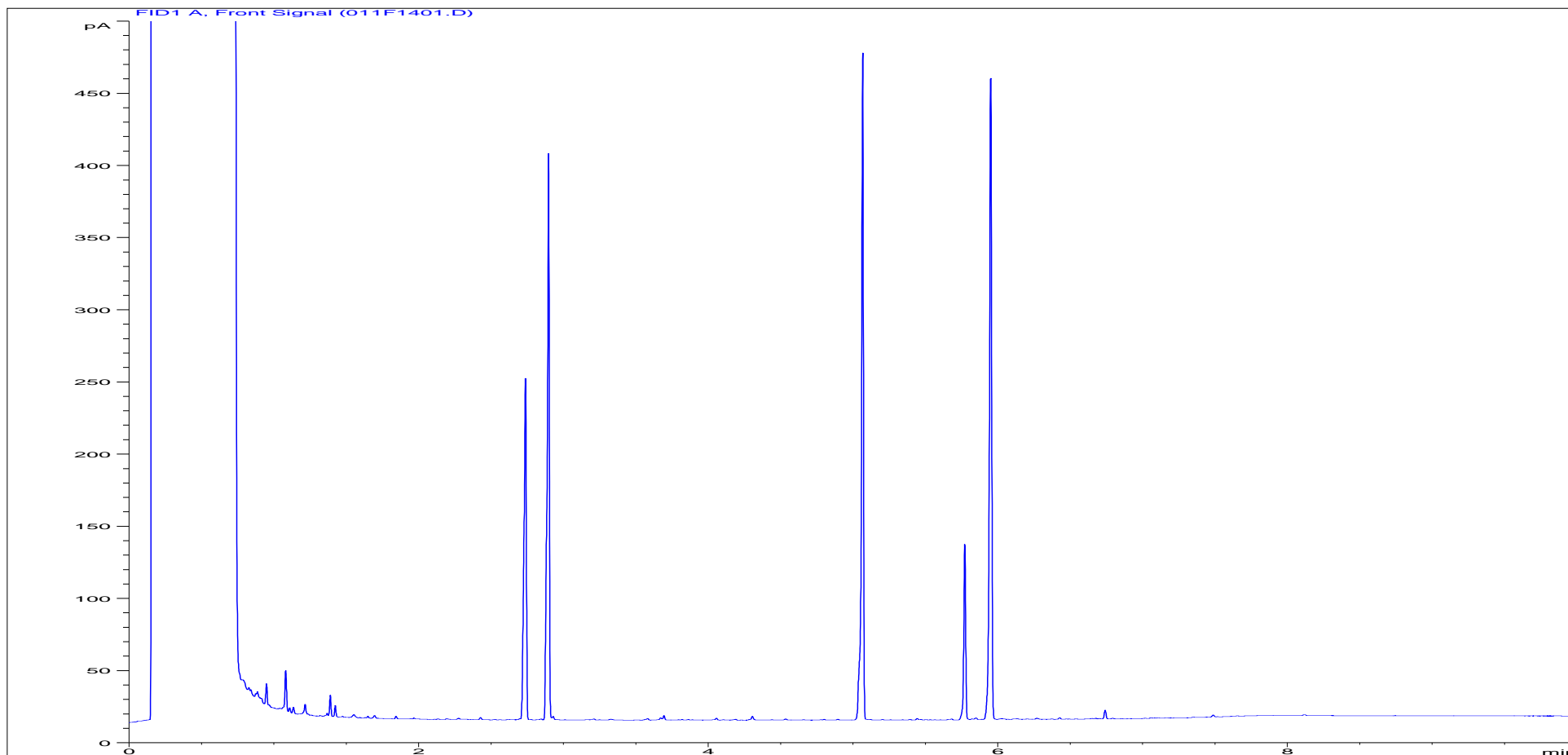
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1610811	<b>Job Number:</b>	W20_3106
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	HW/7B
<b>Acquisition Date/Time:</b>	04-Aug-15, 20:22:05		
<b>Datafile:</b>	D:\TES\DATA\Y2015\080415TPH_GC15\080415 2015-08-04 16-56-35\010F1301.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1610812	<b>Job Number:</b>	W20_3106
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	B/7
<b>Acquisition Date/Time:</b>	04-Aug-15, 20:38:57		
<b>Datafile:</b>	D:\TES\DATA\Y2015\080415TPH_GC15\080415 2015-08-04 16-56-35\011F1401.D		

Where individual results are flagged see report notes for status.



Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W203106

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W203106

Consignment No W91203  
Date Logged 24-Jul-2015

Report Due 06-Aug-2015

WSL/M3	pH units	✓																							
WSL/M27	Total Dissolved Solids																								
WSL/M2	Conductivity uS/cm @ 25C	✓																							
	Bicarbonate Alkalinity as CaCO3	✓																							
	Total Alkalinity as CaCO3	✓																							
	P Alkalinity as CaCO3	✓																							
WSL/M12	TPH GC	✓																							
TPH/FID	TPH Carbon Banding	✓																							
	Chloride as Cl (Kone)	✓																							
KONENS	Aluminium as Al (Dissolved) VAR																								
	Iron as Fe (Dissolved) VAR	✓																							
	Manganese as Mn (Dissolved) VAR	✓																							
	Potassium as K (Dissolved) VAR	✓																							
	Sodium as Na (Dissolved) VAR	✓																							
	Magnesium as Mg (Dissolved) VAR	✓																							
	Calcium as Ca (Dissolved) VAR	✓																							
	Total Sulphur as SO4 (Diss) VAR	✓																							
ICP/M17/AR		✓																							
DISGAS1	^Dissolved Methane																								
CUST SERV	Report B																								
MethodID	Sampled	Matrix Type																							
ID Number	Description																								
EX/1610807	WF/7	Groundwater	23/07/15																						
EX/1610808	HW/7A	Groundwater	23/07/15																						
EX/1610809	ETF/7	Groundwater	23/07/15																						
EX/1610810	TV/7	Groundwater	23/07/15																						
EX/1610811	HW/7B	Groundwater	23/07/15																						
EX/1610812	B/7	Surface Water	23/07/15																						

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
	Analysis Subcontracted - <b>Note: due date may vary</b>

Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W203106

Customer      Envireau Water  
Site            Dissolved Gasses in Waters  
Report No     W203106

Consignment No W91203  
Date Logged 24-Jul-2015

Report Due 06-Aug-2015

ID Number	Description	MethodID		WSLM3
		Matrix Type	Sampled	pH units
				✓
EX/1610807	WF/7	Groundwater	23/07/15	
EX/1610808	HW/7A	Groundwater	23/07/15	
EX/1610809	ETF/7	Groundwater	23/07/15	
EX/1610810	TV/7	Groundwater	23/07/15	
EX/1610811	HW/7B	Groundwater	23/07/15	
EX/1610812	B/7	Surface Water	23/07/15	

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

**In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.**

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
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E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
	Analysis Subcontracted - <b>Note: due date may vary</b>

# Additional Report Notes

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
TPHFID	EX1610807 EX1610808 EX1610809 EX1610810 EX1610812	The Primary process control result associated with this Test has not wholly met the requirements of the Laboratory Quality Management System (QMS). The Laboratory believes that the validity of the data has not been affected but in line with our QMS policy we have removed accreditation from 12-16 . These circumstances should be taken into consideration when utilising the data.

Where individual results are flagged see report notes for status.

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Where individual results are flagged see report notes for status.

# Report Notes

## Generic Notes

### Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### Waters Analysis

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup>@ 15°C

### Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

### Asbestos Analysis

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

^ Sub-contracted analysis.

\$\$ Unable to analyse due to the nature of the sample

¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

¥ Results for guidance only due to possible interference

& Blank corrected result

I.S Insufficient sample to complete requested analysis

I.S(g) Insufficient sample to re-analyse, results for guidance only

Intf Unable to analyse due to interferences

N.D Not determined

N.Det Not detected

N.F No Flow

NS Information Not Supplied

Req Analysis requested, see attached sheets for results

▮ Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** Dissolved Gasses in Waters  
**Report Number :** W20\_3106

## Water Analysis Test Certificate

Round 8

Our Ref: EXR/204697 (Ver. 2)

Your Ref:

September 15, 2015



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Ms P Jenkinson  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Ms P Jenkinson

Dear Ms Jenkinson

**Sample Analysis - Dissolved Gasses in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

A handwritten signature in black ink, appearing to be 'L Thompson', followed by a horizontal line.

L Thompson  
Project Co-ordinator  
01283 554467



# TEST REPORT



Report No. EXR/204697 (Ver. 2)

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

## Site: Dissolved Gasses in Waters

The 8 samples described in this report were registered for analysis by ESG on 22-Aug-2015. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 15-Sep-2015

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Pages 2 to 3)  
Table of TPH Texas banding (0.01) (Page 4)  
GC-FID Chromatograms (Pages 5 to 12)  
Subcontracted Analysis Reports (Page 13)  
*The accreditation status of subcontracted analysis is displayed on the appended subcontracted analysis reports.*  
Analytical and Deviating Sample Overview (Pages 14 to 15)  
Table of Method Descriptions (Page 16)  
Table of Report Notes (Page 17)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns

  
Managing Director  
Multi-Sector Services


Date of Issue: 15-Sep-2015

Tests marked 'N' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

ESG accepts no responsibility for any sampling not carried out by our personnel.



Units : $\mu\text{g/l}$																				
Method Codes : DISGAS1																				
Method Reporting Limits : 6																				
UKAS Accredited :																				
LAB ID Number EX/	Client Sample Description	Sample Date	^Dissolved Methane																	
1618603	WF/8	20-Aug-15 14:00	13																	
1618604	BH/8	20-Aug-15 17:30	9																	
1618605	ETF/81	20-Aug-15 14:45	<4																	
1618606	D/8U	20-Aug-15 15:45																		
1618607	D/8D	20-Aug-15 15:15																		
1618608	TV/8	20-Aug-15 16:45	<4																	
1618609	ETF/8B	20-Aug-15 14:45	<4																	
1618610	DW/8	20-Aug-15 17:00																		
 <p>Bretby Business Park, Ashby Road Burton-on-Trent, Staffordshire, DE15 0YZ Tel +44 (0) 1283 554400 Fax +44 (0) 1283 554422</p>			Client Name	Envireau Water								Sample Analysis								
			Contact	Ms P Jenkinson																
			Dissolved Gasses in Waters								Date Printed	15-Sep-2015								
											Report Number	EXR/204697								
											Table Number	1								

## Total Petroleum Hydrocarbons (TPH) Carbon Ranges

<b>Customer and Site Details:</b>	Envireau Water : Dissolved Gasses in Waters
<b>Job Number:</b>	W20_4697
<b>QC Batch Number:</b>	150593
<b>Directory:</b>	D:\TES\DATA\Y2013\02\090115TPH_GC3\063B1501.D
<b>Method:</b>	Bottle

**Matrix:** Water  
**Date Booked in:** 22-Aug-15  
**Date Extracted:** 29-Aug-15  
**Date Analysed:** 01-Sep-15

\* Sample data with an asterisk are not UKAS accredited.

[illegible]

493 84  
15-166414

Rec: 24/8/15

**W204697 Water -- ^Dissolved Methane g**

Customer: Envireau Water  
Section: Dissolved Gasses in Waters  
Anal Type: shoe  
Method No: DISGAS1  
UKAS Accredited: No

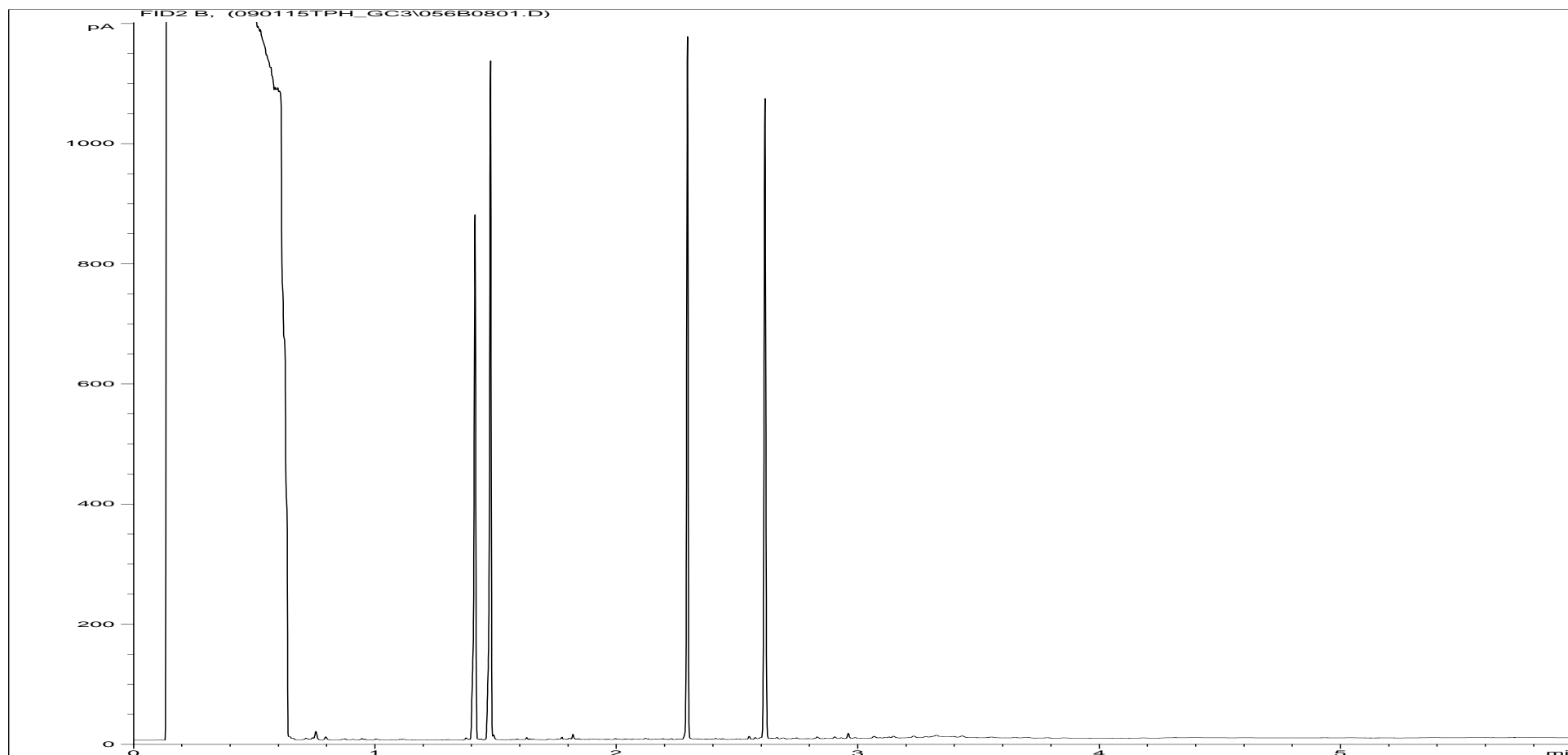
^Dissolved Methane g  
Report No: W/EXR/204697  
Analysis Due: 26/08/15

Standard

ID Number	Analyte	Result	$\mu\text{g/L}^{-1}$
<b>EX/1618603</b> Groundwater	<b>^Dissolved Methane g</b> WF/8		13
<b>EX/1618604</b> Groundwater	<b>^Dissolved Methane g</b> BH/8		9
<b>EX/1618605</b> Groundwater	<b>^Dissolved Methane g</b> ETF/81		< 4
<b>EX/1618608</b> Groundwater	<b>^Dissolved Methane g</b> TV/8		D.B. 24/8 <del>24</del> < 4
<b>EX/1618609</b> Groundwater	<b>^Dissolved Methane g</b> ETF/8B		< 4

QC Batch		Wt/Vol		Prep'd By		Date	
Filename		Final Vol		Analysed By	<i>D. Byrrell</i>	Date	26/8/15
Filename		Units	$\mu\text{g/l}$	Authorised By		Date	
Booked in	22/08/15			Authorised By		Date	
Dilution :				LIMS Entry		Date	
Note: * Denotes Dilution :							Page 1 of 1

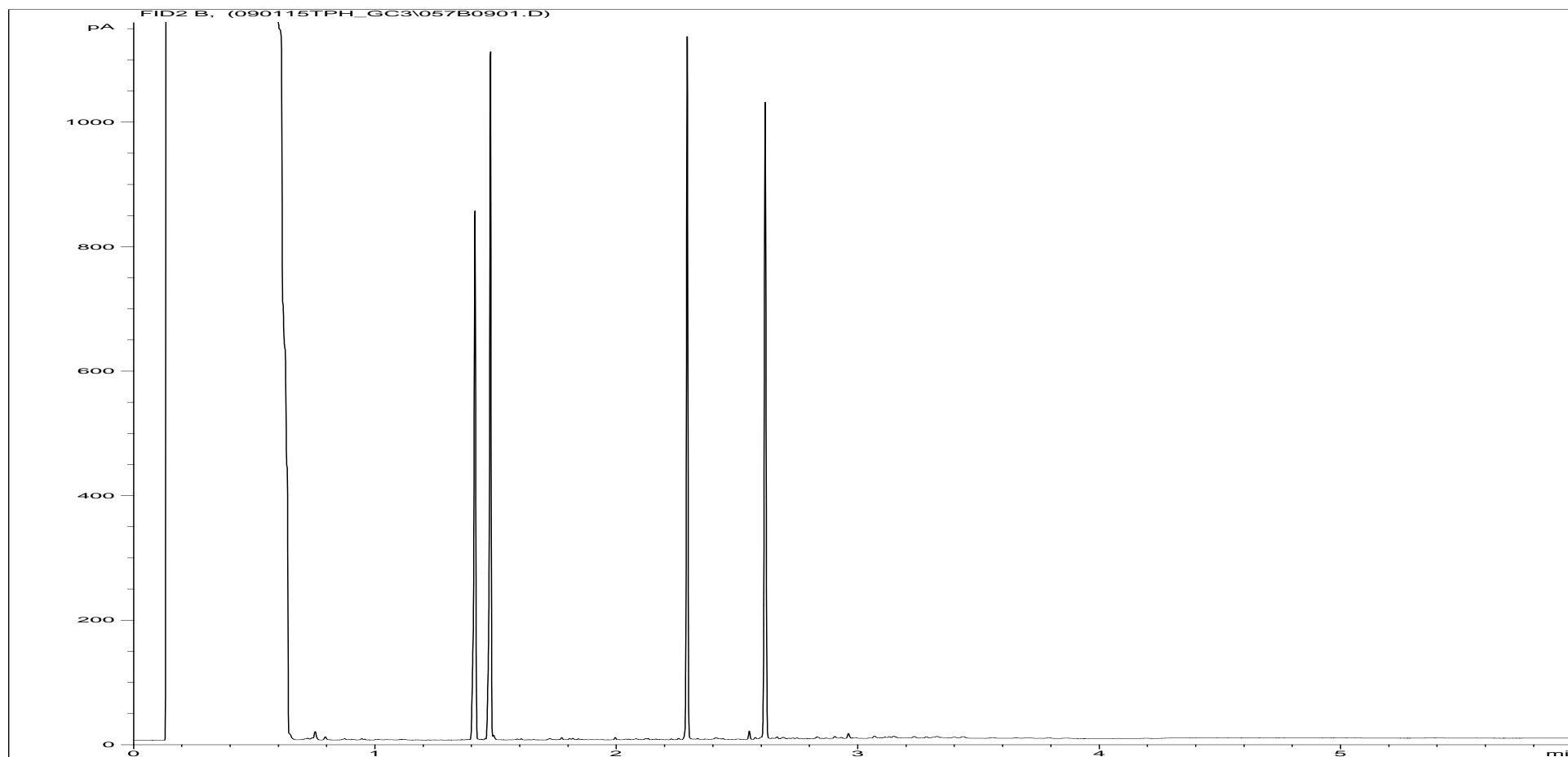
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1618603	<b>Job Number:</b>	W20_4697
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	WF/8
<b>Acquisition Date/Time:</b>	01-Sep-15		
<b>Datafile:</b>	D:\TES\DATA\Y2013\02\090115TPH_GC3\056B0801.D		

Where individual results are flagged see report notes for status.

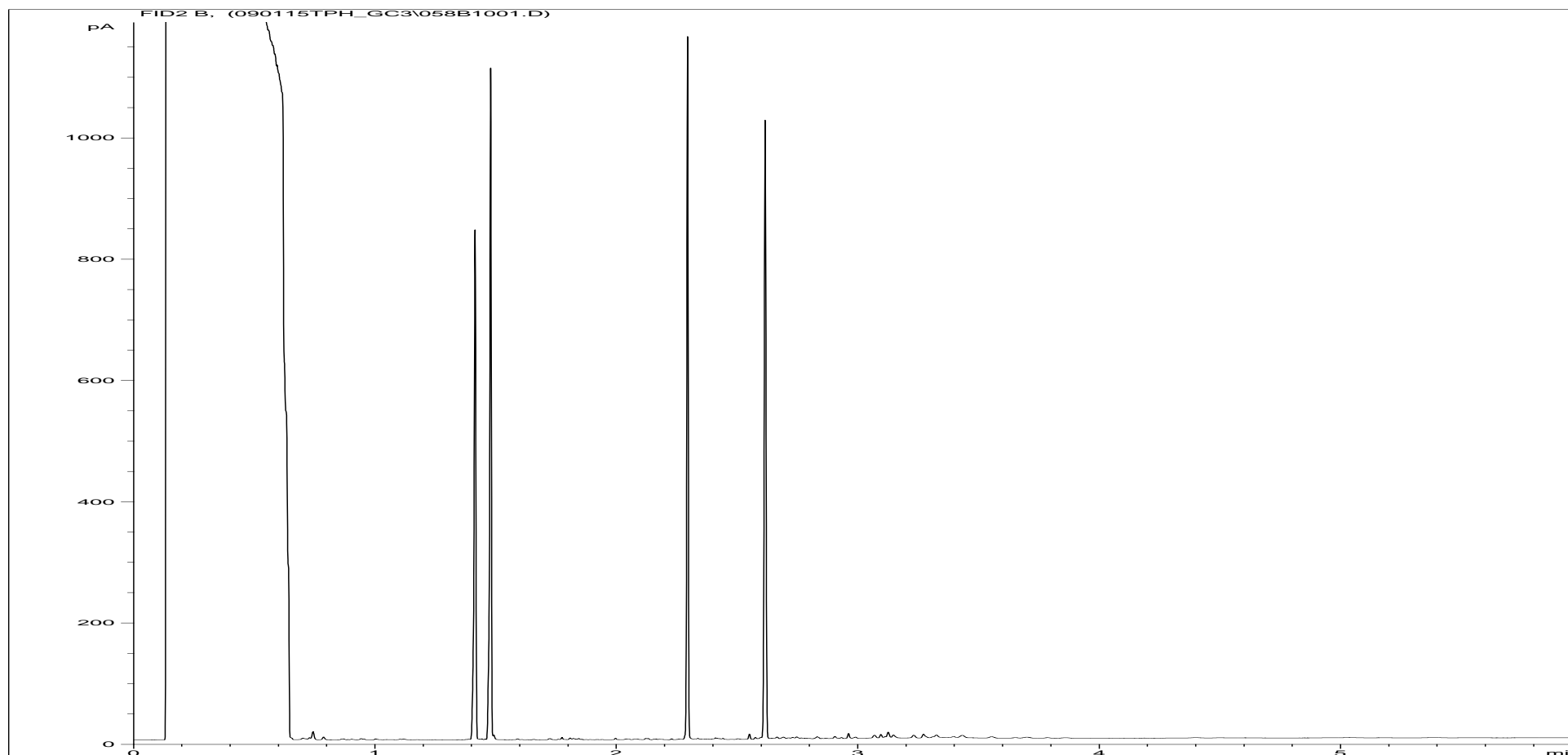
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1618604	<b>Job Number:</b>	W20_4697
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	BH/8
<b>Acquisition Date/Time:</b>	01-Sep-15		
<b>Datafile:</b>	D:\TES\DATA\Y2013\02\090115TPH_GC3\057B0901.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID

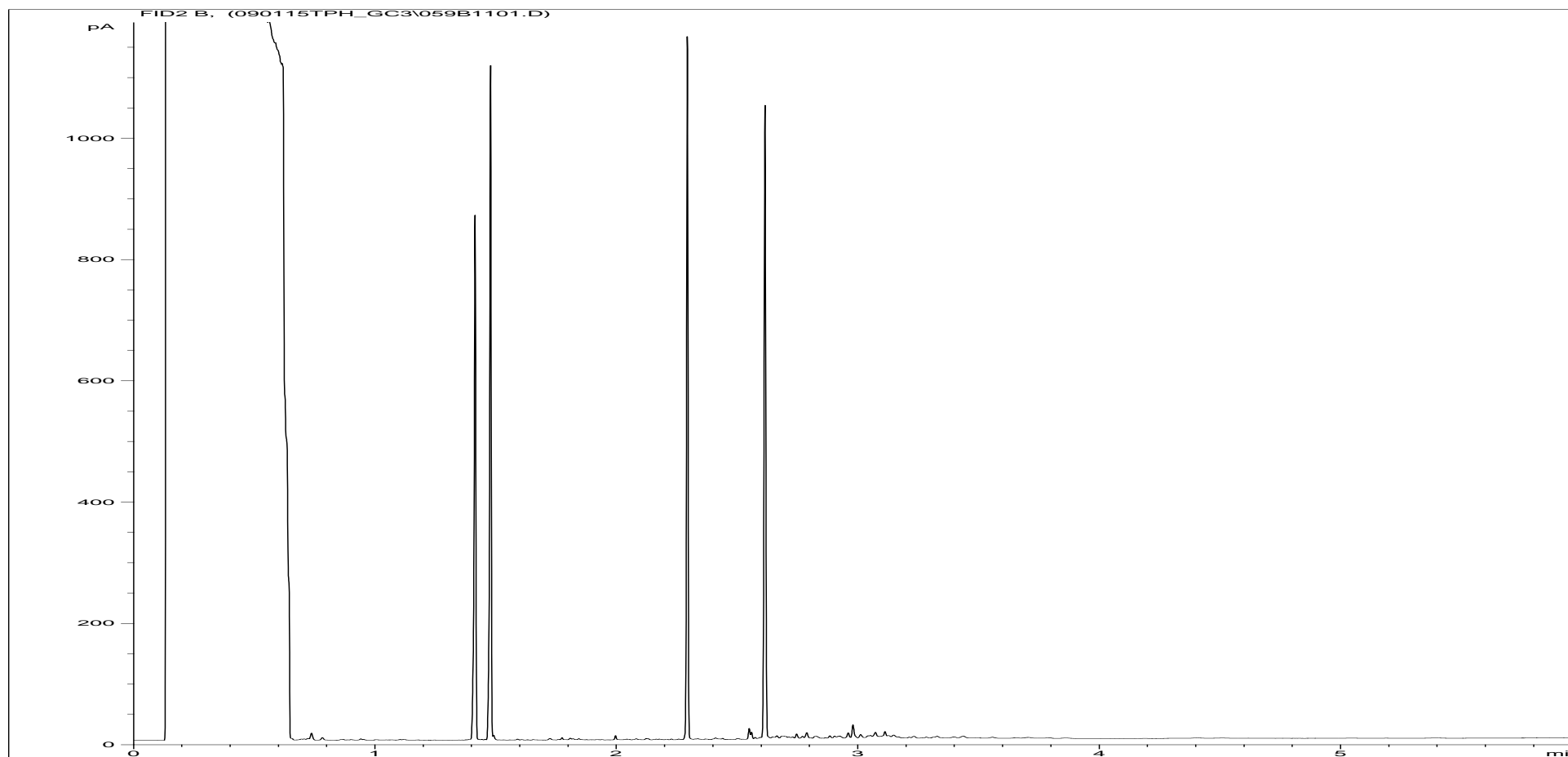


<b>Sample ID:</b>	EX1618605	<b>Job Number:</b>	W20_4697
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	ETF/81
<b>Acquisition Date/Time:</b>	01-Sep-15		
<b>Datafile:</b>	D:\TES\DATA\Y2013\02\090115TPH_GC3\058B1001.D		

Where individual results are flagged see report notes for status.



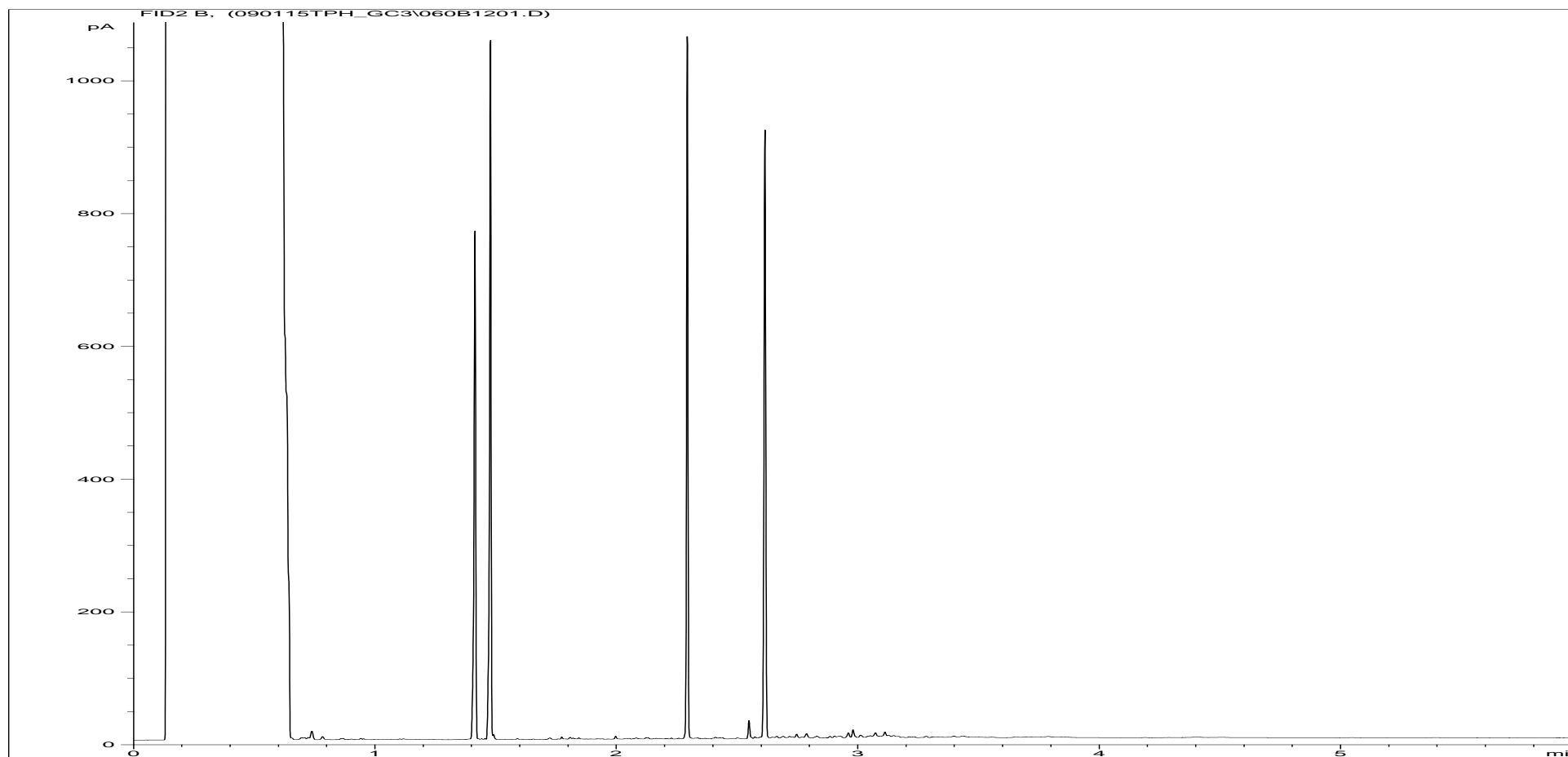
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1618606	<b>Job Number:</b>	W20_4697
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	D/8U
<b>Acquisition Date/Time:</b>	01-Sep-15		
<b>Datafile:</b>	D:\TES\DATA\Y2013\02\090115TPH_GC3\059B1101.D		

Where individual results are flagged see report notes for status.

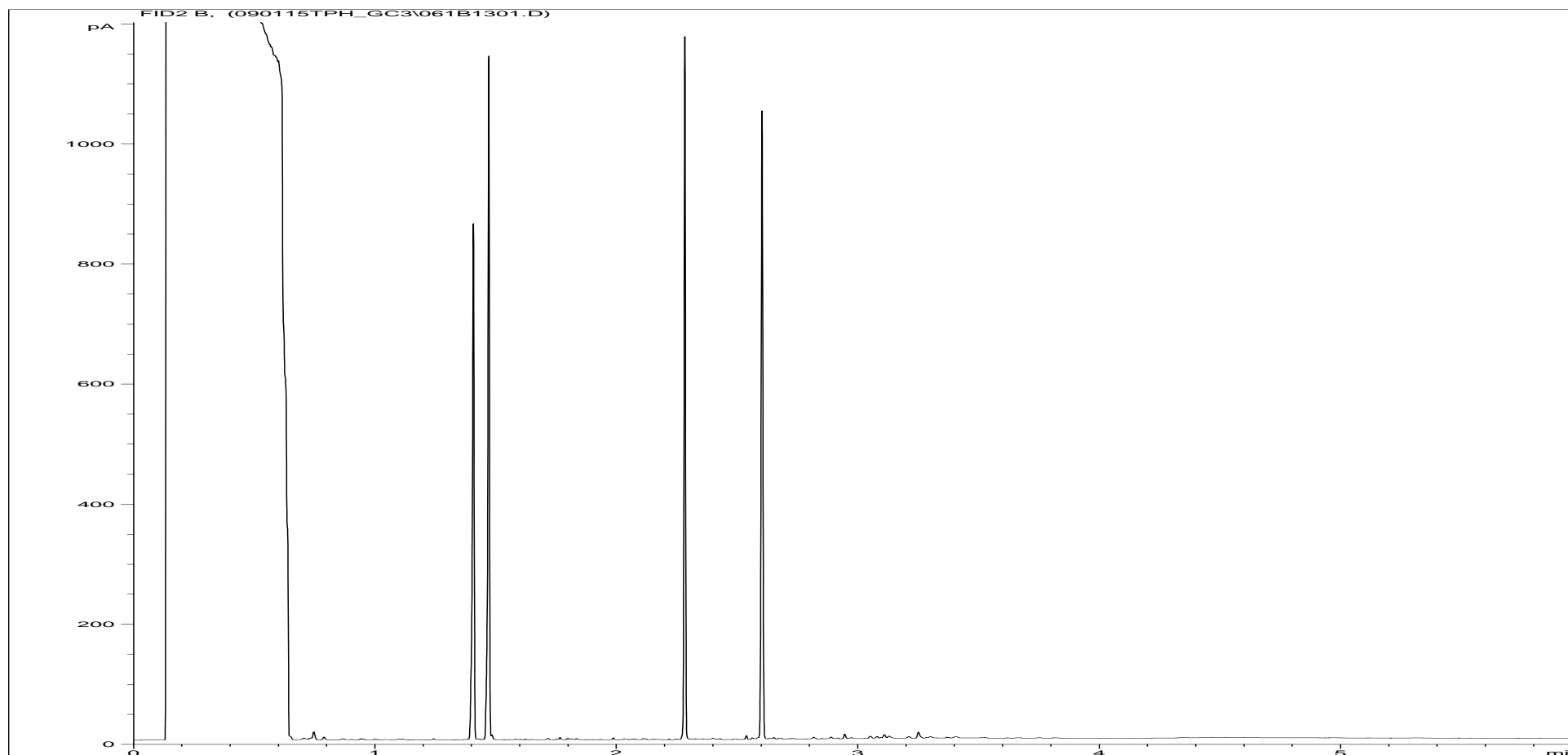
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1618607	<b>Job Number:</b>	W20_4697
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	D/8D
<b>Acquisition Date/Time:</b>	01-Sep-15		
<b>Datafile:</b>	D:\TES\DATA\Y2013\02\090115TPH_GC3\060B1201.D		

Where individual results are flagged see report notes for status.

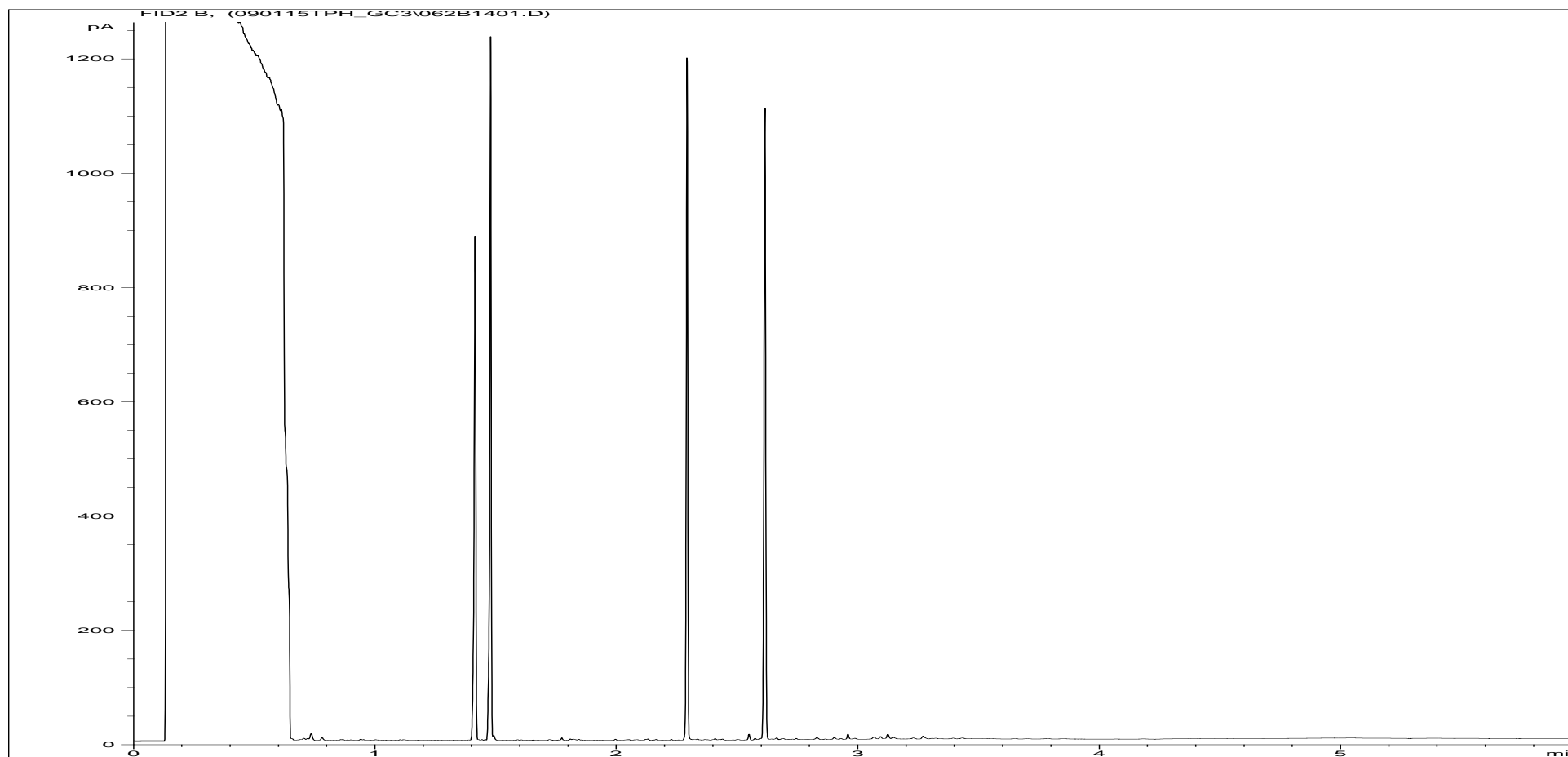
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1618608	<b>Job Number:</b>	W20_4697
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	TV/8
<b>Acquisition Date/Time:</b>	01-Sep-15		
<b>Datafile:</b>	D:\TES\DATA\Y2013\02\090115TPH_GC3\061B1301.D		

Where individual results are flagged see report notes for status.

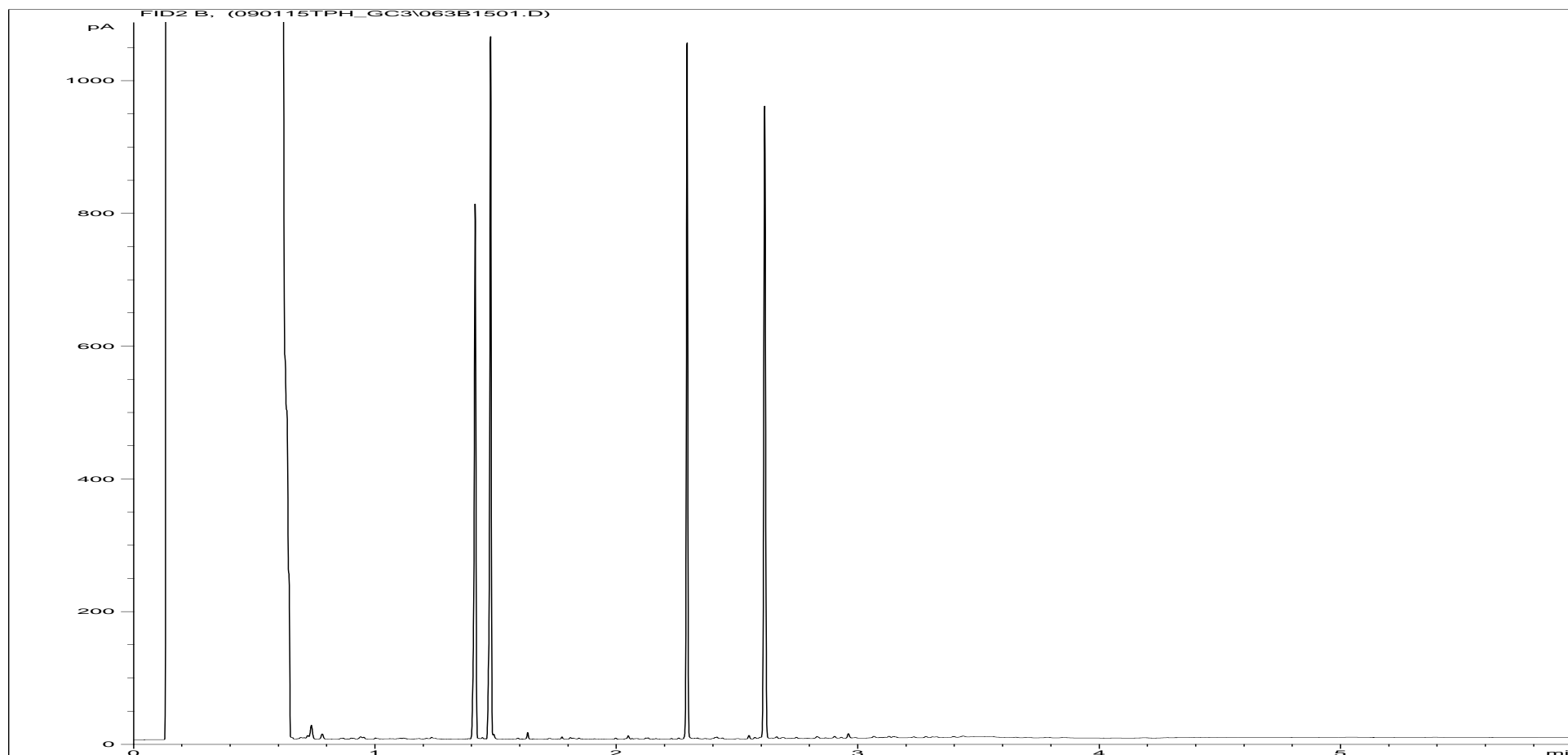
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1618609	<b>Job Number:</b>	W20_4697
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	5UL_RUNF.M	<b>Client Sample Ref:</b>	ETF/8B
<b>Acquisition Date/Time:</b>	01-Sep-15		
<b>Datafile:</b>	D:\TES\DATA\Y2013\02\090115TPH_GC3\062B1401.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1618610	Job Number:	W20_4697
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	5UL_RUNF.M	Client Sample Ref:	DW/8
Acquisition Date/Time:	01-Sep-15		
Datafile:	D:\TES\DATA\Y2013\02\090115TPH_GC3\063B1501.D		

Where individual results are flagged see report notes for status.

CustomerEnvireau Water  
SiteDissolved Gasses in Waters  
Report NoW204697

Consignment No W92461  
Date Logged 22-Aug-2015  
Report Due 07-Sep-2015

WSLM3	pH units	✓																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																</
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Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key

AThe sample was received in an inappropriate container for this analysis  
BThe sample was received without the correct preservation for this analysis  
CHeadspace present in the sample container  
DThe sampling date was not supplied so holding time may be compromised - applicable to all analysis  
ESample processing did not commence within the appropriate holding time  
FSample processing did not commence within the appropriate handling time

Requested Analysis Key

■Analysis Required  
■Analysis dependant upon trigger result - Note: due date may be affected if triggered  
□No analysis scheduled  
^Analysis Subcontracted - Note: due date may vary

## Sample Analysis

## ESG Environmental Chemistry Analytical and Deviating Sample Overview

W204697

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W204697

Consignment No W92461  
Date Logged 22-Aug-2015

Report Due 07-Sep-2015

ID Number	Description	MethodID		WSLM3
		Matrix Type	Sampled	pH units
				✓
EX/1618603	WF/8	Groundwater	20/08/15	
EX/1618604	BH/8	Groundwater	20/08/15	
EX/1618605	ETF/81	Groundwater	20/08/15	
EX/1618606	D/8U	Surface Water	20/08/15	
EX/1618607	D/8D	Surface Water	20/08/15	
EX/1618608	TV/8	Groundwater	20/08/15	
EX/1618609	ETF/8B	Groundwater	20/08/15	
EX/1618610	DW/8	Surface Water	20/08/15	

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

**In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.**

### Deviating Sample Key

- A The sample was received in an inappropriate container for this analysis
- B The sample was received without the correct preservation for this analysis
- C Headspace present in the sample container
- D The sampling date was not supplied so holding time may be compromised - applicable to all analysis
- E Sample processing did not commence within the appropriate holding time
- F Sample processing did not commence within the appropriate handling time

### Requested Analysis Key

- Analysis Required
- Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
- No analysis scheduled
- ^ Analysis Subcontracted - **Note: due date may vary**

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe



# Report Notes

## Generic Notes

### Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### Waters Analysis

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup> @ 15°C

### Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

### Asbestos Analysis

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

**^** Sub-contracted analysis.

**\$\$** Unable to analyse due to the nature of the sample

**¶** Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

**¥** Results for guidance only due to possible interference

**&** Blank corrected result

**I.S** Insufficient sample to complete requested analysis

**I.S(g)** Insufficient sample to re-analyse, results for guidance only

**Intf** Unable to analyse due to interferences

**N.D** Not determined

**N.Det** Not detected

**N.F** No Flow

**NS** Information Not Supplied

**Req** Analysis requested, see attached sheets for results

**p** Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** Dissolved Gasses in Waters  
**Report Number :** W20\_4697

## Water Analysis Test Certificate

Round 9

Our Ref: EXR/206614 (Ver. 1)

Your Ref:

October 2, 2015



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Armelle Bonneton  
Envireau Ltd  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Armelle Bonneton

Dear Armelle Bonneton

**Sample Analysis - Dissolved Gasses in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

A handwritten signature in black ink, appearing to read 'D Simpson', written over a horizontal line.

D Simpson  
Project Co-ordinator  
01283 554458

# TEST REPORT



Report No. EXR/206614 (Ver. 1)

Envireau Ltd  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

## Site: Dissolved Gasses in Waters

The 9 samples described in this report were registered for analysis by ESG on 26-Sep-2015. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 02-Oct-2015

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Pages 2 to 3)  
Table of TPH Texas banding (0.01) (Page 4)  
GC-FID Chromatograms (Pages 5 to 13)  
Subcontracted Analysis Reports (Page 14)  
*The accreditation status of subcontracted analysis is displayed on the appended subcontracted analysis reports.*  
Analytical and Deviating Sample Overview (Pages 15 to 16)  
Table of Method Descriptions (Page 17)  
Table of Report Notes (Page 18)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns

  
Managing Director  
Multi-Sector Services

Date of Issue: 02-Oct-2015

Tests marked 'N' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.





## Total Petroleum Hydrocarbons (TPH) Carbon Ranges

**Customer and Site Details:** Envireau Ltd : Dissolved Gasses in Waters  
**Job Number:** W20\_6614  
**QC Batch Number:** 150668  
**Directory:** D:\TES\DATA\Y2015\100115TPH\_GC15\100115 2015-10-01 16-58-11\064B1901.D  
**Method:** Bottle

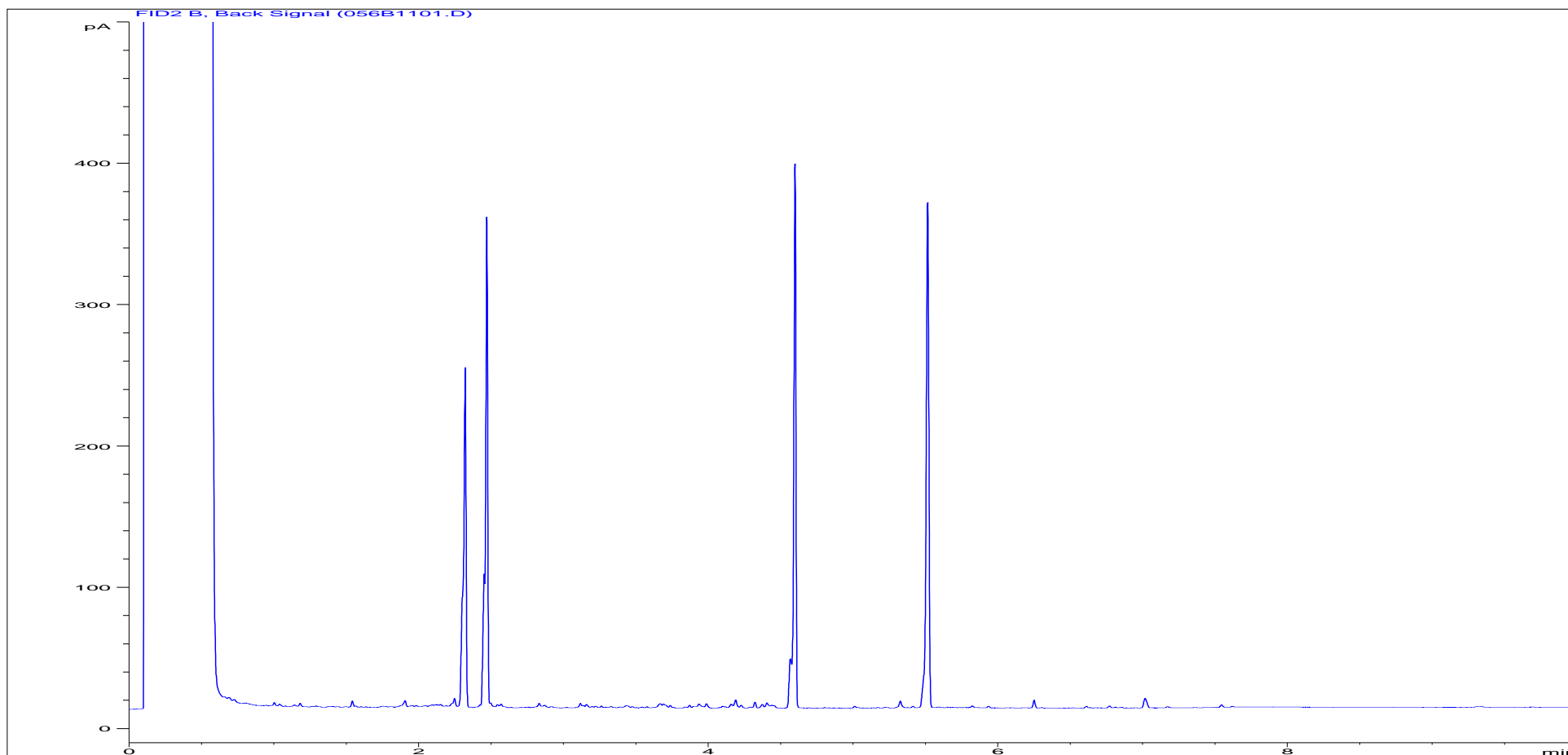
**Matrix:** Water  
**Date Booked in:** 26-Sep-15  
**Date Extracted:** 01-Oct-15  
**Date Analysed:** 01-Oct-15, 22:07:44

**\* Sample data with an asterisk are not UKAS accredited.**

[illegible]



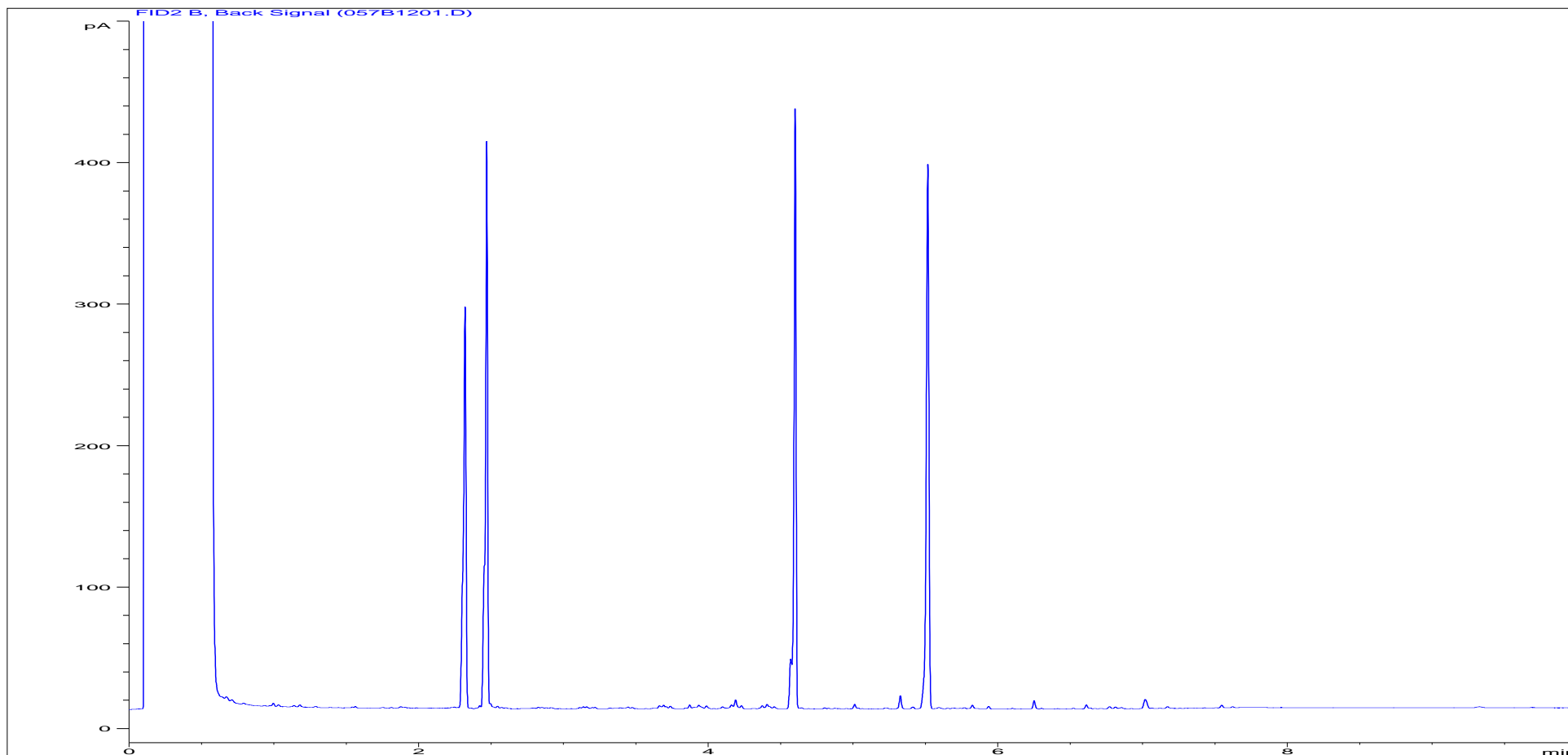
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1627243	<b>Job Number:</b>	W20_6614
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Ltd
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	WF/9
<b>Acquisition Date/Time:</b>	01-Oct-15, 19:52:56		
<b>Datafile:</b>	D:\TES\DATA\Y2015\100115TPH_GC15\100115 2015-10-01 16-58-11\056B1101.D		

Where individual results are flagged see report notes for status.

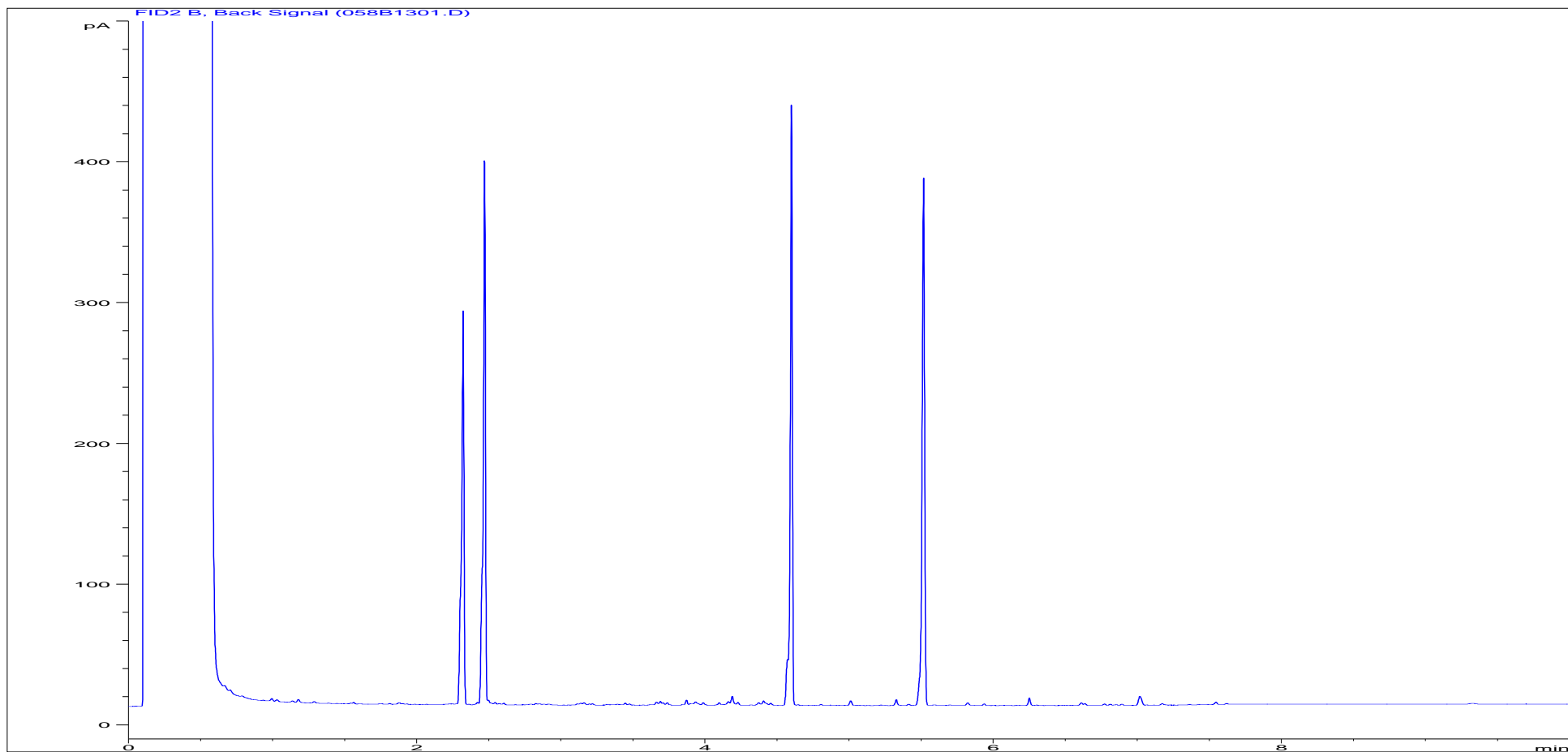
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1627244	<b>Job Number:</b>	W20_6614
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Ltd
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	HW/9
<b>Acquisition Date/Time:</b>	01-Oct-15, 20:09:47		
<b>Datafile:</b>	D:\TES\DATA\Y2015\100115TPH_GC15\100115 2015-10-01 16-58-11\057B1201.D		

Where individual results are flagged see report notes for status.

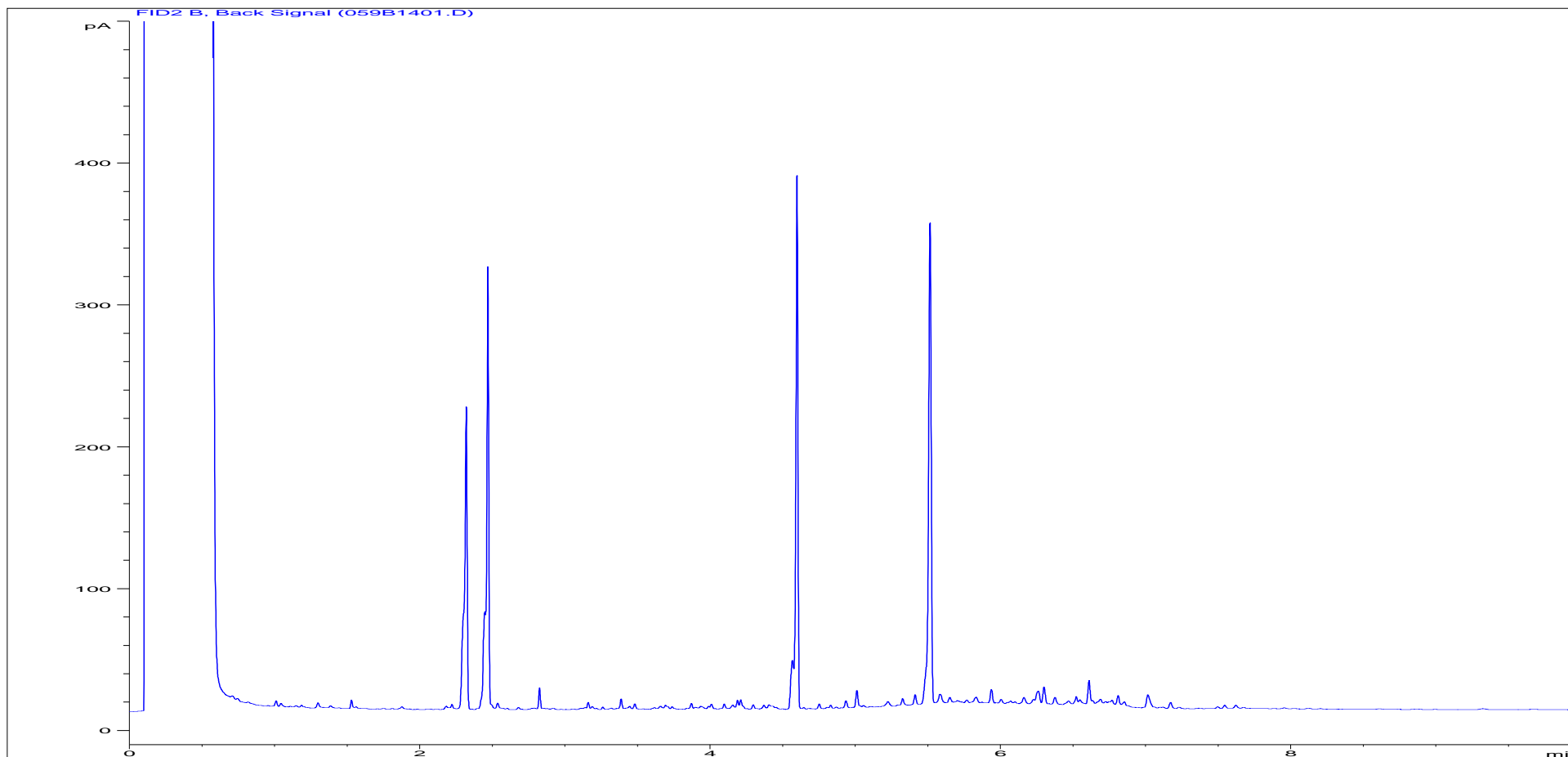
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1627245	<b>Job Number:</b>	W20_6614
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Ltd
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	ETF/9
<b>Acquisition Date/Time:</b>	01-Oct-15, 20:26:45		
<b>Datafile:</b>	D:\TES\DATA\Y2015\100115TPH_GC15\100115 2015-10-01 16-58-11\058B1301.D		

Where individual results are flagged see report notes for status.

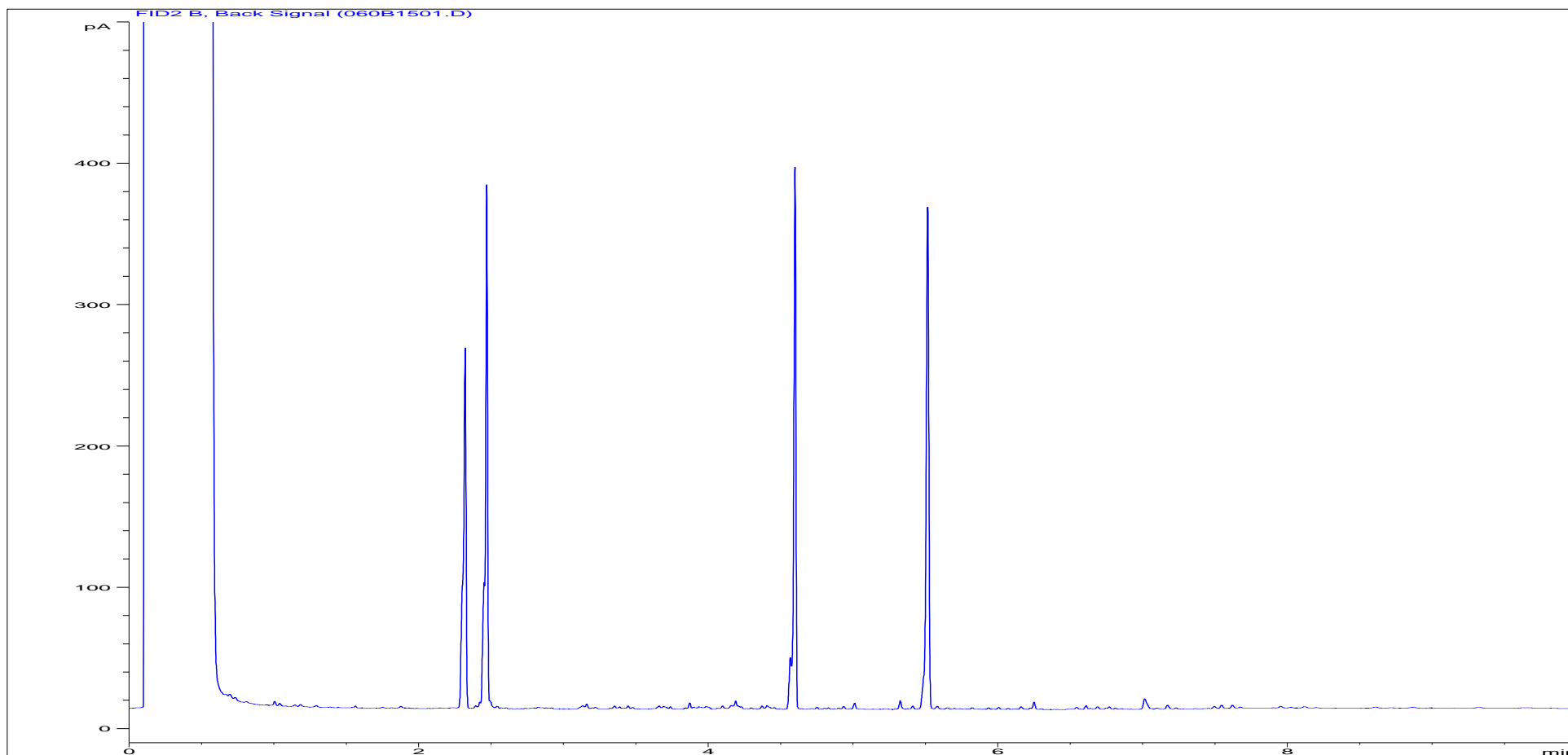
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1627246	<b>Job Number:</b>	W20_6614
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Ltd
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gases in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	D/9D
<b>Acquisition Date/Time:</b>	01-Oct-15, 20:43:29		
<b>Datafile:</b>	D:\TES\DATA\Y2015\100115TPH_GC15\100115 2015-10-01 16-58-11\059B1401.D		

Where individual results are flagged see report notes for status.

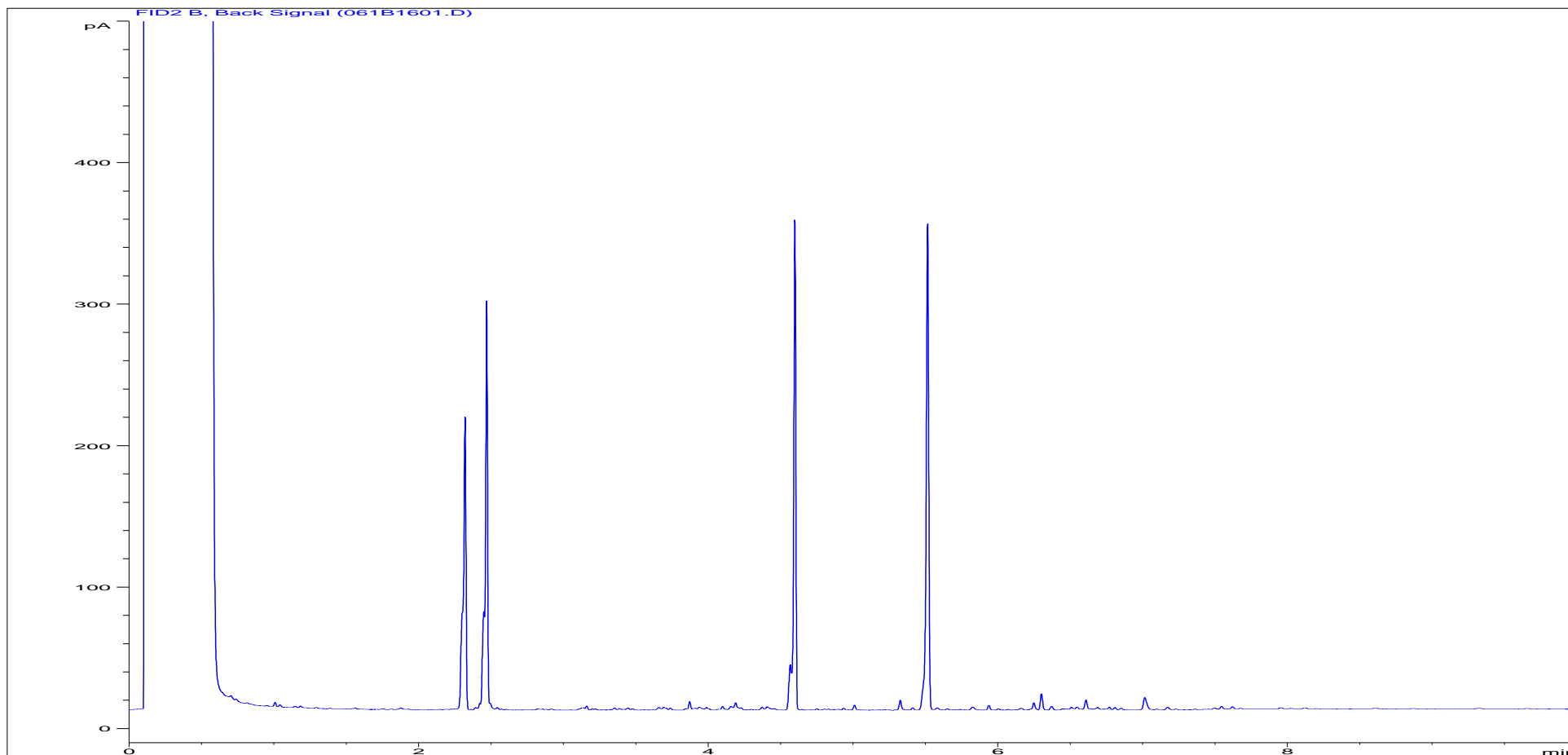
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1627247	<b>Job Number:</b>	W20_6614
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Ltd
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV/9
<b>Acquisition Date/Time:</b>	01-Oct-15, 21:00:24		
<b>Datafile:</b>	D:\TES\DATA\Y2015\100115TPH_GC15\100115 2015-10-01 16-58-11\060B1501.D		

Where individual results are flagged see report notes for status.

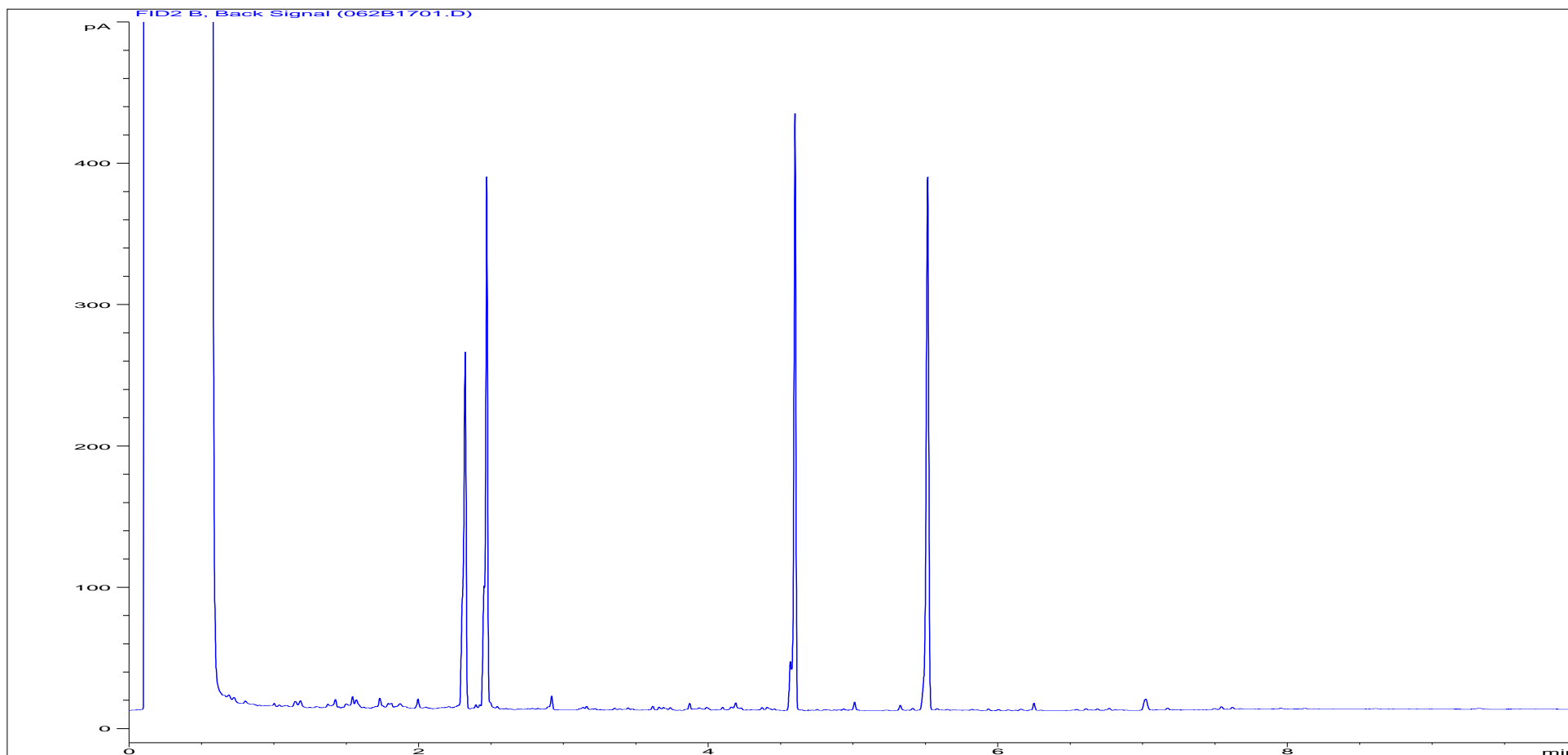
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1627248	<b>Job Number:</b>	W20_6614
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Ltd
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	SHF/9
<b>Acquisition Date/Time:</b>	01-Oct-15, 21:17:10		
<b>Datafile:</b>	D:\TES\DATA\Y2015\100115TPH_GC15\100115 2015-10-01 16-58-11\061B1601.D		

Where individual results are flagged see report notes for status.

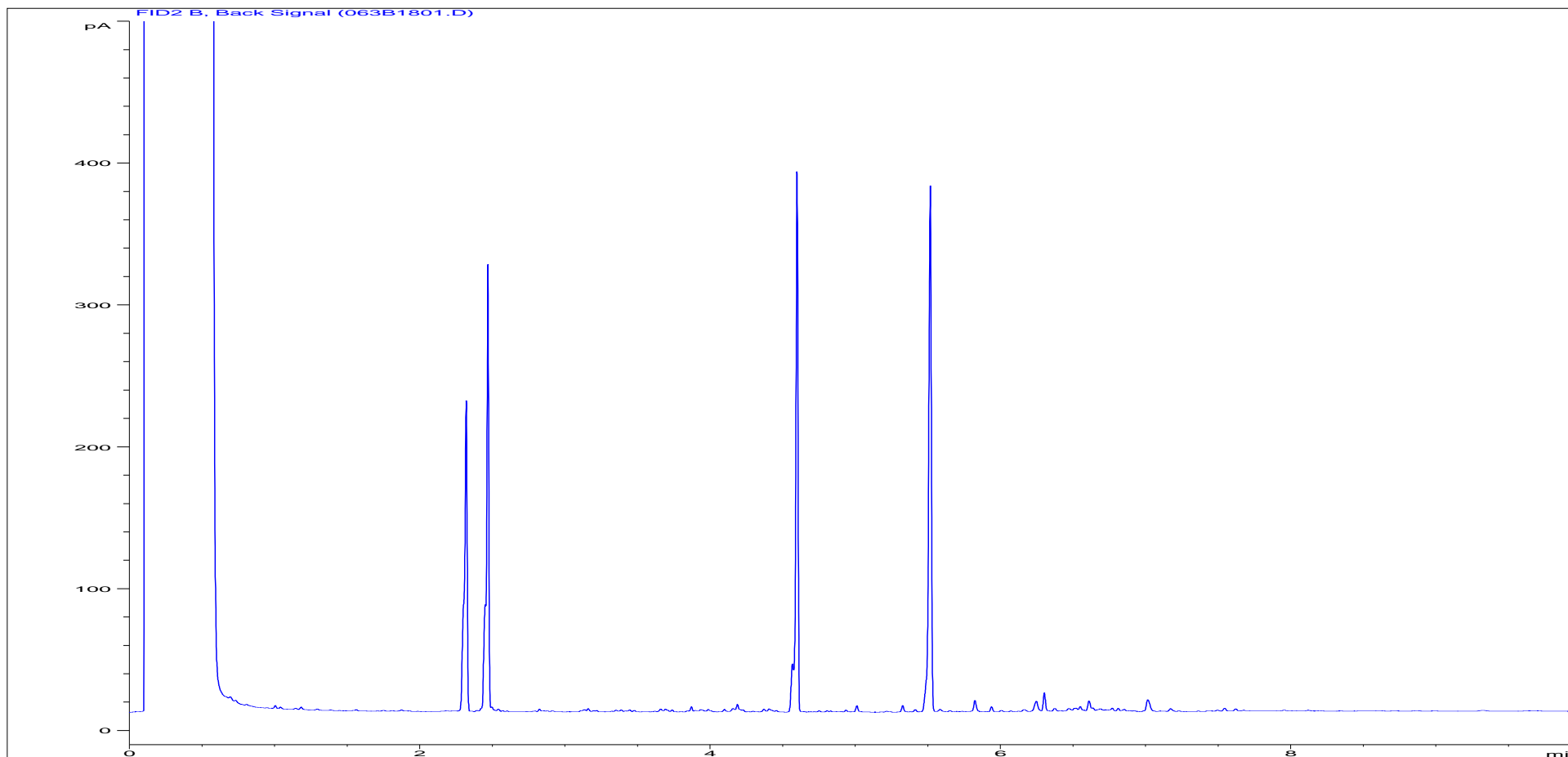
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1627249	Job Number:	W20_6614
Multiplier:	0.005	Client:	Envireau Ltd
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	DW/9
Acquisition Date/Time:	01-Oct-15, 21:33:59		
Datafile:	D:\TES\DATA\Y2015\100115TPH_GC15\100115 2015-10-01 16-58-11\062B1701.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID

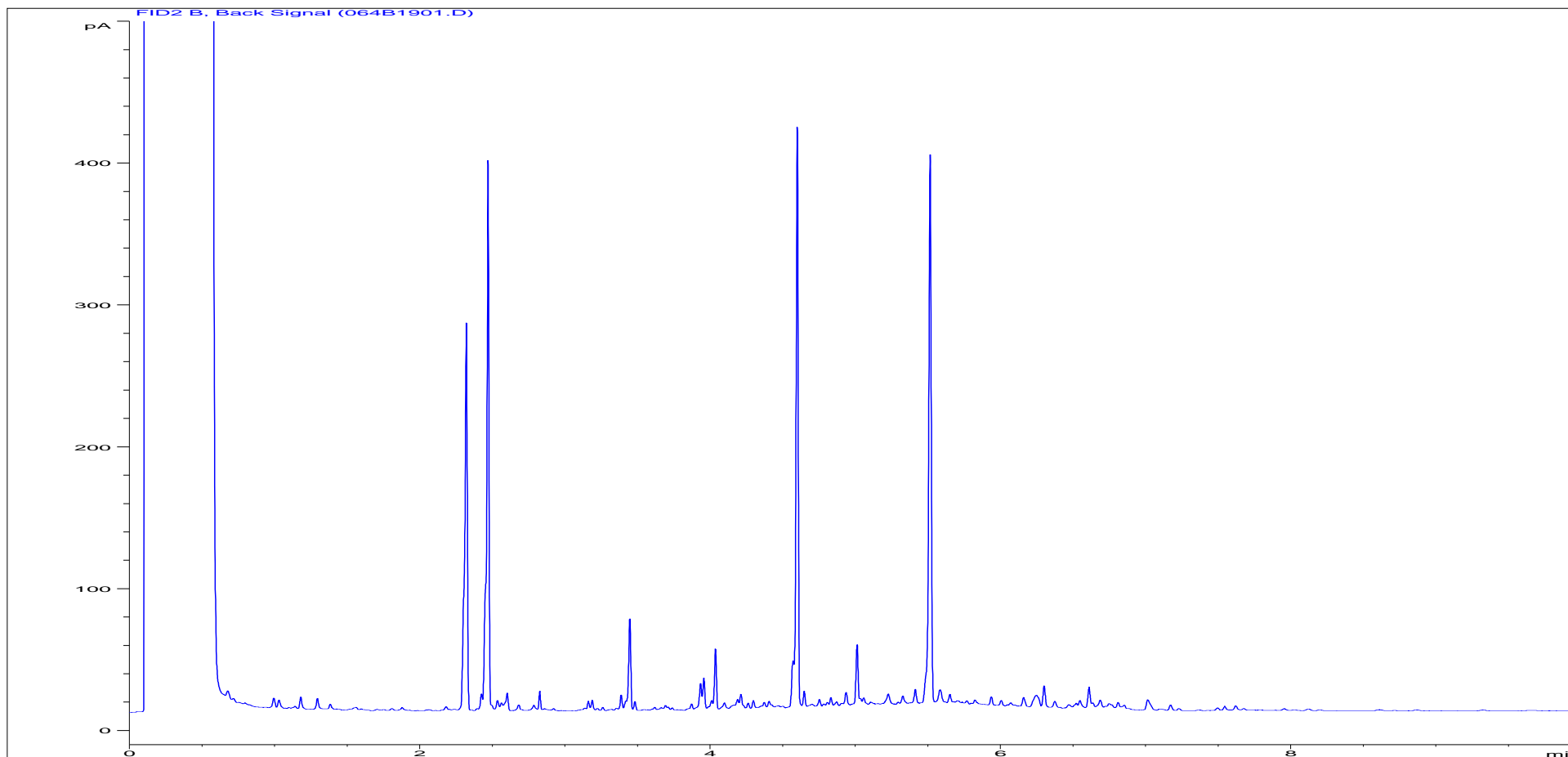


<b>Sample ID:</b>	EX1627250	<b>Job Number:</b>	W20_6614
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Ltd
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	CB/9
<b>Acquisition Date/Time:</b>	01-Oct-15, 21:50:52		
<b>Datafile:</b>	D:\TES\DATA\Y2015\100115TPH_GC15\100115 2015-10-01 16-58-11\063B1801.D		

Where individual results are flagged see report notes for status.



# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1627251	<b>Job Number:</b>	W20_6614
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Ltd
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	BC/9
<b>Acquisition Date/Time:</b>	01-Oct-15, 22:07:44		
<b>Datafile:</b>	D:\TES\DATA\Y2015\100115TPH_GC15\100115 2015-10-01 16-58-11\064B1901.D		

Where individual results are flagged see report notes for status.

## GAS ANALYSIS

Customer: ESG - (BEC BRE), Environmental Chemistry

Date Received: 28 September 2015 Date Sampled:

Report N° GA00971

Date Analysed: 28 September 2015 Site: Envireau Water

SAMPLE REFERENCE	Analysis % V/V
	Dissolved Methane (CH <sub>4</sub> )†
Method of Analysis	9

EX/1627243	0.0011
EX/1627244	0.0013
EX/1627245	0.0086
EX/1627247	0.2632
EX/1627248	0.0007

Method of 9 Dissolved Gas  
Analysis:-

† Not UKAS Accredited

Customer Analytical Requirements CH <sub>4</sub>	Authorised by Phil Shead
<b>Comment Box</b> Dissolved Gases in Water - Report No. 206614	

Authorised by:



Analyst: Daniel Bignell

Issue Date: 28 September 2015

ESG accepts no responsibility for the collection of any of the samples referred to in this report.

-----  
Phil Shead, Operations Manager  
Direct Dial: 01 283 554461

Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W206614

Customer      Envireau Ltd  
Site            Dissolved Gasses in Waters  
Report No     W206614

Consignment No W93928  
Date Logged 26-Sep-2015

Report Due 09-Oct-2015

WSL/M3	pH units	✓																						
WSL/M27	Total Dissolved Solids																							
WSL/M2	Conductivity uS/cm @ 25C	✓																						
WSL/M12	Bicarbonate Alkalinity as CaCO3	✓																						
	Total Alkalinity as CaCO3	✓																						
	P Alkalinity as CaCO3	✓																						
TPH/FID	TPH GC	✓																						
	TPH Carbon Banding	✓																						
KONENS	Chloride as Cl (Kone)	✓																						
	Aluminium as Al (Dissolved) VAR																							
	Iron as Fe (Dissolved) VAR	✓																						
	Manganese as Mn (Dissolved) VAR	✓																						
	Potassium as K (Dissolved) VAR	✓																						
	Sodium as Na (Dissolved) VAR	✓																						
	Magnesium as Mg (Dissolved) VAR	✓																						
	Calcium as Ca (Dissolved) VAR	✓																						
ICP/M1/AR	Total Sulphur as SO4 (Diss) VAR	✓																						
DISGAS1	^Dissolved Methane																							
CUST SERV	Report B																							
MethodID	Sampled																							
Description	Matrix Type																							
ID Number																								
EX/1627243	WF/9	Groundwater	24/09/15																					
EX/1627244	HW/9	Groundwater	24/09/15																					
EX/1627245	ETF/9	Groundwater	24/09/15																					
EX/1627246	D/9D	Groundwater	24/09/15																					
EX/1627247	TV/9	Groundwater	24/09/15																					
EX/1627248	SHF/9	Groundwater	24/09/15																					
EX/1627249	DW/9	Surface Water	24/09/15																					
EX/1627250	CB/9	Surface Water	24/09/15																					
EX/1627251	BC/9	Surface Water	24/09/15																					

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

**In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.**

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
	Analysis Subcontracted - <b>Note: due date may vary</b>

Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W206614

Customer      Envireau Ltd  
Site            Dissolved Gasses in Waters  
Report No     W206614

Consignment No W93928  
Date Logged 26-Sep-2015

Report Due 09-Oct-2015

ID Number	Description	MethodID		WSLM3
		Matrix Type	Sampled	pH units
				✓
EX/1627243	WF/9	Groundwater	24/09/15	
EX/1627244	HW/9	Groundwater	24/09/15	
EX/1627245	ETF/9	Groundwater	24/09/15	
EX/1627246	D/9D	Groundwater	24/09/15	
EX/1627247	TV/9	Groundwater	24/09/15	
EX/1627248	SHF/9	Groundwater	24/09/15	
EX/1627249	DW/9	Surface Water	24/09/15	
EX/1627250	CB/9	Surface Water	24/09/15	
EX/1627251	BC/9	Surface Water	24/09/15	

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

**In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.**

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
^	Analysis Subcontracted - <b>Note: due date may vary</b>

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Where individual results are flagged see report notes for status.

# Report Notes

## Generic Notes

### Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### Waters Analysis

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup>@ 15°C

### Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

### Asbestos Analysis

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

**^** Sub-contracted analysis.

**\$\$** Unable to analyse due to the nature of the sample

**¶** Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

**¥** Results for guidance only due to possible interference

**&** Blank corrected result

**I.S** Insufficient sample to complete requested analysis

**I.S(g)** Insufficient sample to re-analyse, results for guidance only

**Intf** Unable to analyse due to interferences

**N.D** Not determined

**N.Det** Not detected

**N.F** No Flow

**NS** Information Not Supplied

**Req** Analysis requested, see attached sheets for results

**▯** Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Ltd  
**Site :** Dissolved Gasses in Waters  
**Report Number :** W20\_6614

[illegible]

## Water Analysis Test Certificate

Round 10



Our Ref: EXR/208498 (Ver. 2)

Your Ref:

December 10, 2015



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Armelle Bonneton  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Armelle Bonneton

Dear Armelle Bonneton

**Sample Analysis - Dissolved Gasses in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

J Colbourne  
Project Co-ordinator  
01283 554547

# TEST REPORT



Report No. EXR/208498 (Ver. 2)

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

## Site: Dissolved Gasses in Waters

The 9 samples described in this report were registered for analysis by ESG on 30-Oct-2015. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 10-Dec-2015

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Page 2)  
GC-FID Chromatograms (Pages 3 to 11)  
Analytical and Deviating Sample Overview (Page 12)  
Table of Method Descriptions (Page 13)  
Table of Report Notes (Page 14)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns

  
Managing Director  
Multi-Sector Services

Date of Issue: 10-Dec-2015

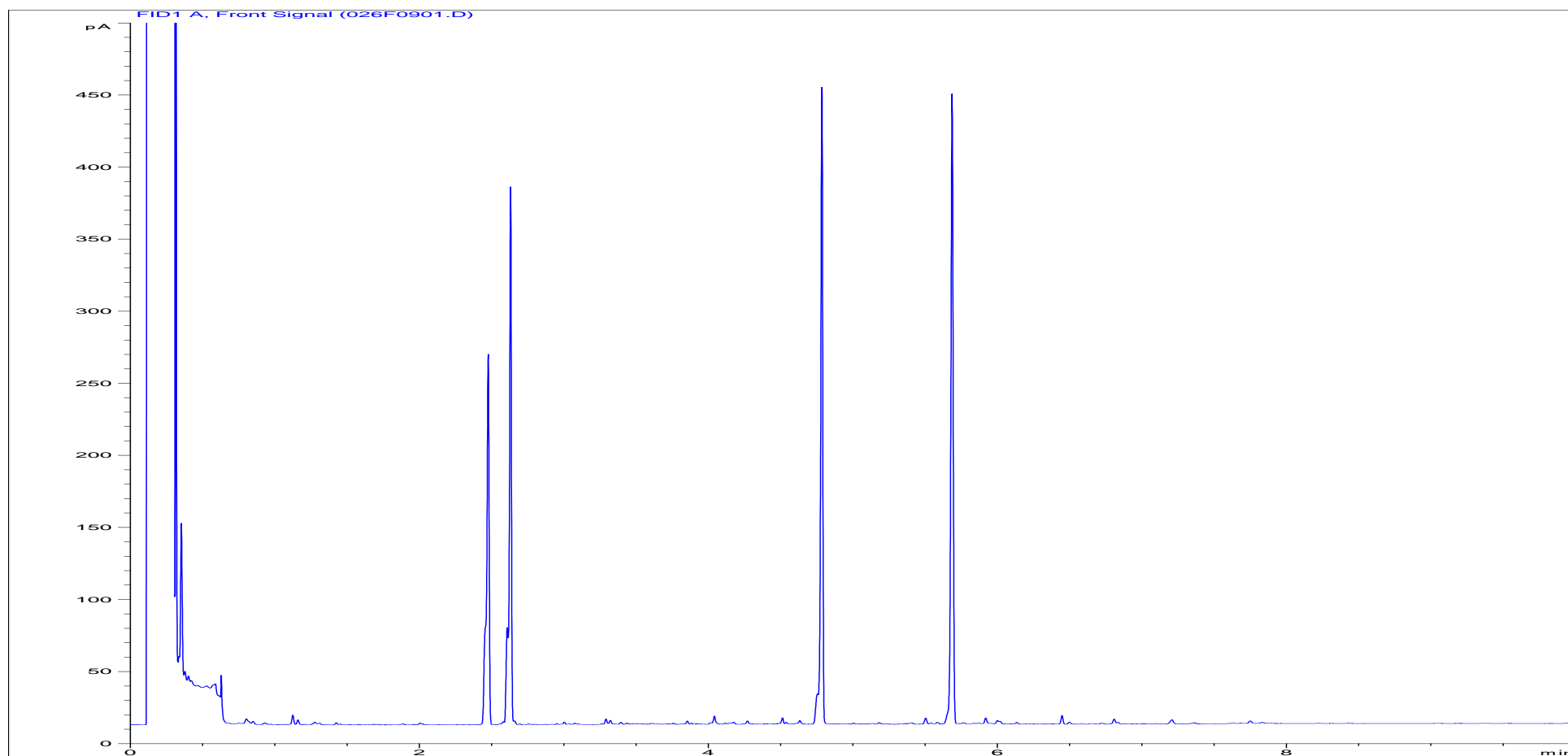
Tests marked '^' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

ESG accepts no responsibility for any sampling not carried out by our personnel.

Units : Method Codes : Method Reporting Limits : UKAS Accredited :			pH units	uS/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	µg/l
			WSLM3	WSLM2	WSLM12	WSLM12	KONENS	ICPWATVAR	ICPWATVAR	ICPWATVAR	ICPWATVAR	ICPWATVAR	ICPWATVAR	ICPWATVAR	TPHFID	WSLM27	ICPWATVAR	DISGAS1
			100				1	3	1	1	1	0.01	0.01	0.01	5	0.01	6	
			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	
LAB ID Number EX/	Client Sample Description	Sample Date	pH units w	Conductivity uS/cm @ 25C w	Total Alkalinity as CaCO3 w	Bicarbonate Alkalinity as CaCO3 w	Chloride as Cl w	Total Sulphur as SO4 (Dissolved) a	Calcium as Ca (Dissolved) a	Magnesium as Mg (Dissolved) a	Sodium as Na (Dissolved) a	Potassium as K (Dissolved) a	Manganese as MN (Dissolved) a	Iron as Fe (Dissolved) a	TPH GC	Total Dissolved Solids w	Aluminium as Al (Dissolved) a	^Dissolved Methane
1635411	WF/10	29-Oct-15 11:30	7.7	924	438	438	28	29	35	7	175	3	0.31	0.06	0.02	510	<0.01	11
1635412	HW/10	29-Oct-15 14:00	7.6	808	406	406	22	16	29	5	162	3	0.28	0.05	0.02	440	<0.01	8
1635413	ETF/10	29-Oct-15 10:10	7.8	3090	688	688	104	773	69	33	603	7	0.02	0.06	0.01	2040	0.01	194
1635414	D/10U	29-Oct-15 11:00	7.8	703	202	202	71	51	141	6	15	8	<0.01	0.20	0.04	580	0.02	
1635415	D/10D	29-Oct-15 10:40	7.8	751	193	193	71	53	131	6	19	8	<0.01	0.18	0.05	567	0.02	
1635416	TV/10	29-Oct-15 13:30	7.7	1600	646	646	49	143	24	6	379	4	0.03	0.03	0.02	950	<0.01	1310
1635417	SHF/10	29-Oct-15 12:30	7.6	599	207	207	26	49	94	8	18	14	<0.01	0.09	0.02	350	0.02	4
1635418	DW/10	29-Oct-15 13:00	6.2	<100	3	3	<1	<3	<1	<1	<1	<1	<0.01	<0.01	0.04	<5	<0.01	
1635419	VT/10	29-Oct-15 13:20	7.7 §	1580 §	650 §	650 §	51 §	139 §	22 §	6 §	362 §	4 §	0.03 §	0.02 §	0.01 §	950	<0.01	2727
													</					

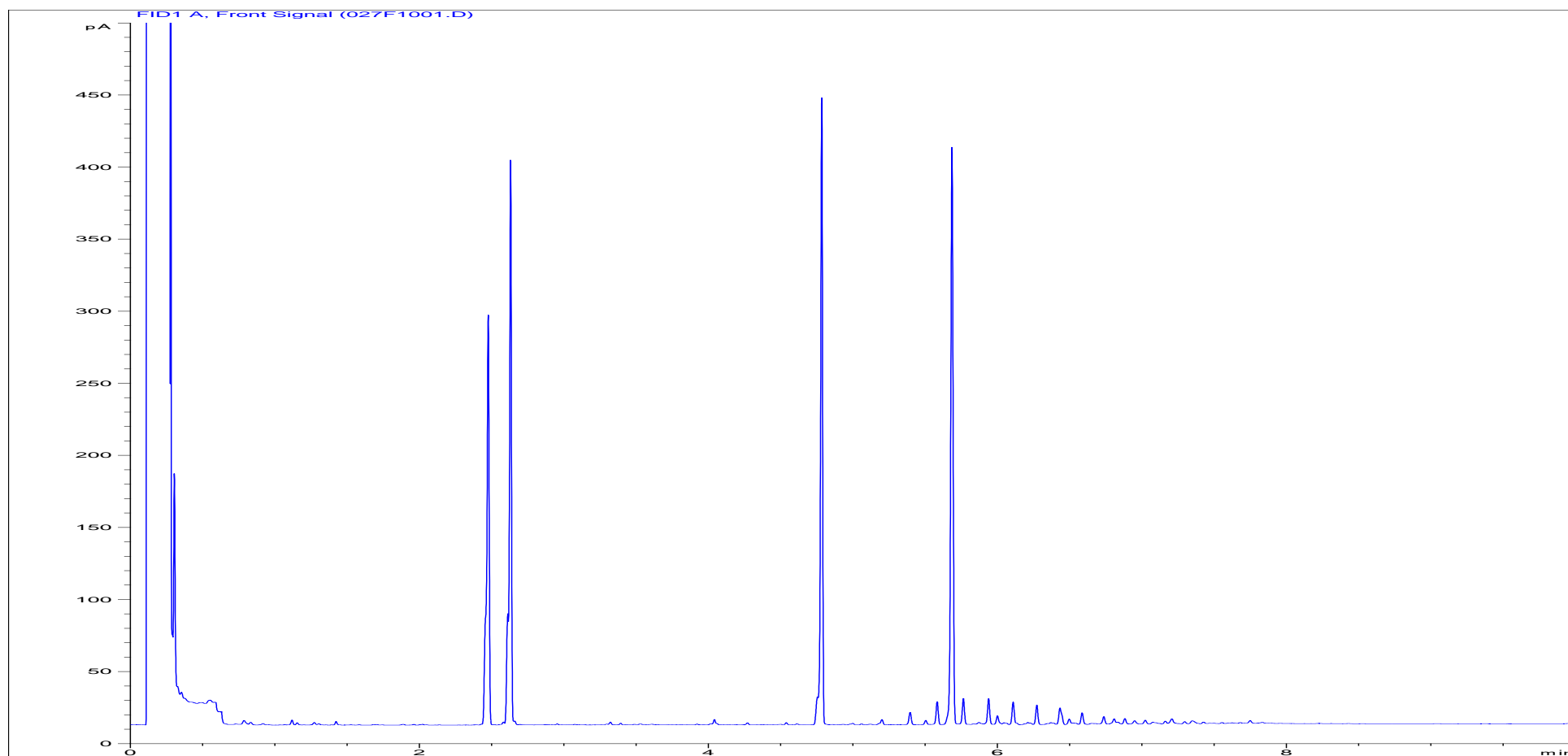
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1635411	<b>Job Number:</b>	W20_8498
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	WF/10
<b>Acquisition Date/Time:</b>	04-Nov-15, 20:33:06		
<b>Datafile:</b>	D:\TES\DATA\Y2015\110415TPH_GC15\110415A 2015-11-04 18-15-27\026F0901.D		

Where individual results are flagged see report notes for status.

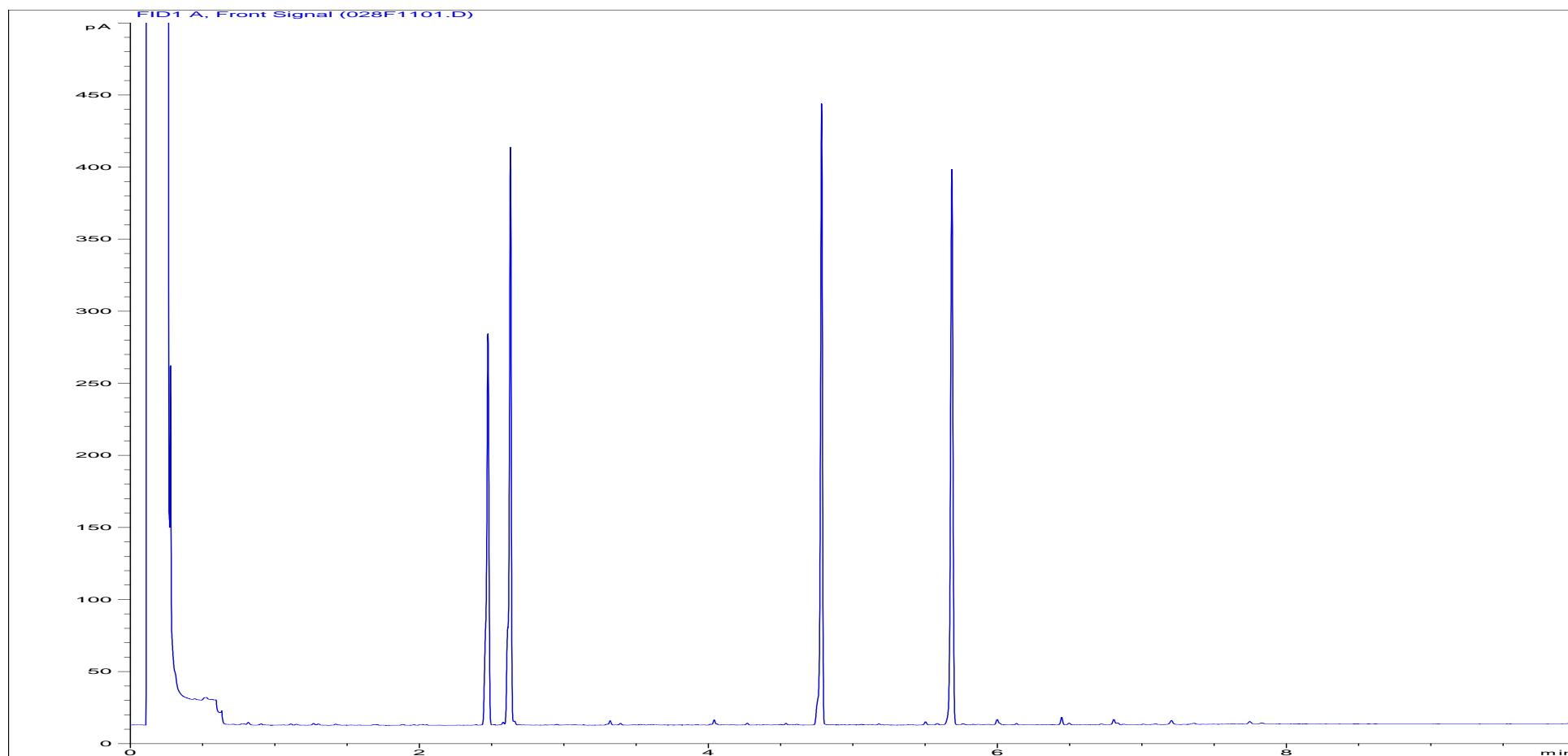
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1635412	<b>Job Number:</b>	W20_8498
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	HW/10
<b>Acquisition Date/Time:</b>	04-Nov-15, 20:51:54		
<b>Datafile:</b>	D:\TES\DATA\Y2015\110415TPH_GC15\110415A 2015-11-04 18-15-27\027F1001.D		

Where individual results are flagged see report notes for status.

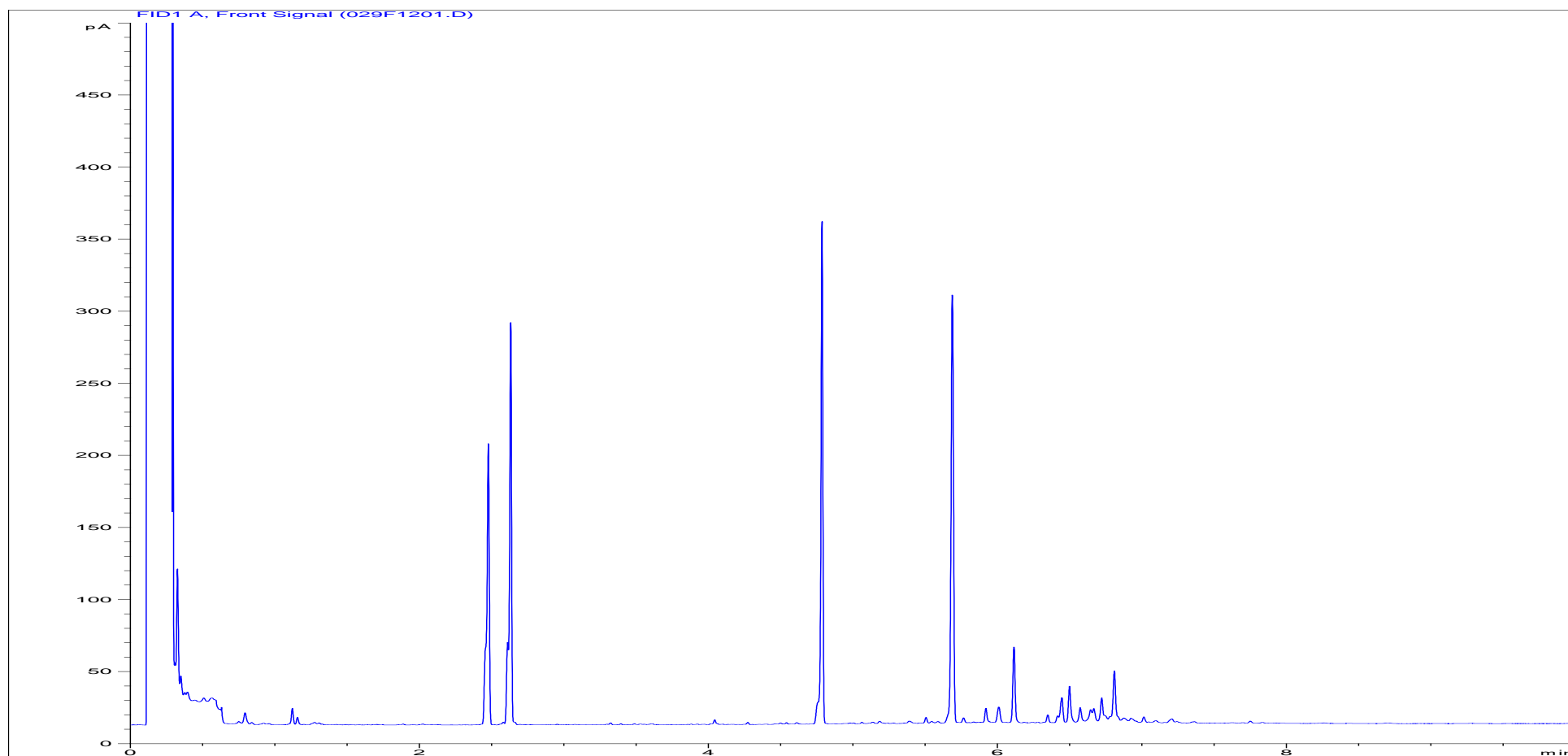
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1635413	<b>Job Number:</b>	W20_8498
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	ETF/10
<b>Acquisition Date/Time:</b>	04-Nov-15, 21:08:48		
<b>Datafile:</b>	D:\TES\DATA\Y2015\110415TPH_GC15\110415A 2015-11-04 18-15-27\028F1101.D		

Where individual results are flagged see report notes for status.

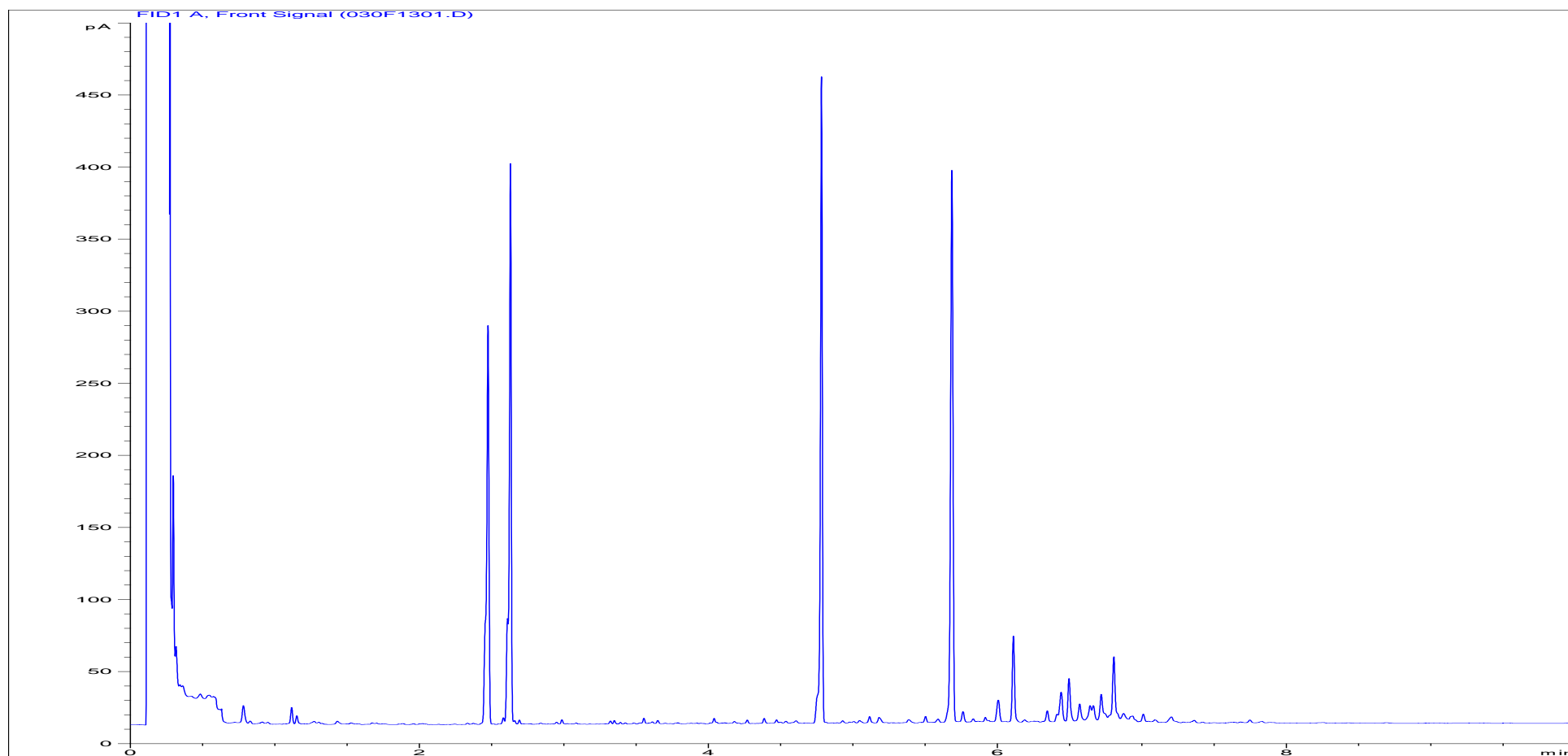
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1635414	Job Number:	W20_8498
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	D/10U
Acquisition Date/Time:	04-Nov-15, 21:25:42		
Datafile:	D:\TES\DATA\Y2015\110415TPH_GC15\110415A 2015-11-04 18-15-27\029F1201.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID

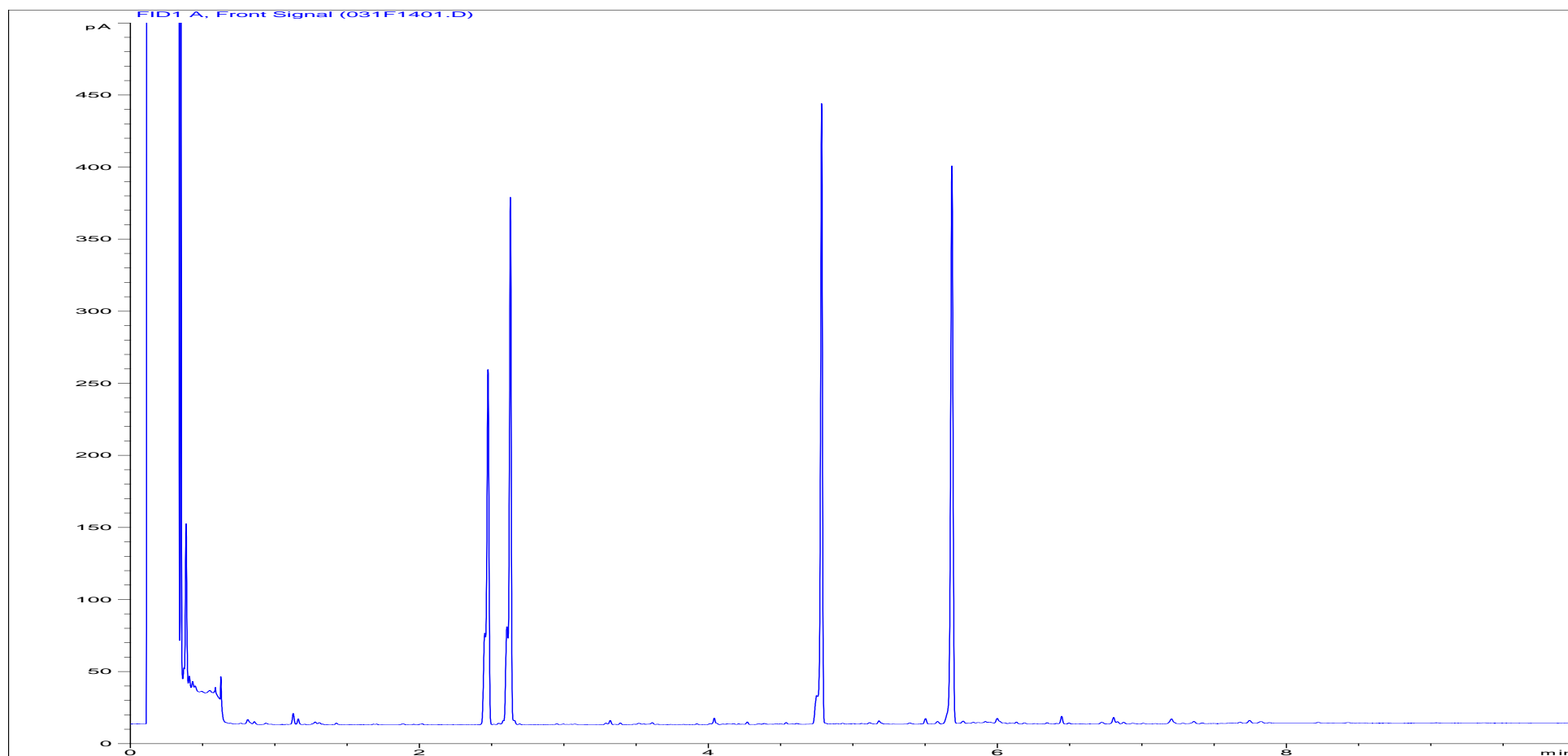


<b>Sample ID:</b>	EX1635415	<b>Job Number:</b>	W20_8498
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	D/10D
<b>Acquisition Date/Time:</b>	04-Nov-15, 21:42:47		
<b>Datafile:</b>	D:\TES\DATA\Y2015\110415TPH_GC15\110415A 2015-11-04 18-15-27\030F1301.D		

Where individual results are flagged see report notes for status.



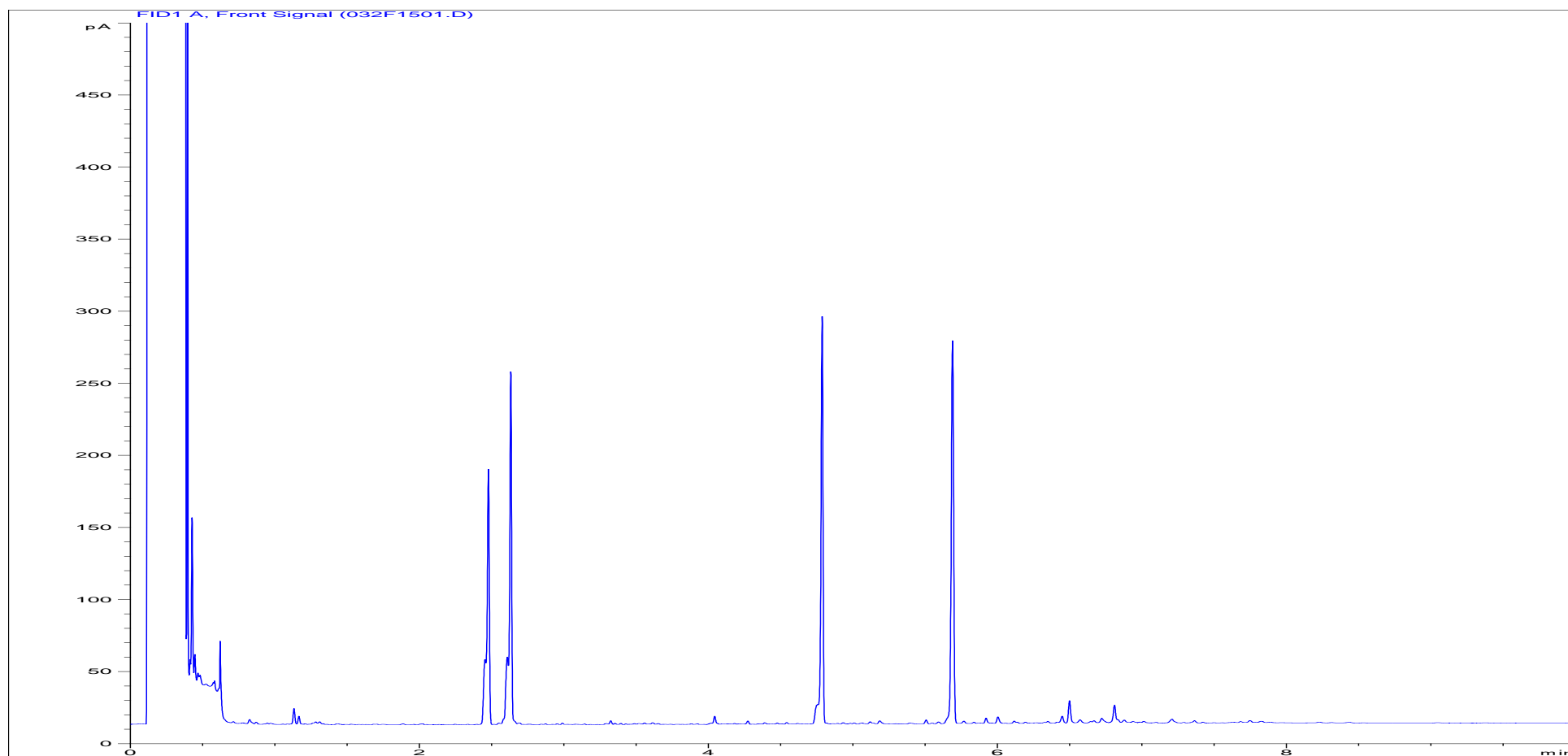
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1635416	<b>Job Number:</b>	W20_8498
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV/10
<b>Acquisition Date/Time:</b>	04-Nov-15, 21:59:44		
<b>Datafile:</b>	D:\TES\DATA\Y2015\110415TPH_GC15\110415A 2015-11-04 18-15-27\031F1401.D		

Where individual results are flagged see report notes for status.

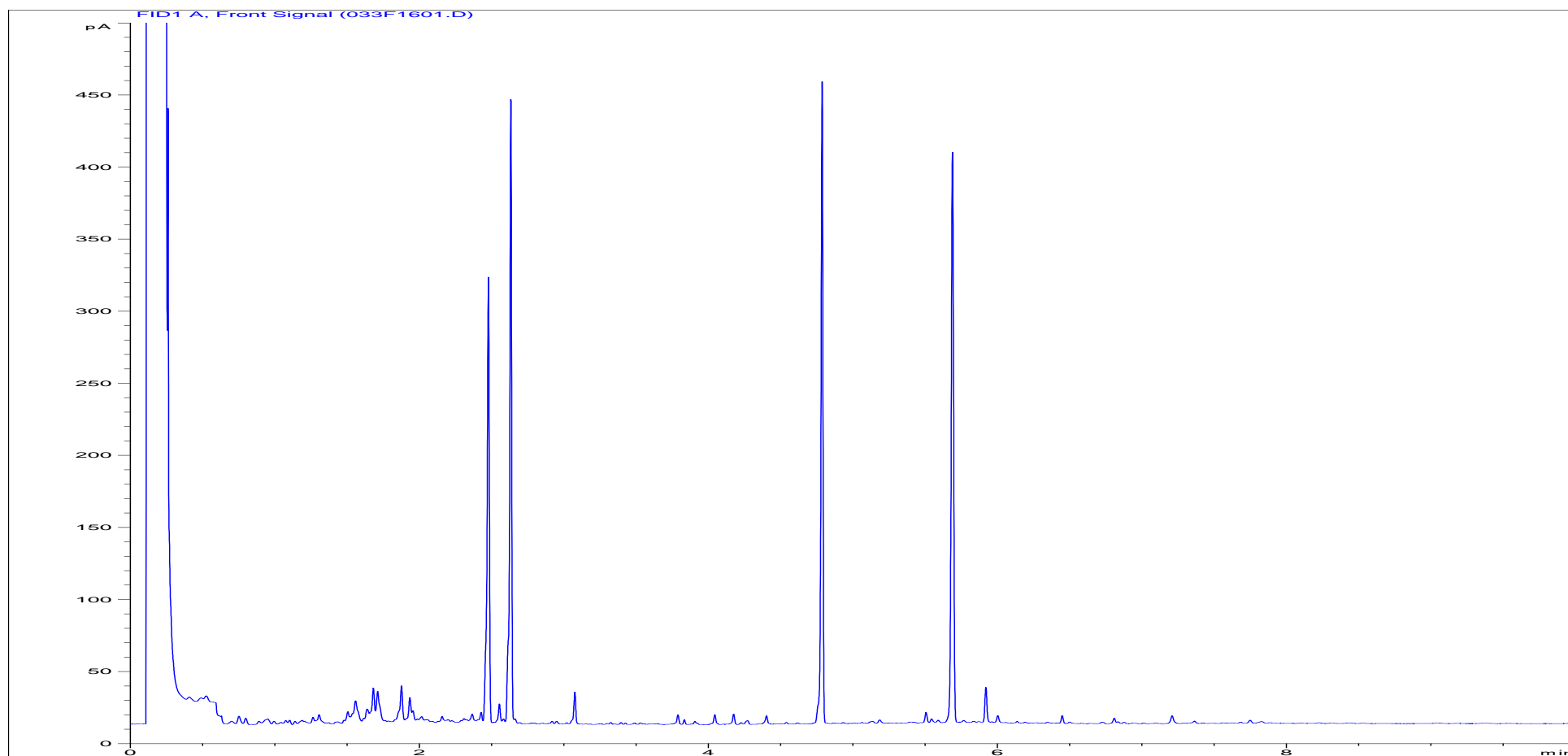
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1635417	<b>Job Number:</b>	W20_8498
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	SHF/10
<b>Acquisition Date/Time:</b>	04-Nov-15, 22:17:01		
<b>Datafile:</b>	D:\TES\DATA\Y2015\110415TPH_GC15\110415A 2015-11-04 18-15-27\032F1501.D		

Where individual results are flagged see report notes for status.

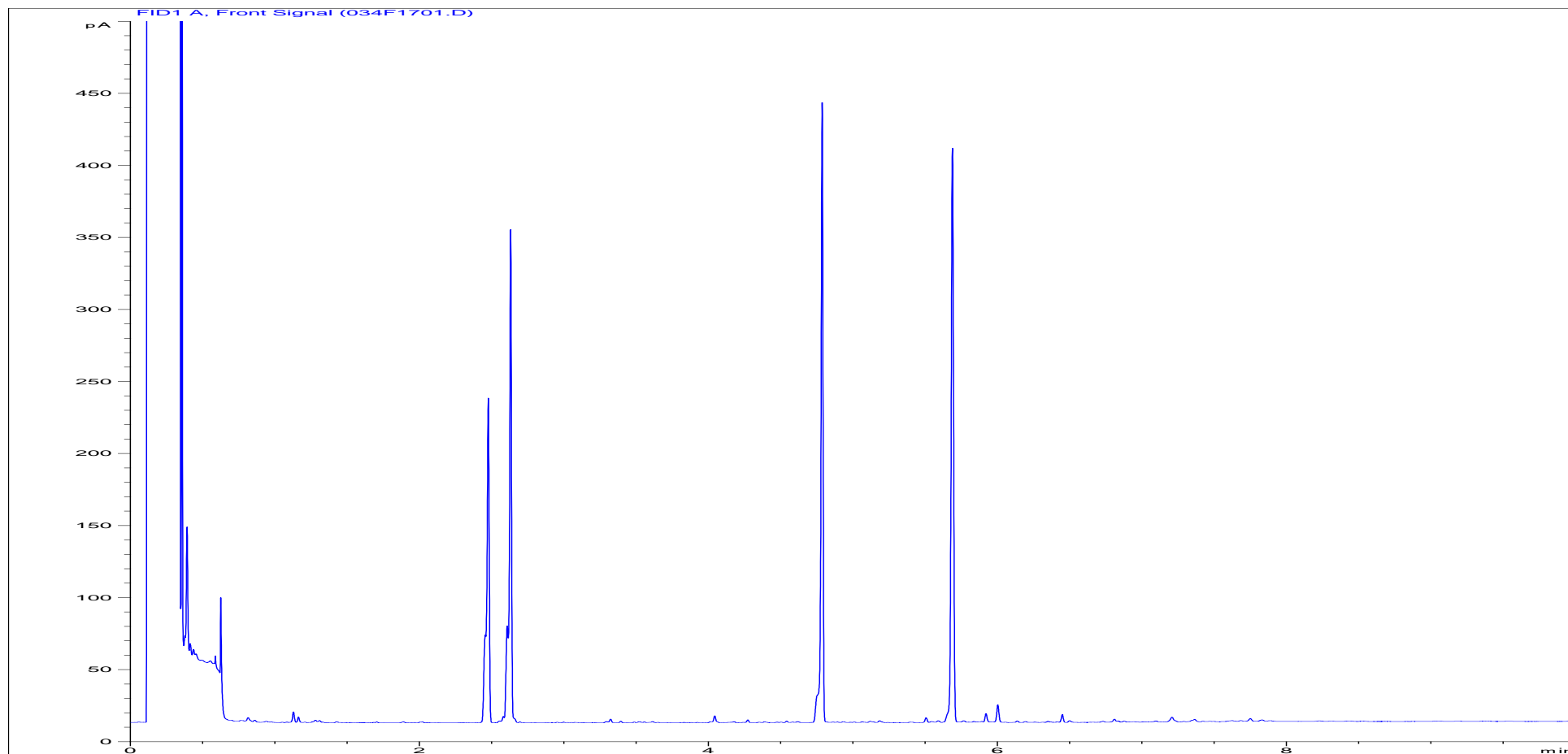
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1635418	<b>Job Number:</b>	W20_8498
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	DW/10
<b>Acquisition Date/Time:</b>	04-Nov-15, 22:33:47		
<b>Datafile:</b>	D:\TES\DATA\Y2015\110415TPH_GC15\110415A 2015-11-04 18-15-27\033F1601.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1635419	Job Number:	W20_8498
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	VT/10
Acquisition Date/Time:	04-Nov-15, 22:50:44		
Datafile:	D:\TES\DATA\Y2015\110415TPH_GC15\110415A 2015-11-04 18-15-27\034F1701.D		

Where individual results are flagged see report notes for status.

# Sample Analysis

## ESG Environmental Chemistry Analytical and Deviating Sample Overview

W208498

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W208498

Consignment No W95239  
Date Logged 30-Oct-2015

Report Due 06-Nov-2015

ID Number	Description	MethodID		CUSTSERV	DISGAS1	ICPMATVAR											KONENS	TPH/FID	WSL.M2	WSL.M27	WSL.M3
		Matrix Type	Sampled				Total Sulphur as SO4 (Diss) VAR	Calcium as Ca (Dissolved) VAR	Magnesium as Mg (Dissolved) VAR	Sodium as Na (Dissolved) VAR	Potassium as K (Dissolved) VAR	Manganese as Mn (Dissolved) VAR	Iron as Fe (Dissolved) VAR	Aluminium as Al (Dissolved) VAR	Chloride as Cl (Kone)	P Alkalinity as CaCO3	Total Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Conductivity uS/cm @ 25C	Total Dissolved Solids	pH units
EX/1635411	WF/10	Groundwater	29/10/15																		
EX/1635412	HW/10	Groundwater	29/10/15																		
EX/1635413	ETF/10	Groundwater	29/10/15																		
EX/1635414	D/10U	Surface Water	29/10/15																		
EX/1635415	D/10D	Surface Water	29/10/15																		
EX/1635416	TV/10	Groundwater	29/10/15																		
EX/1635417	SHF/10	Groundwater	29/10/15																		
EX/1635418	DW/10	Surface Water	29/10/15																		
EX/1635419	VT/10	Unclassified	29/10/15																		

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

### Deviating Sample Key

- A The sample was received in an inappropriate container for this analysis
- B The sample was received without the correct preservation for this analysis
- C Headspace present in the sample container
- D The sampling date was not supplied so holding time may be compromised - applicable to all analysis
- E Sample processing did not commence within the appropriate holding time
- F Sample processing did not commence within the appropriate handling time

### Requested Analysis Key

- Analysis Required
- Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
- No analysis scheduled
- Analysis Subcontracted - **Note: due date may vary**

Where individual results are flagged see report notes for status.

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Where individual results are flagged see report notes for status.

# Report Notes

## Generic Notes

### Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### Waters Analysis

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup> @ 15°C

### Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

### Asbestos Analysis

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

**^** Sub-contracted analysis.

**\$\$** Unable to analyse due to the nature of the sample

**¶** Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

**¥** Results for guidance only due to possible interference

**&** Blank corrected result

**I.S** Insufficient sample to complete requested analysis

**I.S(g)** Insufficient sample to re-analyse, results for guidance only

**Intf** Unable to analyse due to interferences

**N.D** Not determined

**N.Det** Not detected

**N.F** No Flow

**NS** Information Not Supplied

**Req** Analysis requested, see attached sheets for results

**▮** Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** Dissolved Gasses in Waters  
**Report Number :** W20\_8498

[illegible]



## Water Analysis Test Certificate

Round 11

Our Ref: EXR/209637 (Ver. 1)

Your Ref:

November 27, 2015



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Armelle Bonneton  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Armelle Bonneton

Dear Armelle Bonneton

**Sample Analysis - Dissolved Gasses in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

A handwritten signature in dark ink, appearing to read 'P Williams', followed by a long horizontal flourish.

P Williams

Project Co-ordinator

01283 554647

# TEST REPORT



Report No. EXR/209637 (Ver. 1)

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

## Site: Dissolved Gasses in Waters

The 8 samples described in this report were registered for analysis by ESG on 19-Nov-2015. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 27-Nov-2015

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Page 2)  
GC-FID Chromatograms (Pages 3 to 10)  
Subcontracted Analysis Reports (Page 11)  
*The accreditation status of subcontracted analysis is displayed on the appended subcontracted analysis reports.*  
Analytical and Deviating Sample Overview (Page 12)  
Table of Additional Report Notes (Page 13)  
Table of Method Descriptions (Page 14)  
Table of Report Notes (Page 15)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns

  
Managing Director  
Multi-Sector Services

Date of Issue: 27-Nov-2015

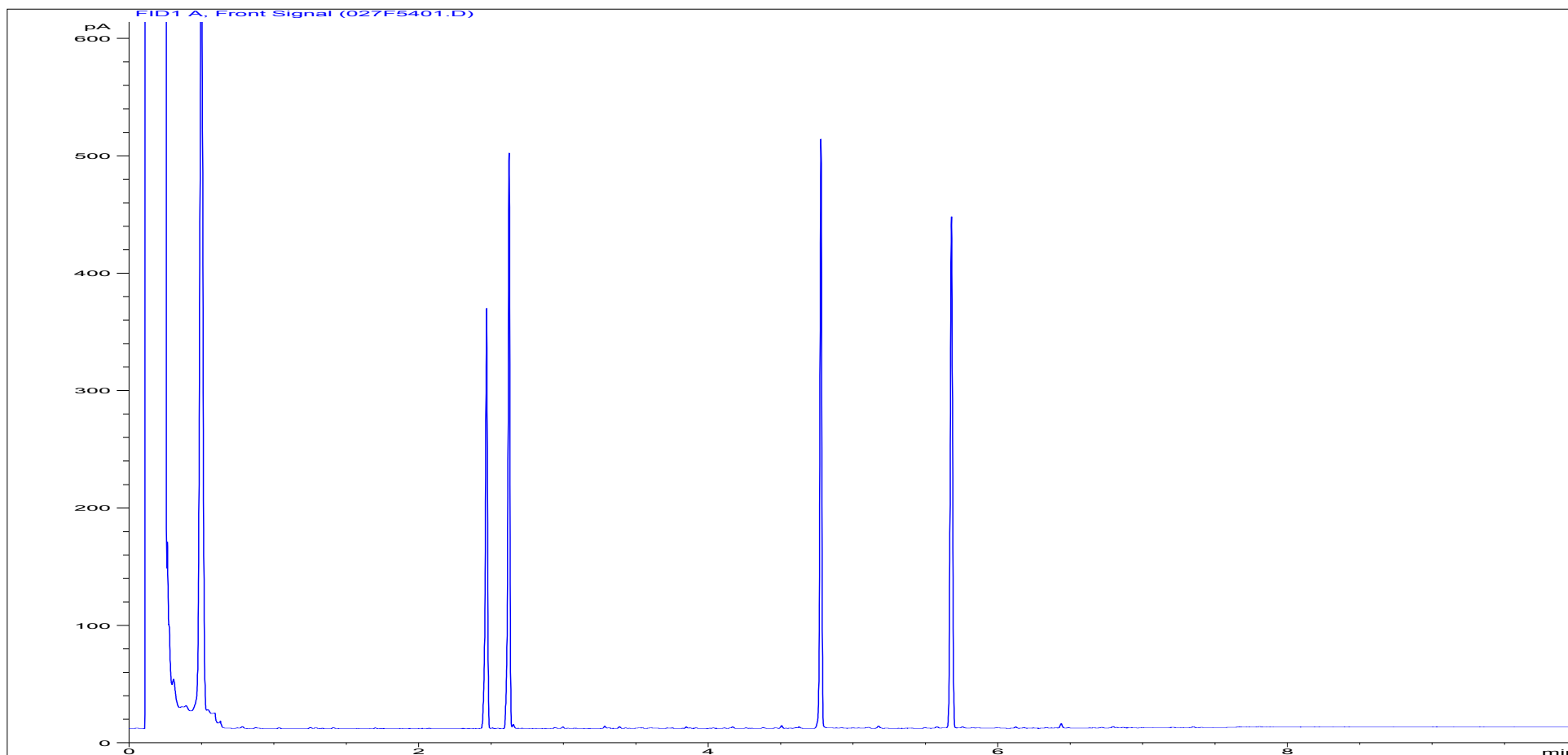
Tests marked '^' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected. ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.



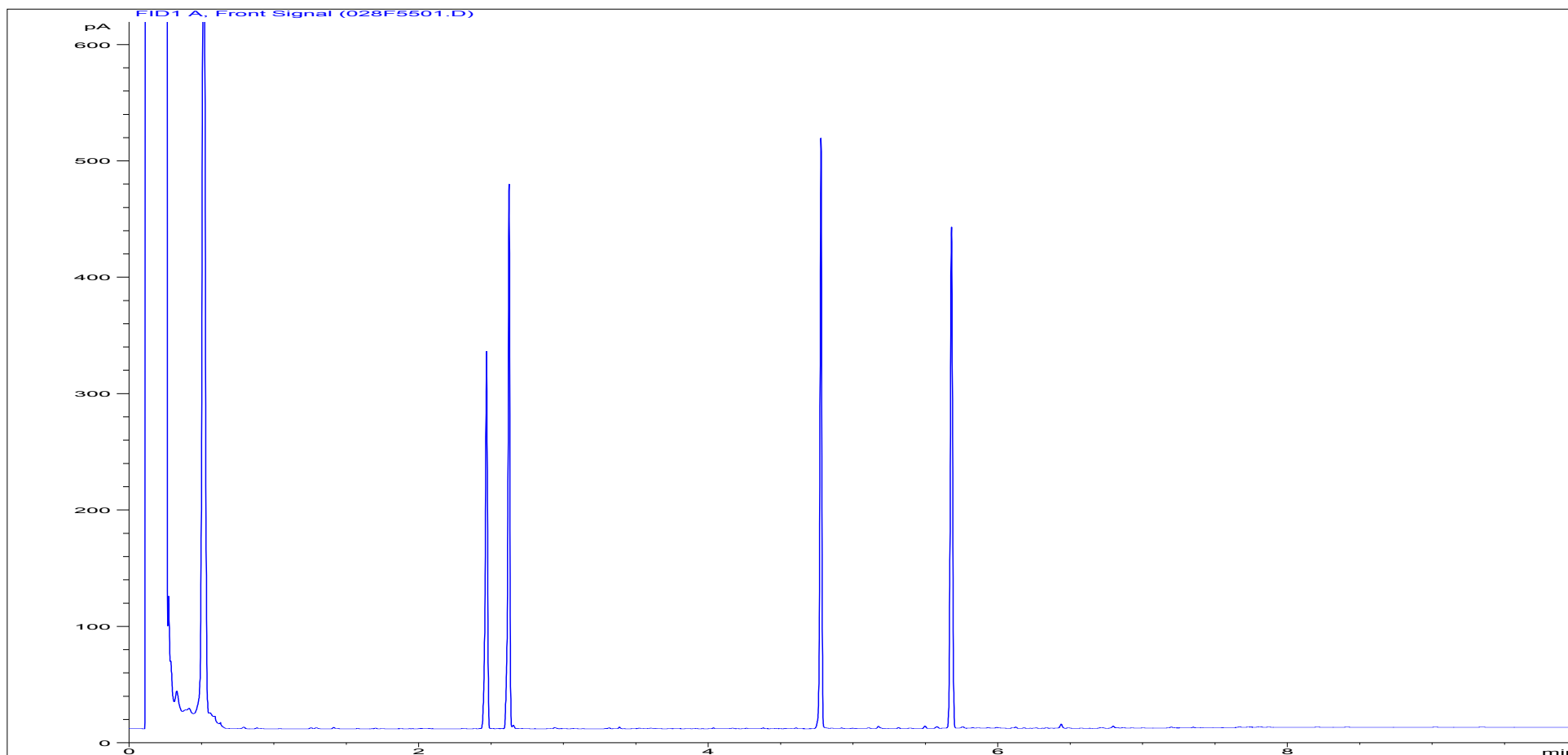
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1640457	Job Number:	W20_9637
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	WF 11
Acquisition Date/Time:	25-Nov-15, 01:17:07		
Datafile:	D:\TES\DATA\Y2015\112415TPH_GC15\112415 2015-11-24 10-09-11\027F5401.D		

Where individual results are flagged see report notes for status.

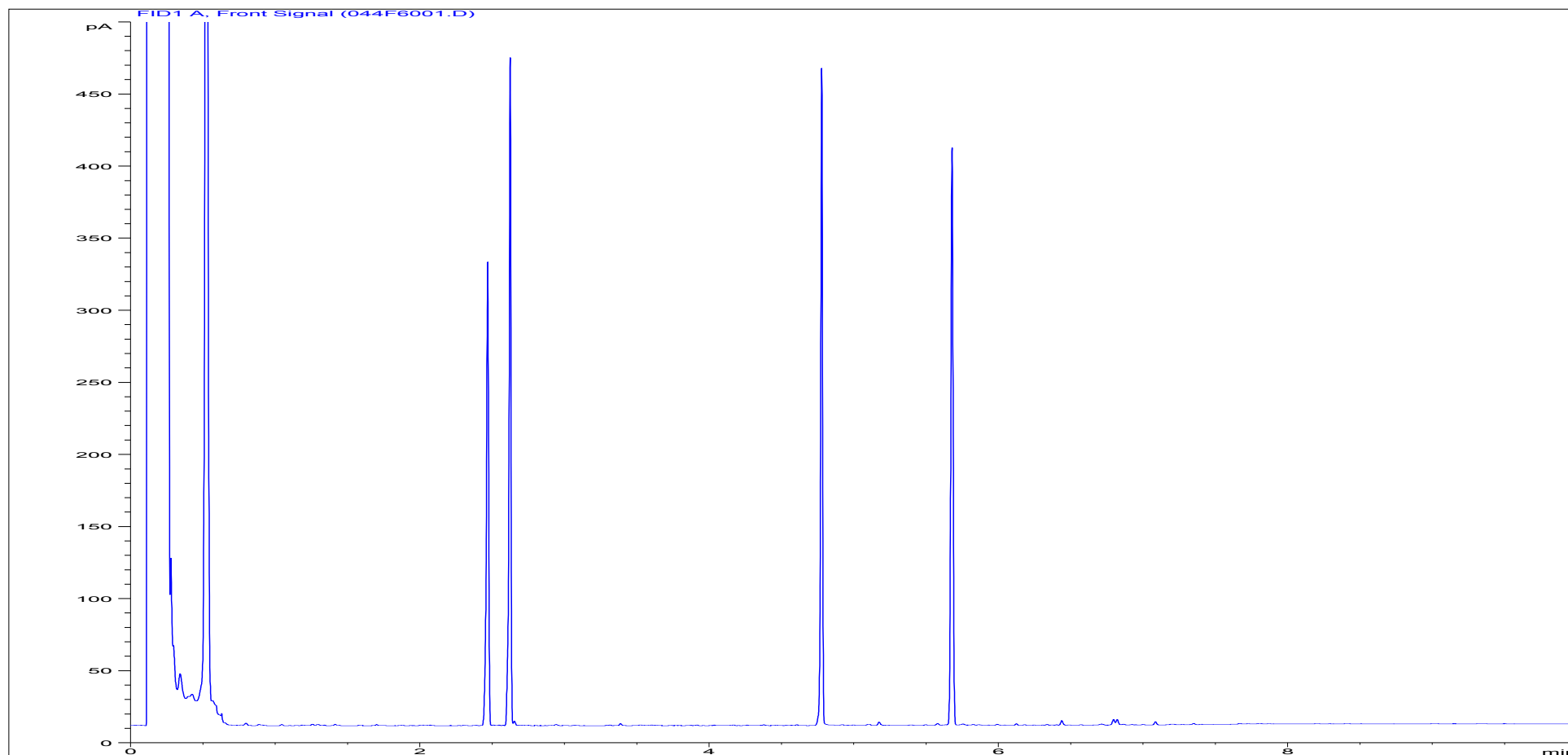
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1640458	Job Number:	W20_9637
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	HW 11
Acquisition Date/Time:	25-Nov-15, 01:33:39		
Datafile:	D:\TES\DATA\Y2015\112415TPH_GC15\112415 2015-11-24 10-09-11\028F5501.D		

Where individual results are flagged see report notes for status.

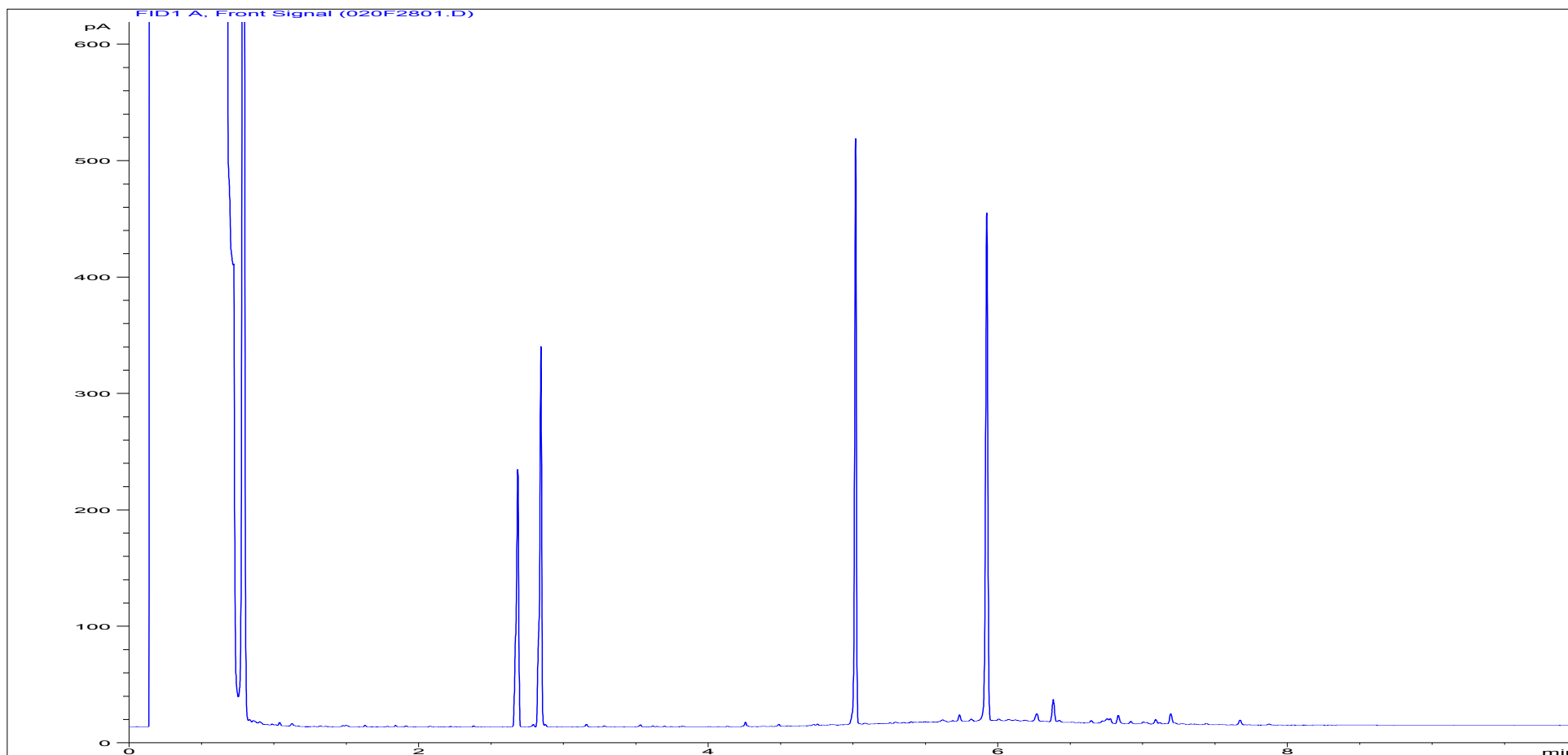
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1640459	<b>Job Number:</b>	W20_9637
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	ETF 11
<b>Acquisition Date/Time:</b>	25-Nov-15, 02:58:22		
<b>Datafile:</b>	D:\TES\DATA\Y2015\112415TPH_GC15\112415 2015-11-24 10-09-11\044F6001.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID

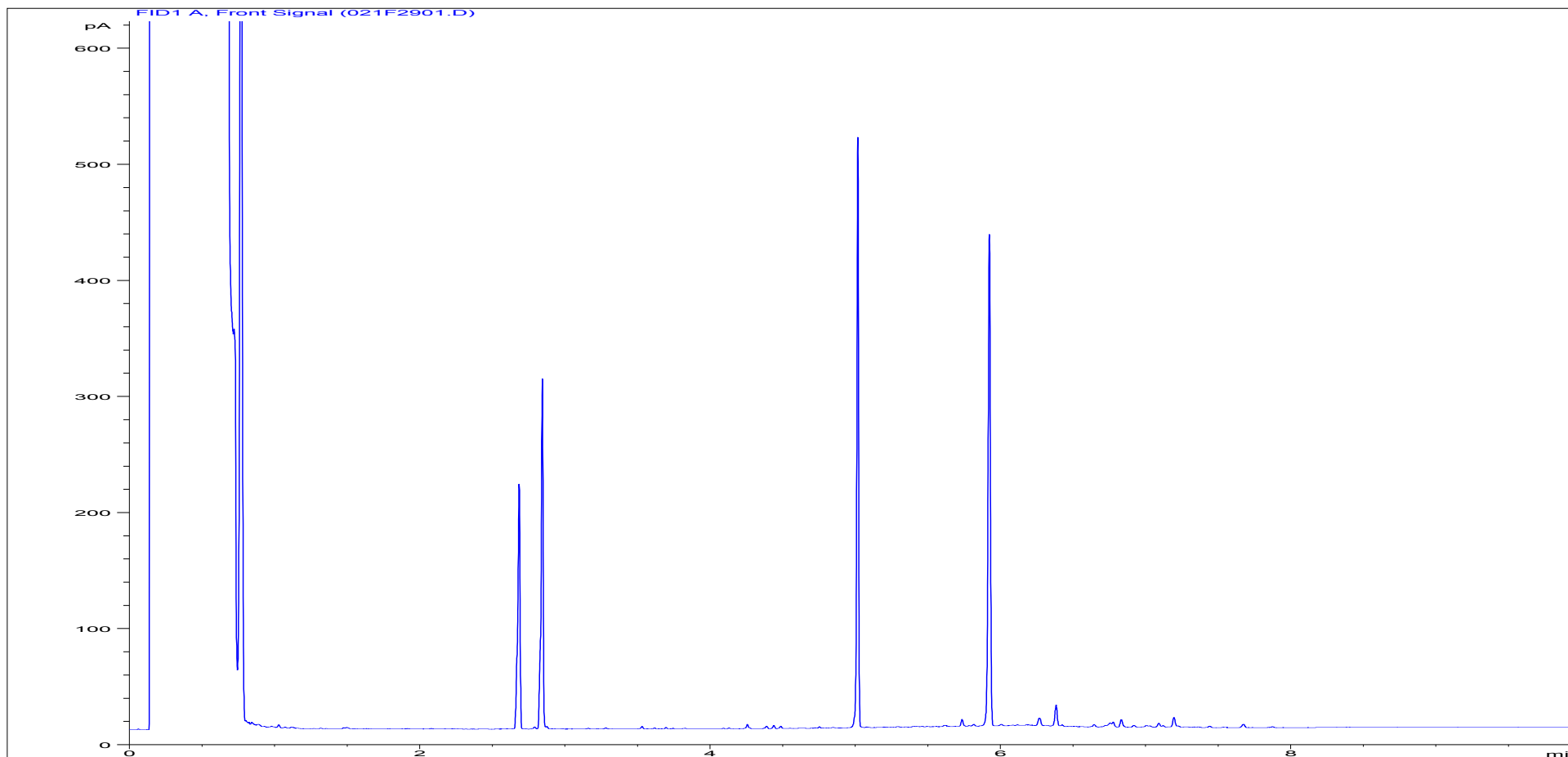


<b>Sample ID:</b>	EX1640460	<b>Job Number:</b>	W20_9637
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	D 11U
<b>Acquisition Date/Time:</b>	26-Nov-15, 17:41:43		
<b>Datafile:</b>	D:\TES\DATA\Y2015\112615TPH_GC17\112615 2015-11-26 09-09-06\020F2801.D		

Where individual results are flagged see report notes for status.



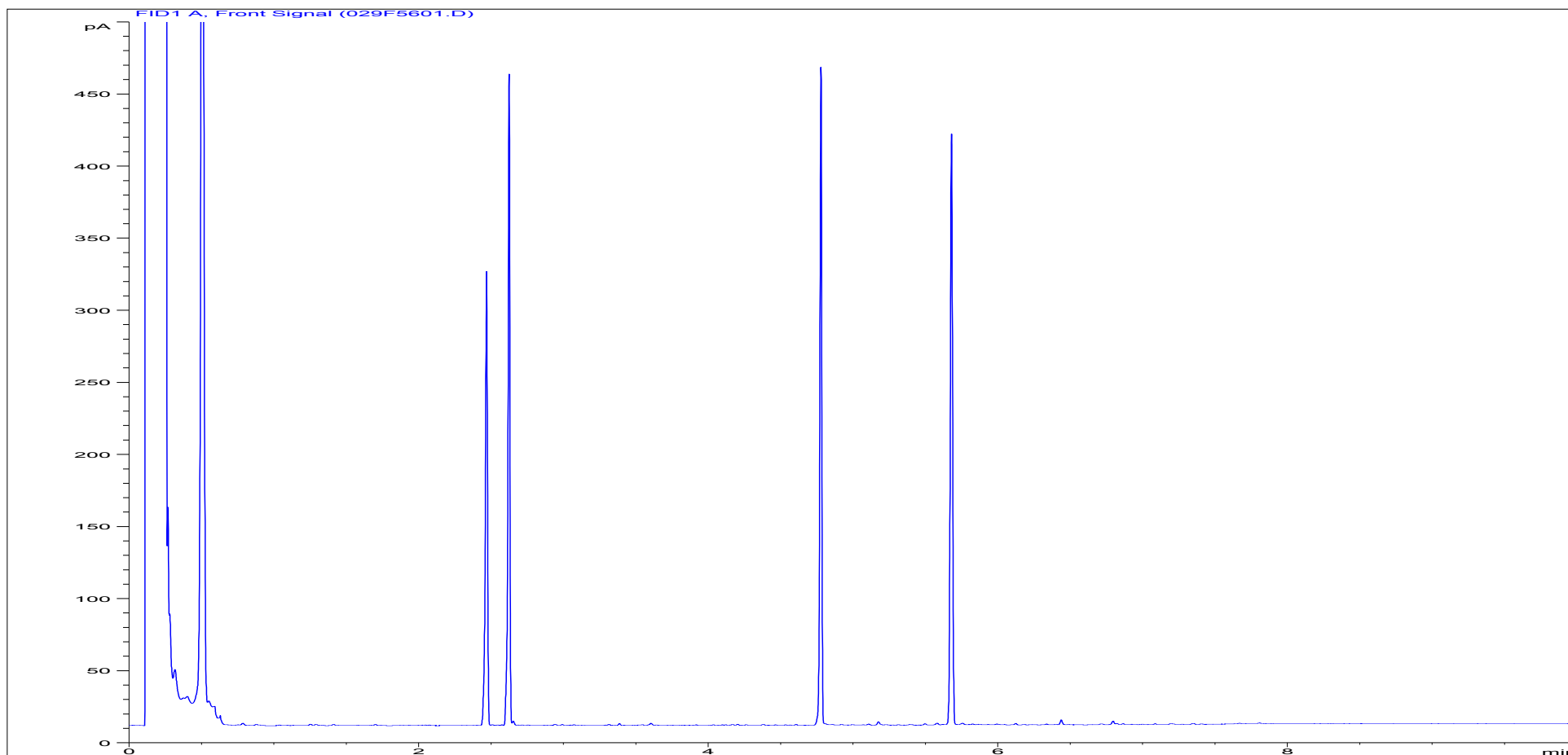
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1640461	<b>Job Number:</b>	W20_9637
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	D 11D
<b>Acquisition Date/Time:</b>	26-Nov-15, 18:00:21		
<b>Datafile:</b>	D:\TES\DATA\Y2015\112615TPH_GC17\112615 2015-11-26 09-09-06\021F2901.D		

Where individual results are flagged see report notes for status.

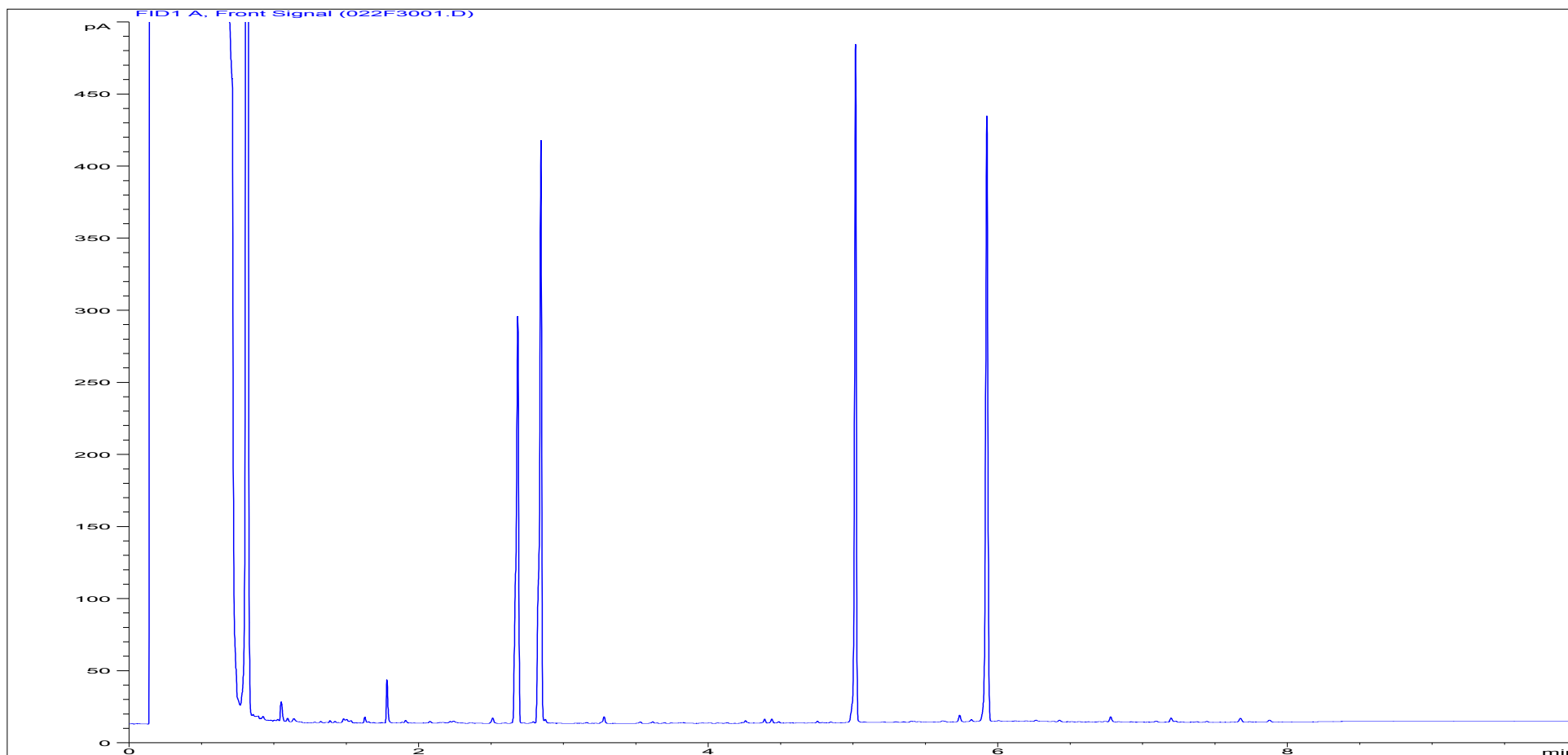
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1640462	<b>Job Number:</b>	W20_9637
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV 11
<b>Acquisition Date/Time:</b>	25-Nov-15, 01:50:05		
<b>Datafile:</b>	D:\TES\DATA\Y2015\112415TPH_GC15\112415 2015-11-24 10-09-11\029F5601.D		

Where individual results are flagged see report notes for status.

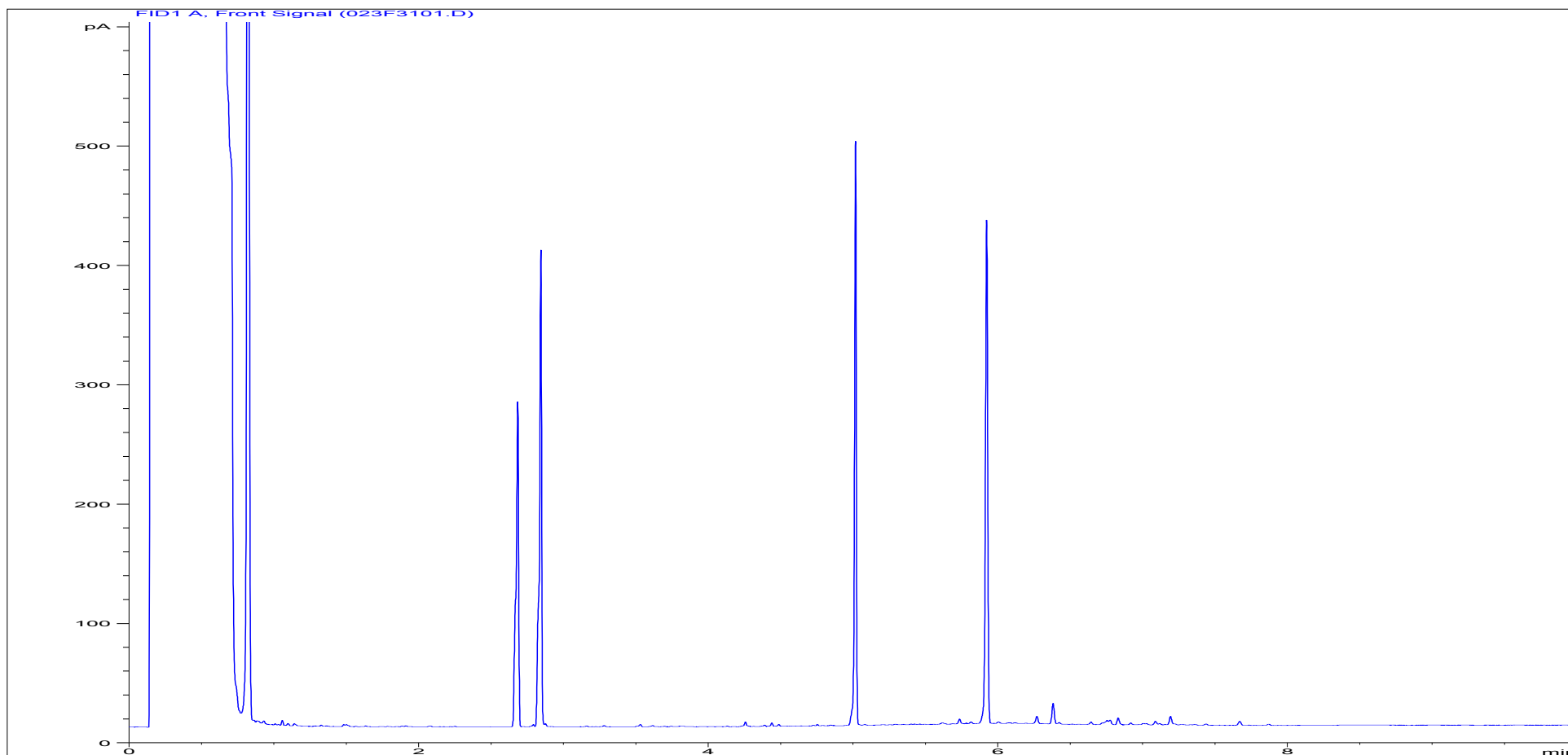
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1640463	<b>Job Number:</b>	W20_9637
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	DW 11
<b>Acquisition Date/Time:</b>	26-Nov-15, 18:19:16		
<b>Datafile:</b>	D:\TES\DATA\Y2015\112615TPH_GC17\112615 2015-11-26 09-09-06\022F3001.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1640464	Job Number:	W20_9637
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gasses in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	D 11DD
Acquisition Date/Time:	26-Nov-15, 18:37:58		
Datafile:	D:\TES\DATA\Y2015\112615TPH_GC17\112615 2015-11-26 09-09-06\023F3101.D		

Where individual results are flagged see report notes for status.

## GAS ANALYSIS

Customer: ESG - (BEC BRE), Environmental Chemistry

Date Received: 20 November 2015 Date Sampled:  
Date Analysed: 24 November 2015 Site: Envireau Water

Report N° GA01037

SAMPLE REFERENCE	Analysis % V/V
	Dissolved Methane (CH <sub>4</sub> )†
Method of Analysis	9
1640457	0.0007
1640458	0.0007
1640459	<0.0005
1640462	0.3020

Method of 9 Dissolved Gas (Not UKAS Accredited)  
Analysis:-

† Not UKAS Accredited

Customer Analytical Requirements CH <sub>4</sub>	Authorised by Phil Shead
<b>Comment Box</b> Report No: 209637	

Authorised by:



Analyst: Daniel Bignell

Issue Date: 24 November 2015

ESG accepts no responsibility for the collection of any of the samples referred to in this report.

Phil Shead, Operations Manager  
Direct Dial: 01 283 554461

Sample Analysis

ESG Environmental Chemistry  
Analytical and Deviating Sample Overview

W209637

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W209637

Consignment No W96113  
Date Logged 19-Nov-2015

Report Due 26-Nov-2015

ID Number	Description	MethodID		CUST SERV	DISGAS1	ICP/AL/AR	KONENS	TPH/FID	WSL/M2	WSL/M27	WSL/M3											
		Matrix Type	Sampled																			
				Report A	^Dissolved Methane	Total Sulphur as SO4 (Diss) VAR	Calcium as Ca (Dissolved) VAR	Magnesium as Mg (Dissolved) VAR	Sodium as Na (Dissolved) VAR	Potassium as K (Dissolved) VAR	Manganese as Mn (Dissolved) VAR	Iron as Fe (Dissolved) VAR	Aluminium as Al (Dissolved) VAR	Chloride as Cl (Kone)	TPH GC	P Alkalinity as CaCO3	Total Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Conductivity uS/cm @ 25C	Total Dissolved Solids	pH units	
EX/1640457	WF 11	Groundwater	17/11/15																			
EX/1640458	HW 11	Groundwater	17/11/15																			
EX/1640459	ETF 11	Groundwater	17/11/15																			
EX/1640460	D 11U	Surface Water	17/11/15																			
EX/1640461	D 11D	Surface Water	17/11/15																			
EX/1640462	TV 11	Groundwater	17/11/15																			
EX/1640463	DW 11	Surface Water	17/11/15																			
EX/1640464	D 11DD	Surface Water	17/11/15																			

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - Note: due date may be affected if triggered
	No analysis scheduled
	Analysis Subcontracted - Note: due date may vary

Report Number : W/EXR/209637

# Additional Report Notes

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
TPHFID	EX1640460 EX1640461 EX1640463 EX1640464	This sample has been taken from a non standard inorganic bottle. Accreditation has therefore been removed from these samples. These circumstances should be taken into consideration when utilising the data.

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Where individual results are flagged see report notes for status.



# Report Notes

## Generic Notes

### Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### Waters Analysis

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup>@ 15°C

### Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

### Asbestos Analysis

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

**^** Sub-contracted analysis.

**\$\$** Unable to analyse due to the nature of the sample

**¶** Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

**¥** Results for guidance only due to possible interference

**&** Blank corrected result

**I.S** Insufficient sample to complete requested analysis

**I.S(g)** Insufficient sample to re-analyse, results for guidance only

**Intf** Unable to analyse due to interferences

**N.D** Not determined

**N.Det** Not detected

**N.F** No Flow

**NS** Information Not Supplied

**Req** Analysis requested, see attached sheets for results

**▯** Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** Dissolved Gasses in Waters  
**Report Number :** W20\_9637

## Water Analysis Test Certificate

Round 12

Our Ref: EXR/211176 (Ver. 1)

Your Ref:

December 18, 2015



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Armelle Bonneton  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Armelle Bonneton

Dear Armelle Bonneton

**Sample Analysis - Dissolved Gasses in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

A handwritten signature in black ink, appearing to be 'L. Thompson', followed by a horizontal line.

L Thompson

Project Co-ordinator

01283 554467

# TEST REPORT



1252

**Report No. EXR/211176 (Ver. 1)**

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

**Site: Dissolved Gasses in Waters**

The 8 samples described in this report were registered for analysis by ESG on 14-Dec-2015. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 18-Dec-2015

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Pages 2 to 3)  
Table of TPH Texas banding (0.01) (Page 4)  
GC-FID Chromatograms (Pages 5 to 12)  
Analytical and Deviating Sample Overview (Pages 13 to 14)  
Table of Method Descriptions (Page 15)  
Table of Report Notes (Page 16)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns

  
Managing Director  
Multi-Sector Services

Date of Issue: 18-Dec-2015

Tests marked 'N' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

ESG accepts no responsibility for any sampling not carried out by our personnel.



[illegible]

## Total Petroleum Hydrocarbons (TPH) Carbon Ranges

**Customer and Site Details:** Envireau Water : Dissolved Gasses in Waters  
**Job Number:** W21\_1176  
**QC Batch Number:** 150852  
**Directory:** D:\TES\DATA\Y2015\121615TPH\_GC15\121615A 2015-12-17 08-45-24\041B8601.D  
**Method:** Bottle

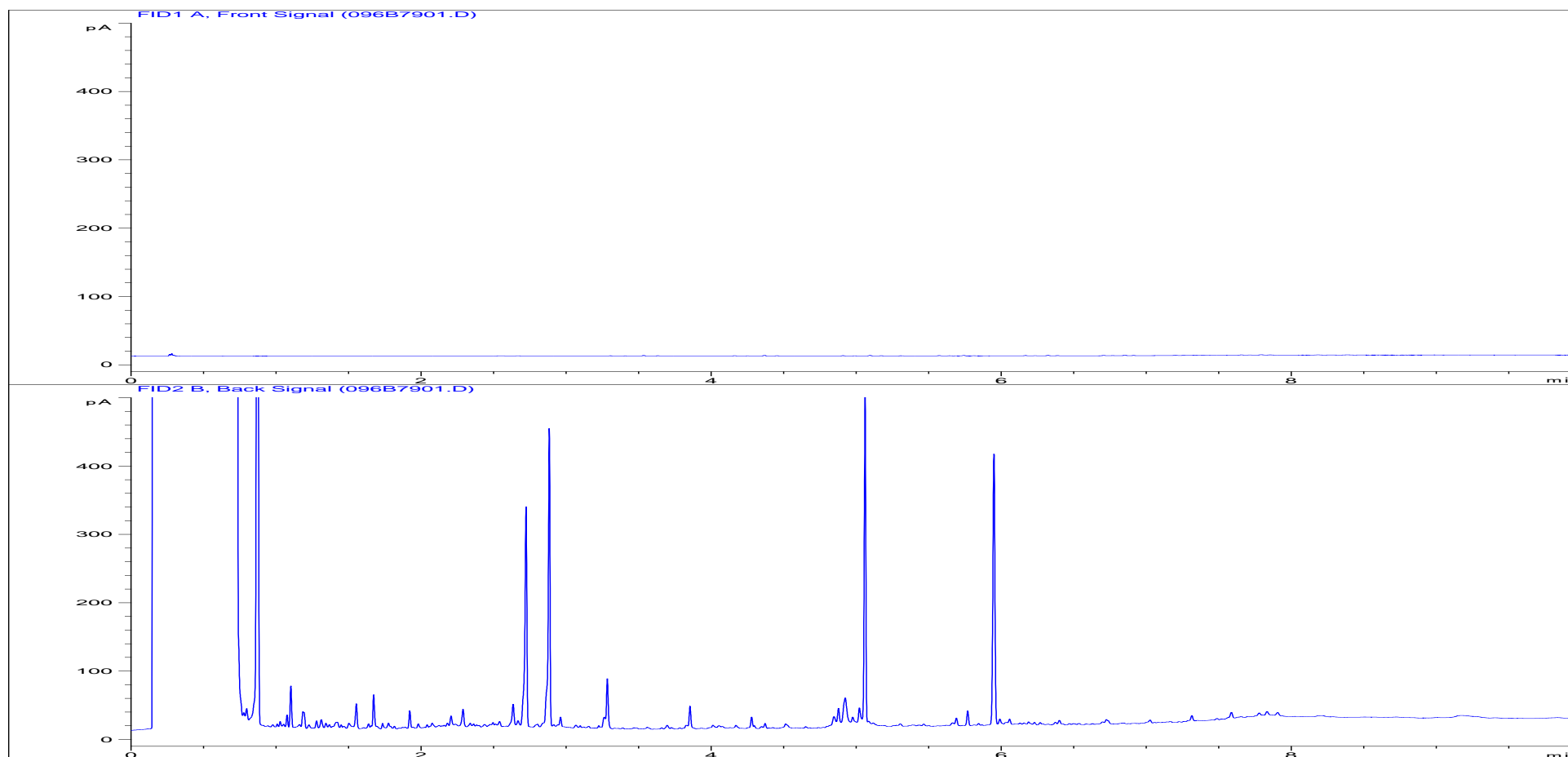
**Matrix:** Water  
**Date Booked in:** 14-Dec-15  
**Date Extracted:** 17-Dec-15  
**Date Analysed:** 18-Dec-15, 08:47:26

\* Sample data with an asterisk are not UKAS accredited.

[illegible]



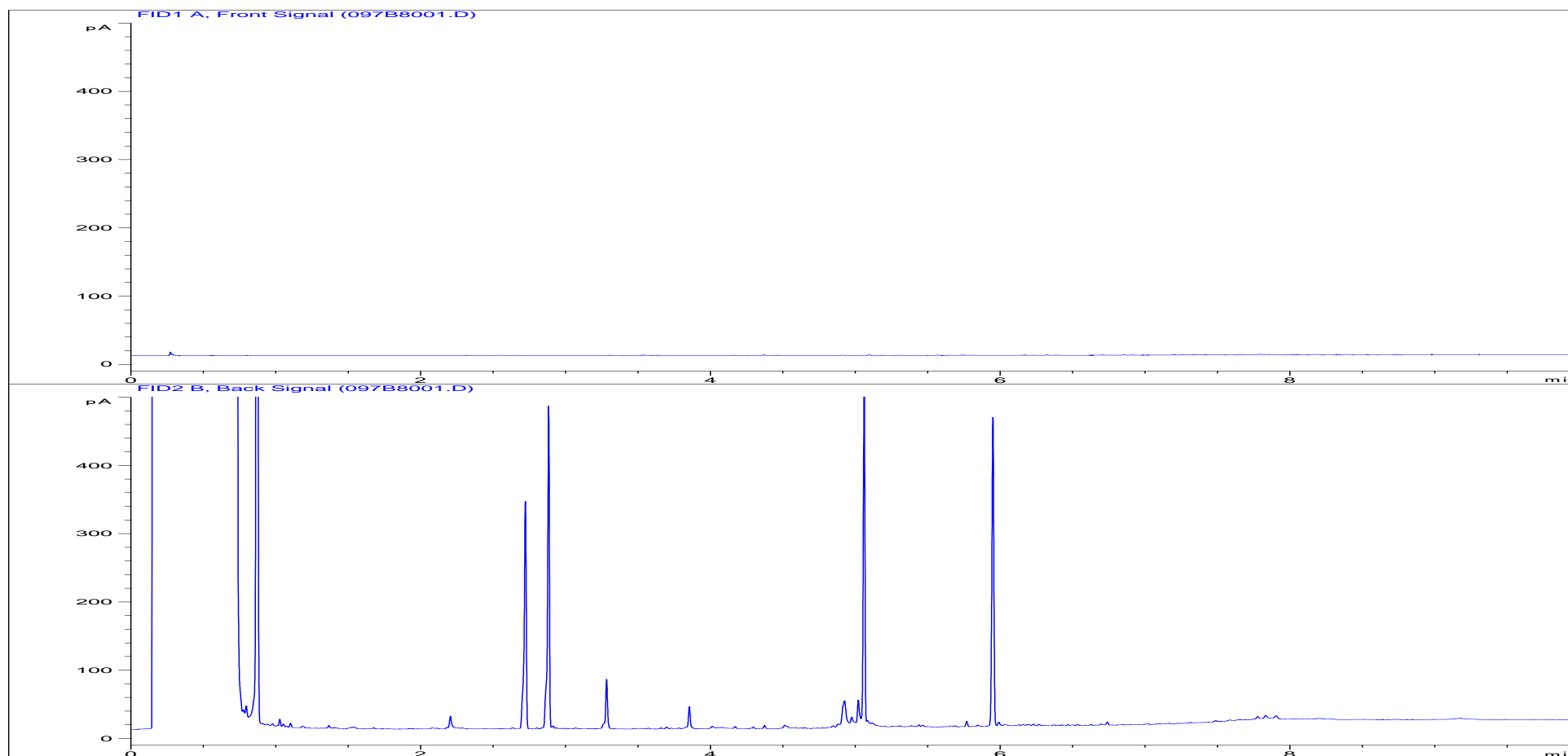
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1647466	<b>Job Number:</b>	W21_1176
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	WF/12
<b>Acquisition Date/Time:</b>	18-Dec-15, 06:52:40		
<b>Datafile:</b>	D:\TES\DATA\Y2015\121615TPH_GC15\121615A 2015-12-17 08-45-24\096B7901.D		

Where individual results are flagged see report notes for status.

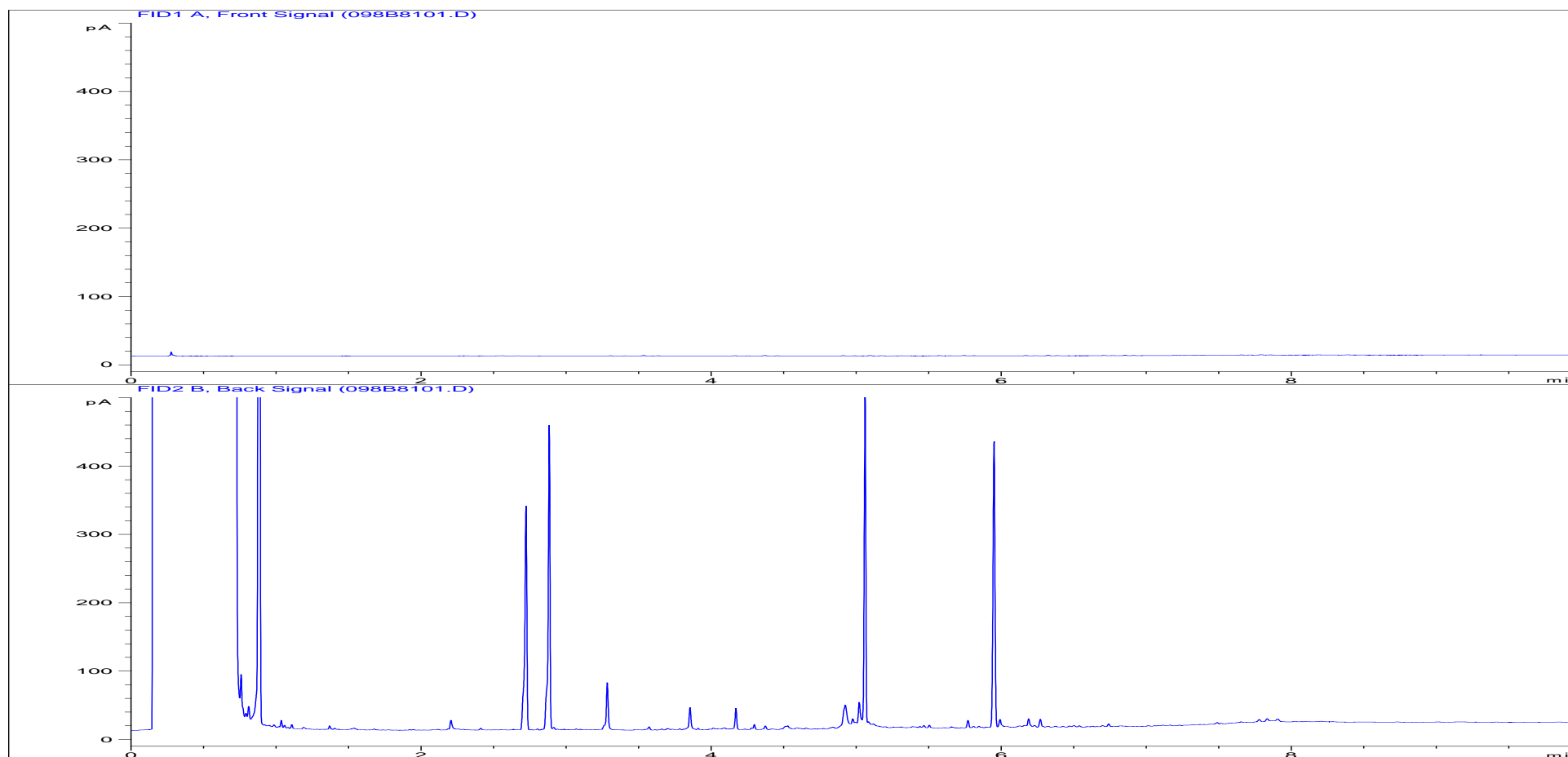
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1647467	<b>Job Number:</b>	W21_1176
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	HW/12
<b>Acquisition Date/Time:</b>	18-Dec-15, 07:08:56		
<b>Datafile:</b>	D:\TES\DATA\Y2015\121615TPH_GC15\121615A 2015-12-17 08-45-24\097B8001.D		

Where individual results are flagged see report notes for status.

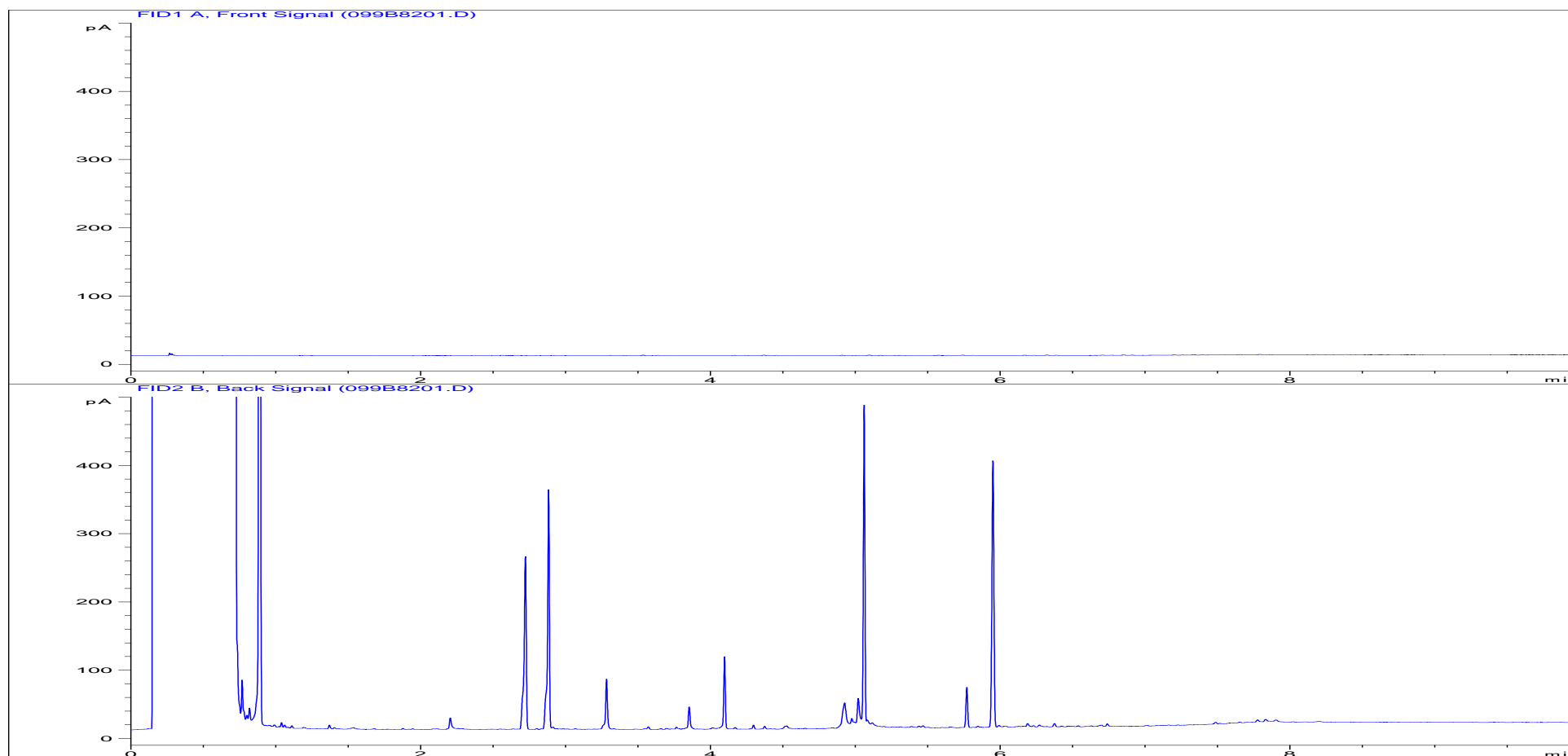
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1647468	<b>Job Number:</b>	W21_1176
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	ETF/12
<b>Acquisition Date/Time:</b>	18-Dec-15, 07:25:20		
<b>Datafile:</b>	D:\TES\DATA\Y2015\121615TPH_GC15\121615A 2015-12-17 08-45-24\098B8101.D		

Where individual results are flagged see report notes for status.

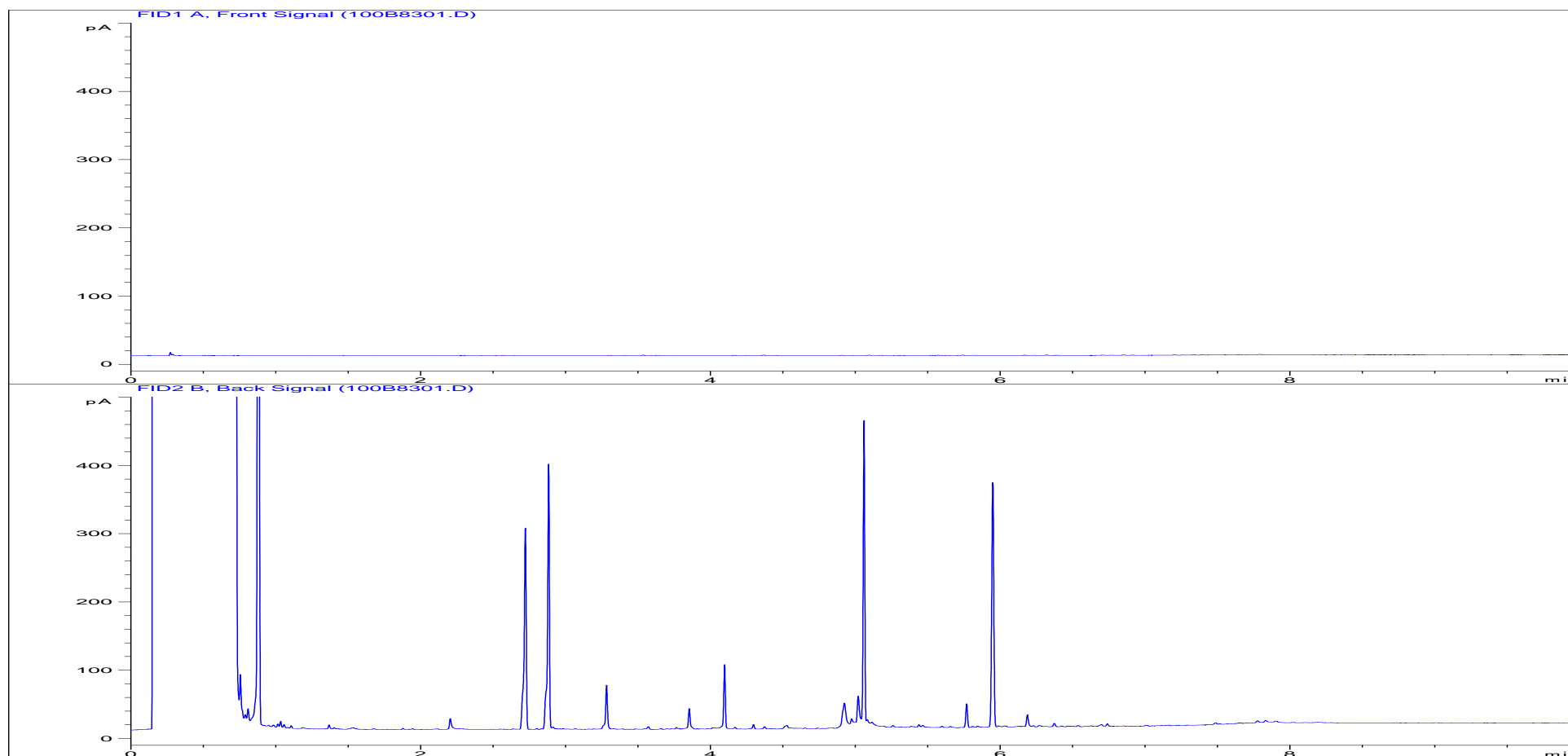
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1647469	<b>Job Number:</b>	W21_1176
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	D/12U
<b>Acquisition Date/Time:</b>	18-Dec-15, 07:41:50		
<b>Datafile:</b>	D:\TES\DATA\Y2015\121615TPH_GC15\121615A 2015-12-17 08-45-24\099B8201.D		

Where individual results are flagged see report notes for status.

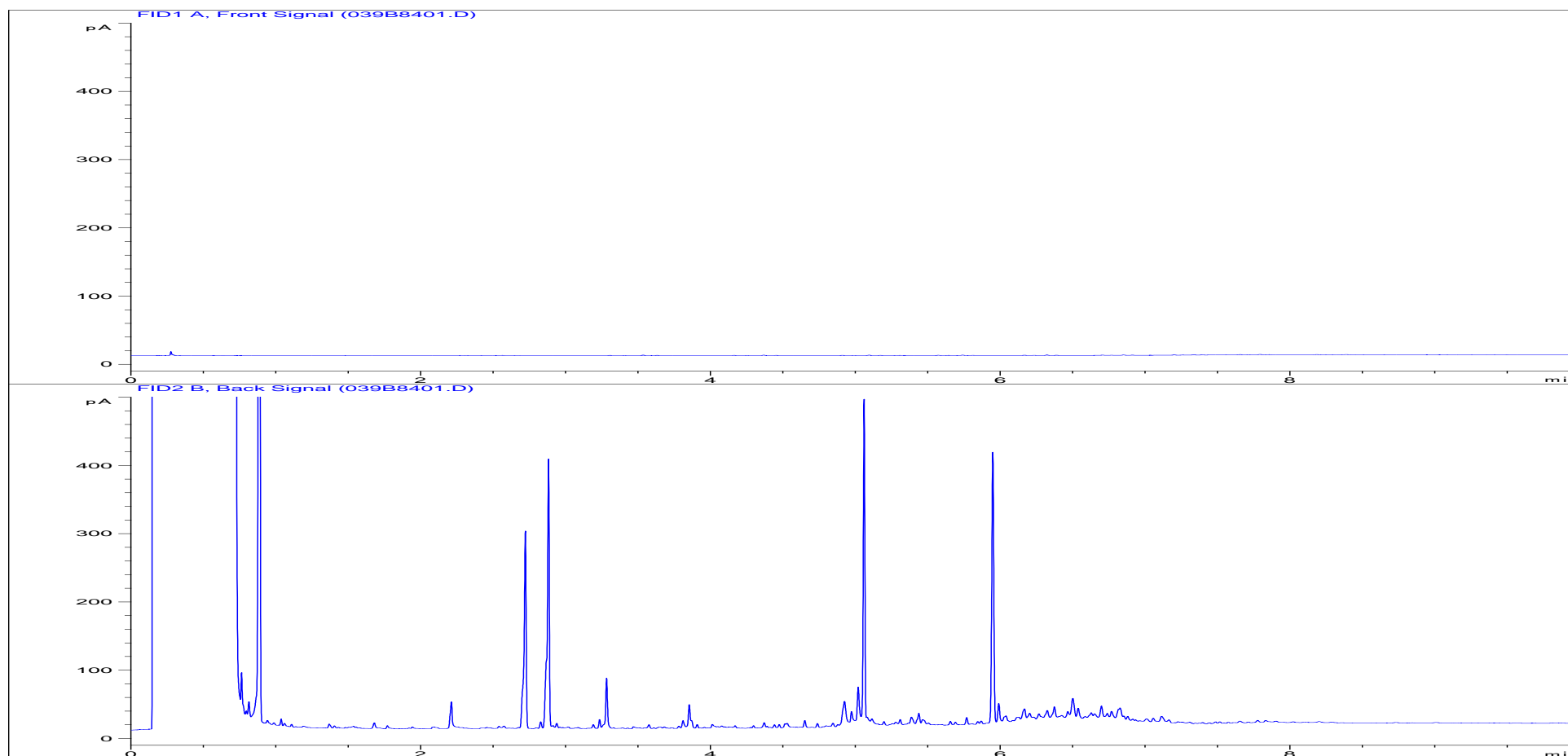
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1647470	<b>Job Number:</b>	W21_1176
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	D/12D
<b>Acquisition Date/Time:</b>	18-Dec-15, 07:58:16		
<b>Datafile:</b>	D:\TES\DATA\Y2015\121615TPH_GC15\121615A 2015-12-17 08-45-24\100B8301.D		

Where individual results are flagged see report notes for status.

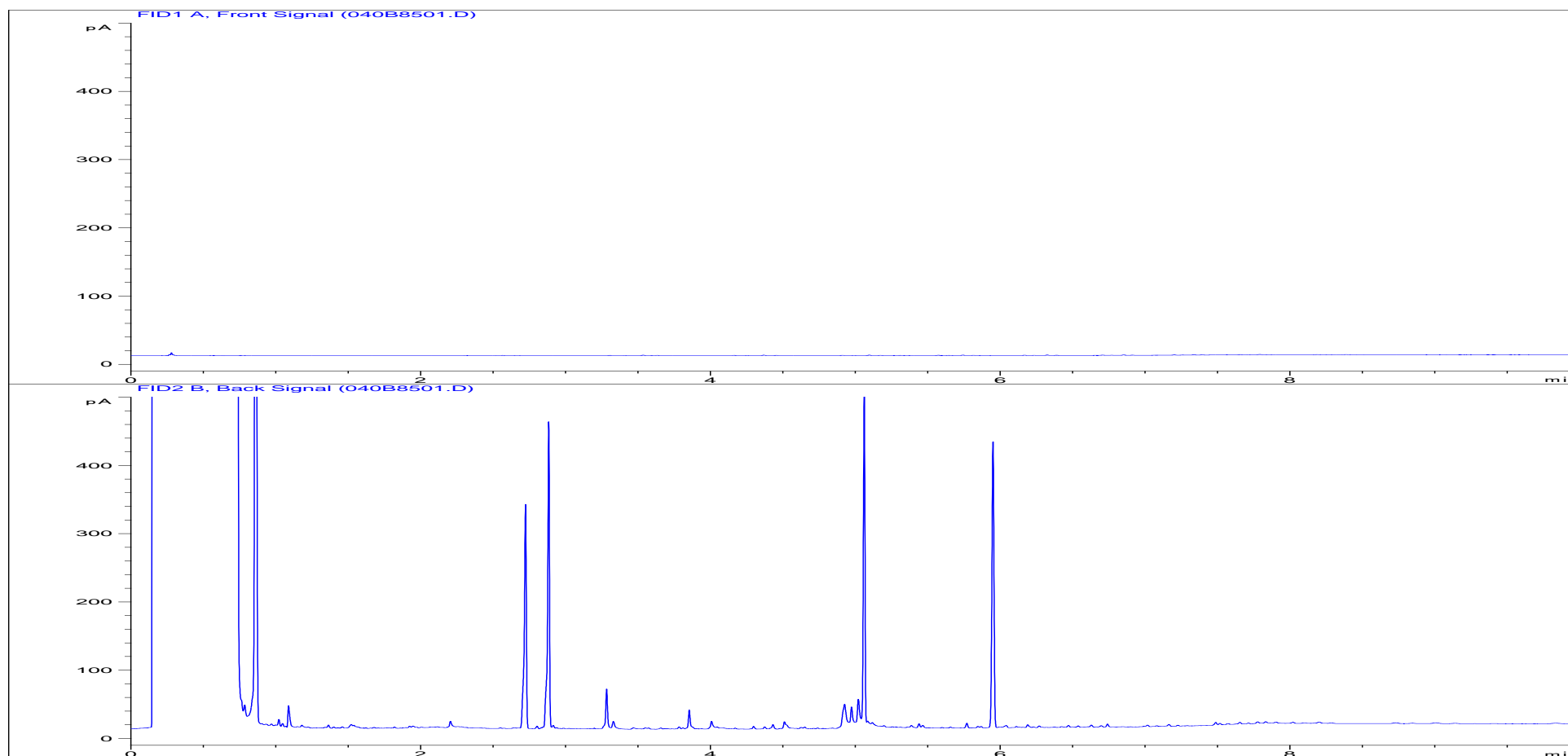
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1647471	<b>Job Number:</b>	W21_1176
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV/12
<b>Acquisition Date/Time:</b>	18-Dec-15, 08:14:36		
<b>Datafile:</b>	D:\TES\DATA\Y2015\121615TPH_GC15\121615A 2015-12-17 08-45-24\039B8401.D		

Where individual results are flagged see report notes for status.

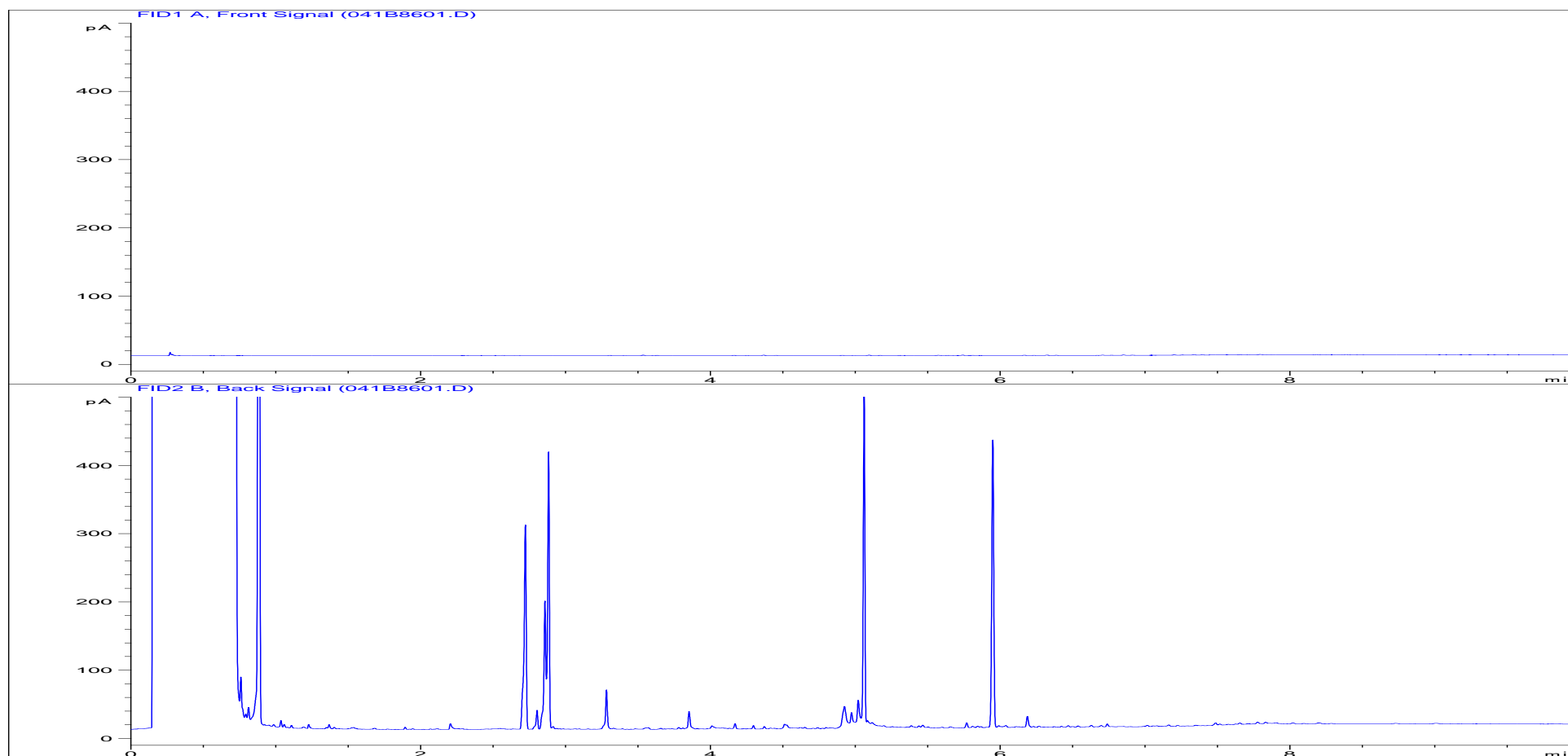
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1647472	<b>Job Number:</b>	W21_1176
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	DW/12
<b>Acquisition Date/Time:</b>	18-Dec-15, 08:30:59		
<b>Datafile:</b>	D:\TES\DATA\Y2015\121615TPH_GC15\121615A 2015-12-17 08-45-24\040B8501.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1647473	<b>Job Number:</b>	W21_1176
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	FW/12
<b>Acquisition Date/Time:</b>	18-Dec-15, 08:47:26		
<b>Datafile:</b>	D:\TES\DATA\Y2015\121615TPH_GC15\121615A 2015-12-17 08-45-24\041B8601.D		

Where individual results are flagged see report notes for status.



# Sample Analysis

## ESG Environmental Chemistry Analytical and Deviating Sample Overview

W211176

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W211176

Consignment No W97319  
Date Logged 14-Dec-2015

Report Due 21-Dec-2015

ID Number	Description	MethodID		CUSTSERV	DISGAS1	ICPMATVAR											KONEIS	TPHFD	WSLM12		WSLM2	WSLM27	WSLM3
		Matrix Type	Sampled				Total Sulphur as SO4 (Diss) VAR	Calcium as Ca (Dissolved) VAR	Magnesium as Mg (Dissolved) VAR	Sodium as Na (Dissolved) VAR	Potassium as K (Dissolved) VAR	Manganese as Mn (Dissolved) VAR	Iron as Fe (Dissolved) VAR	Aluminium as Al (Dissolved) VAR	Chloride as Cl (Kone)	TPH Carbon Banding	TPH GC	P Alkalinity as CaCO3	Total Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Conductivity uS/cm @ 25C	Total Dissolved Solids	pH units
							^ Dissolved Methane																
EX/1647466	WF/12	Groundwater	10/12/15												E								
EX/1647467	HW/12	Groundwater	10/12/15																				
EX/1647468	ETF/12	Groundwater	10/12/15												E								
EX/1647469	D/12U	Surface Water	10/12/15												E								
EX/1647470	D/12D	Surface Water	10/12/15												E								
EX/1647471	TV/12	Groundwater	10/12/15																				
EX/1647472	DW/12	Surface Water	10/12/15																				
EX/1647473	FW/12	Groundwater	10/12/15												E								

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

### Deviating Sample Key

- A The sample was received in an inappropriate container for this analysis
- B The sample was received without the correct preservation for this analysis
- C Headspace present in the sample container
- D The sampling date was not supplied so holding time may be compromised - applicable to all analysis
- E Sample processing did not commence within the appropriate holding time
- F Sample processing did not commence within the appropriate handling time

### Requested Analysis Key

- Analysis Required
- Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
- No analysis scheduled
- ^ Analysis Subcontracted - **Note: due date may vary**

## Sample Analysis

## ESG Environmental Chemistry Analytical and Deviating Sample Overview

W211176

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W211176

Consignment No W97319  
Date Logged 14-Dec-2015

Report Due 21-Dec-2015

ID Number	Description	MethodID		WSLM3
		Matrix Type	Sampled	pH units
				✓
EX/1647466	WF/12	Groundwater	10/12/15	
EX/1647467	HW/12	Groundwater	10/12/15	
EX/1647468	ETF/12	Groundwater	10/12/15	
EX/1647469	D/12U	Surface Water	10/12/15	
EX/1647470	D/12D	Surface Water	10/12/15	
EX/1647471	TV/12	Groundwater	10/12/15	
EX/1647472	DW/12	Surface Water	10/12/15	
EX/1647473	FW/12	Groundwater	10/12/15	

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

### Deviating Sample Key

- A The sample was received in an inappropriate container for this analysis
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- F Sample processing did not commence within the appropriate handling time

### Requested Analysis Key

- Analysis Required
- Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
- No analysis scheduled
- ^ Analysis Subcontracted - **Note: due date may vary**

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

# Report Notes

## Generic Notes

### Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### Waters Analysis

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup> @ 15°C

### Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

### Asbestos Analysis

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

**^** Sub-contracted analysis.

**\$\$** Unable to analyse due to the nature of the sample

**¶** Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

**¥** Results for guidance only due to possible interference

**&** Blank corrected result

**I.S** Insufficient sample to complete requested analysis

**I.S(g)** Insufficient sample to re-analyse, results for guidance only

**Intf** Unable to analyse due to interferences

**N.D** Not determined

**N.Det** Not detected

**N.F** No Flow

**NS** Information Not Supplied

**Req** Analysis requested, see attached sheets for results

**⬆** Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** Dissolved Gasses in Waters  
**Report Number :** W21\_1176

[illegible]

## Water Analysis Test Certificate

Round 13

Our Ref: EXR/212494 (Ver. 1)

Your Ref:

January 21, 2016



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Armelle Bonneton  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Armelle Bonneton

Dear Armelle Bonneton

**Sample Analysis - Dissolved Gasses in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

A handwritten signature in black ink, appearing to be 'L Thompson', followed by a horizontal line.

L Thompson  
Project Co-ordinator  
01283 554467

# TEST REPORT



Report No. EXR/212494 (Ver. 1)

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

## Site: Dissolved Gasses in Waters

The 8 samples described in this report were registered for analysis by ESG on 14-Jan-2016. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 21-Jan-2016

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Page 2)  
GC-FID Chromatograms (Pages 3 to 10)  
Analytical and Deviating Sample Overview (Page 11)  
Table of Method Descriptions (Page 12)  
Table of Report Notes (Page 13)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns

  
Managing Director  
Multi-Sector Services

Date of Issue: 21-Jan-2016

Tests marked '^' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

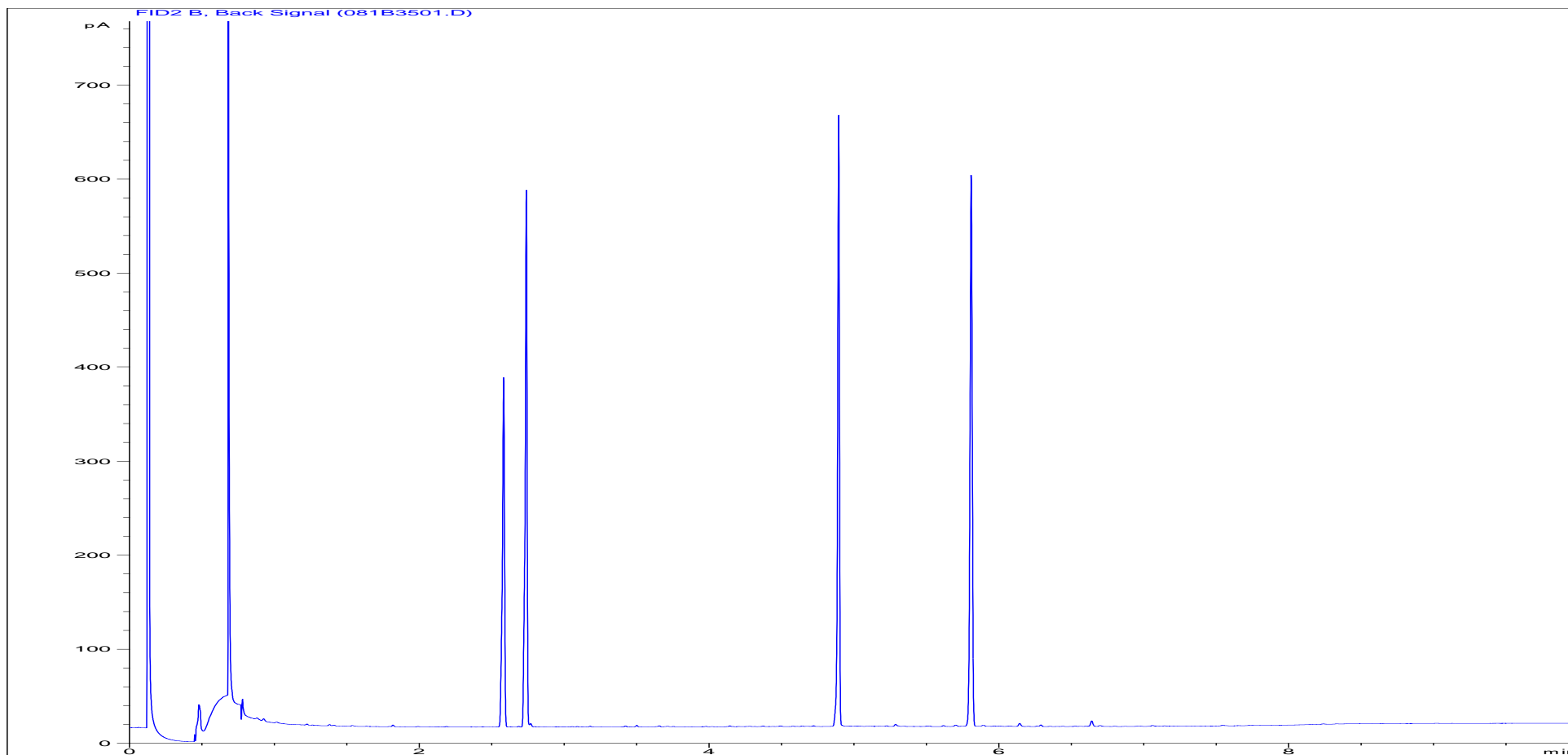
ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.





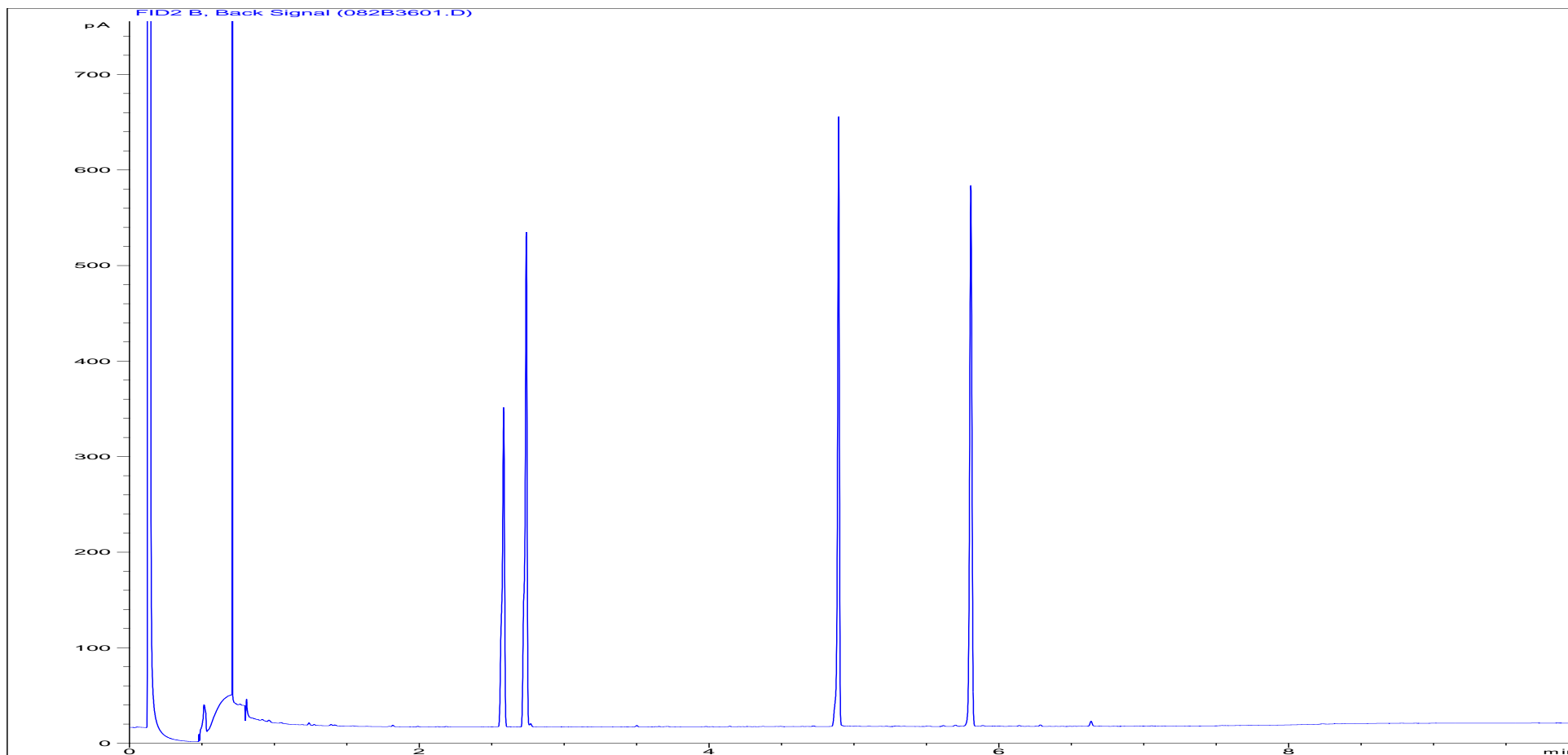
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1652839	<b>Job Number:</b>	W21_2494
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	WF/13
<b>Acquisition Date/Time:</b>	16-Jan-16, 02:57:43		
<b>Datafile:</b>	D:\TES\DATA\Y2016\011516TPH_GC17\011516 2016-01-15 16-36-39\081B3501.D		

Where individual results are flagged see report notes for status.

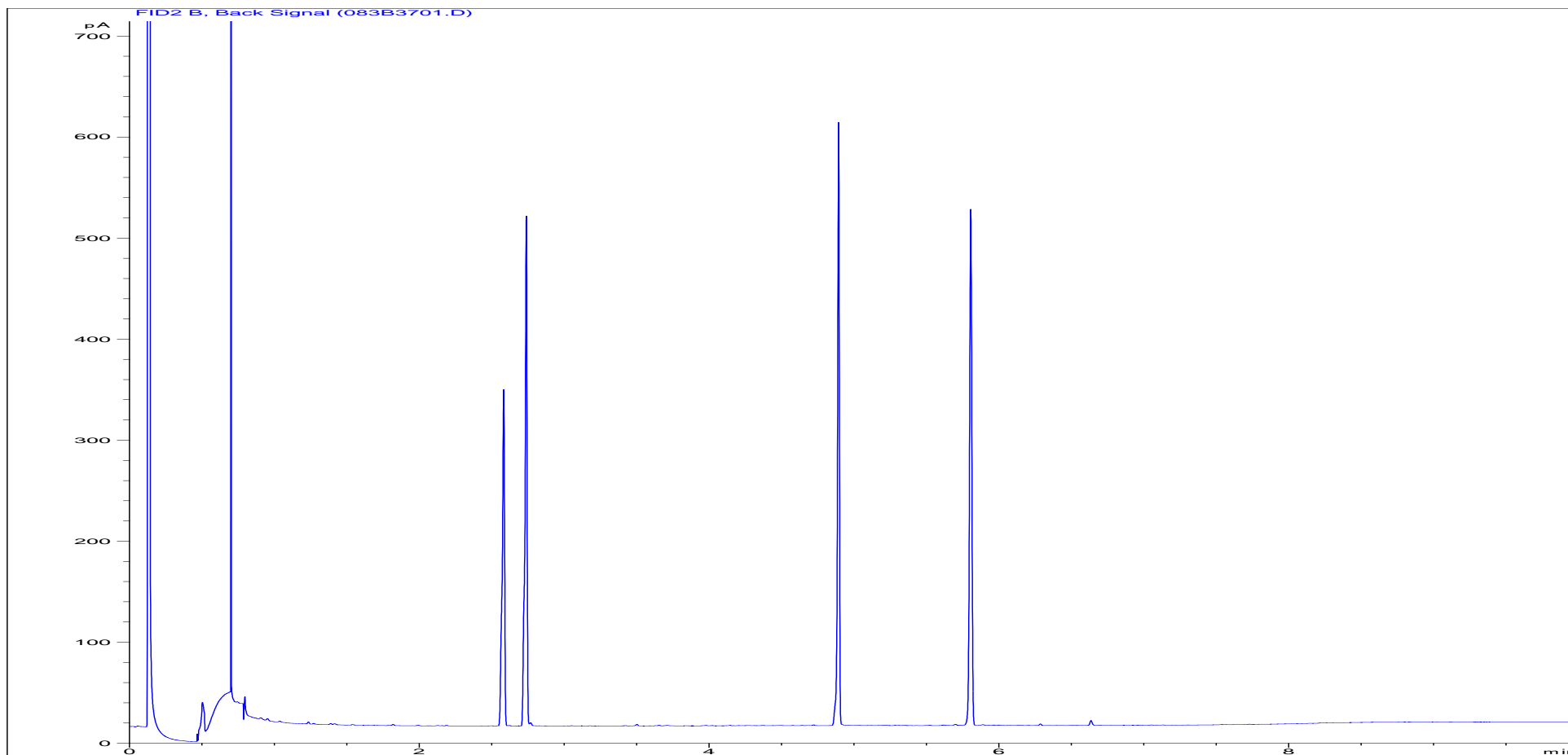
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1652840	<b>Job Number:</b>	W21_2494
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	HW/13
<b>Acquisition Date/Time:</b>	16-Jan-16, 03:15:19		
<b>Datafile:</b>	D:\TES\DATA\Y2016\011516TPH_GC17\011516 2016-01-15 16-36-39\082B3601.D		

Where individual results are flagged see report notes for status.

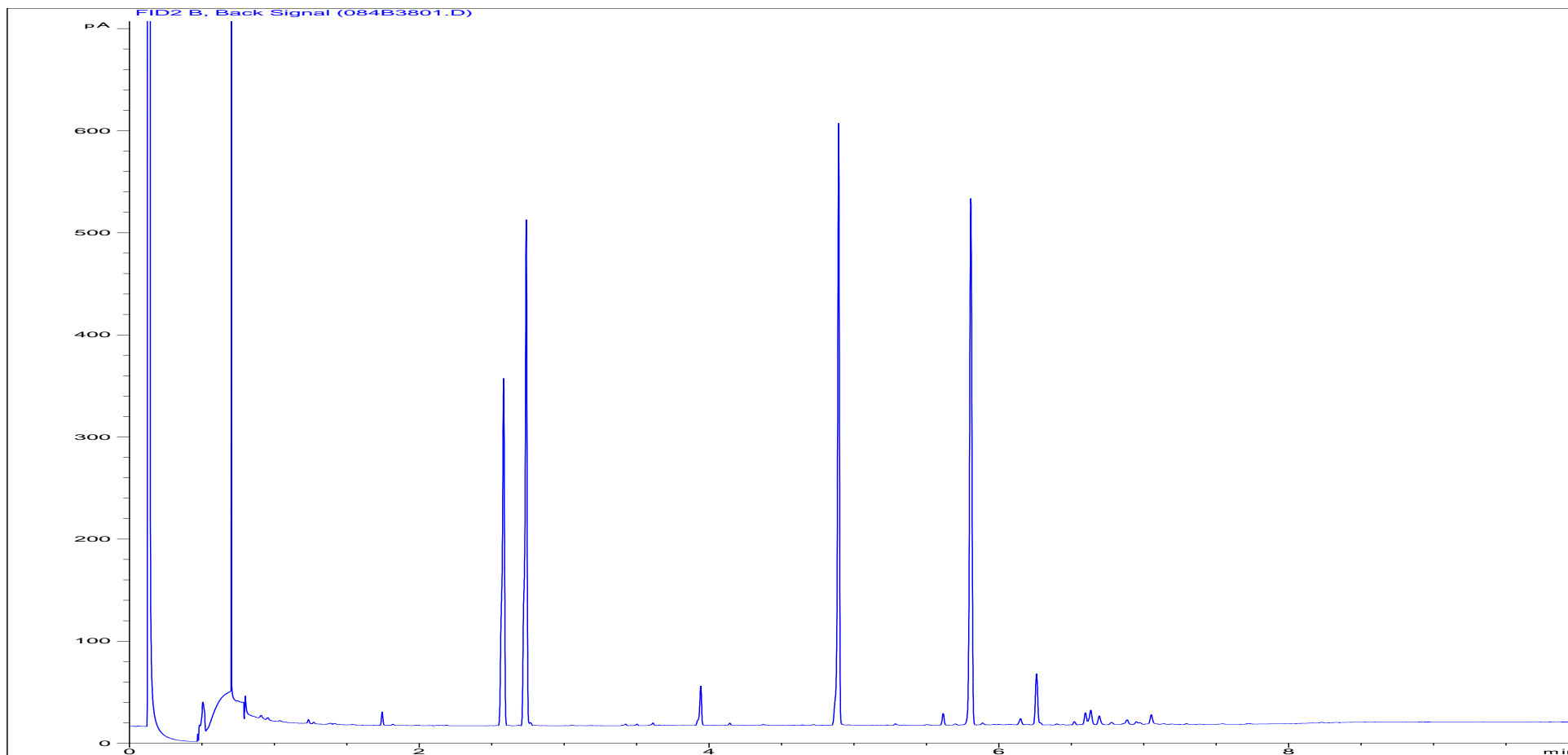
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1652841	<b>Job Number:</b>	W21_2494
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	ETF/13
<b>Acquisition Date/Time:</b>	16-Jan-16, 03:32:54		
<b>Datafile:</b>	D:\TES\DATA\Y2016\011516TPH_GC17\011516 2016-01-15 16-36-39\083B3701.D		

Where individual results are flagged see report notes for status.

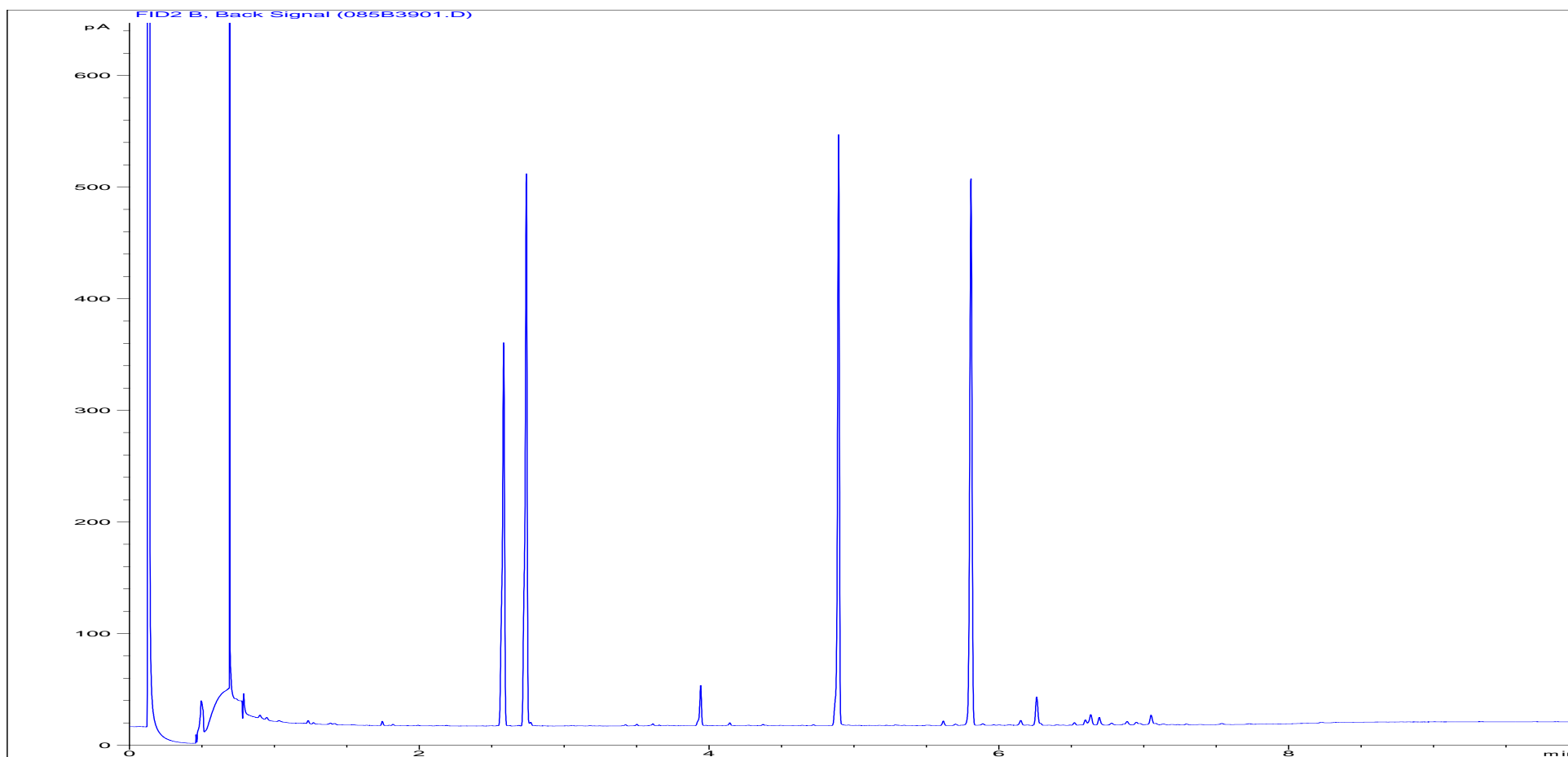
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1652842	<b>Job Number:</b>	W21_2494
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	D/13U
<b>Acquisition Date/Time:</b>	16-Jan-16, 03:50:43		
<b>Datafile:</b>	D:\TES\DATA\Y2016\011516TPH_GC17\011516 2016-01-15 16-36-39\084B3801.D		

Where individual results are flagged see report notes for status.

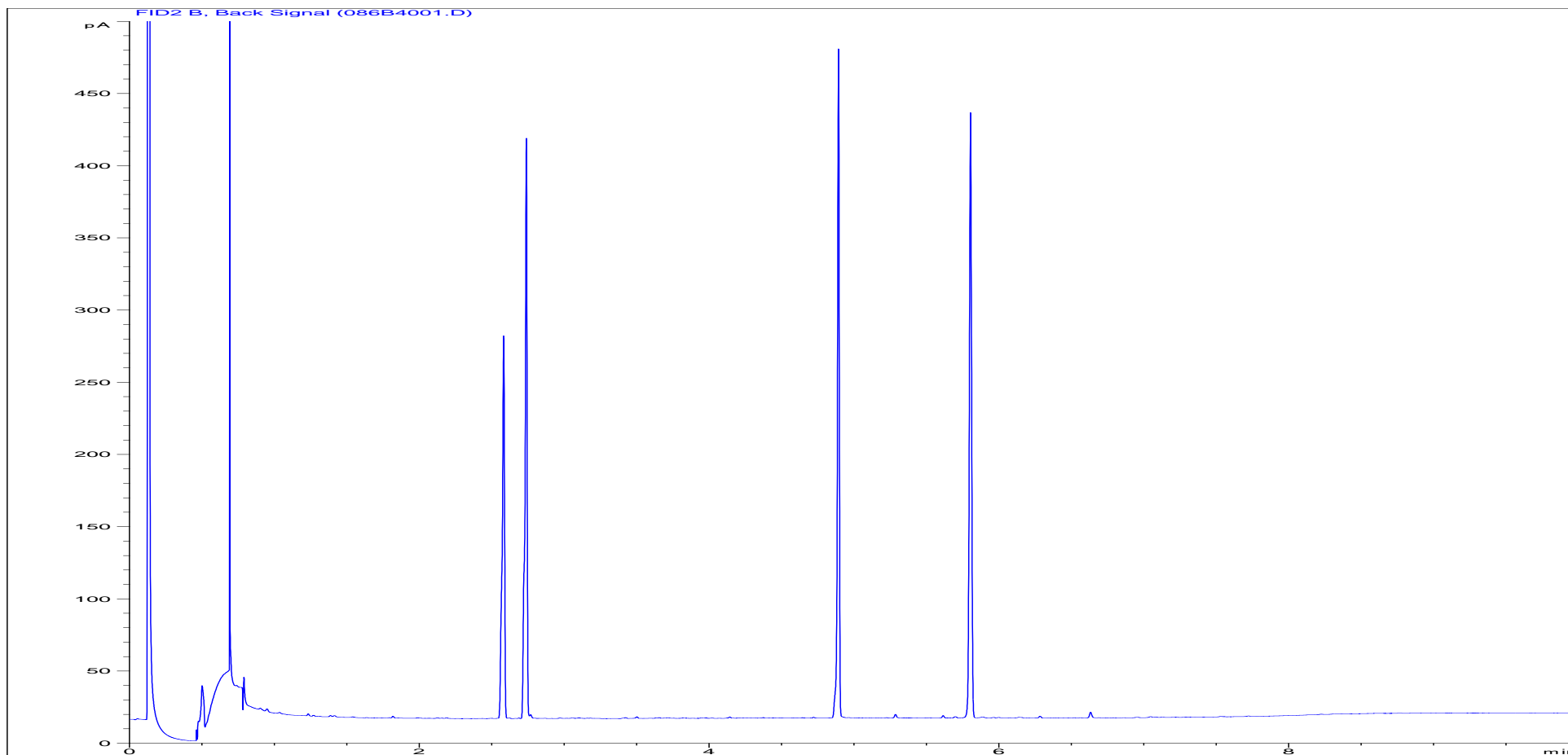
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1652843	<b>Job Number:</b>	W21_2494
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	D/13D
<b>Acquisition Date/Time:</b>	16-Jan-16, 04:08:18		
<b>Datafile:</b>	D:\TES\DATA\Y2016\011516TPH_GC17\011516 2016-01-15 16-36-39\085B3901.D		

Where individual results are flagged see report notes for status.

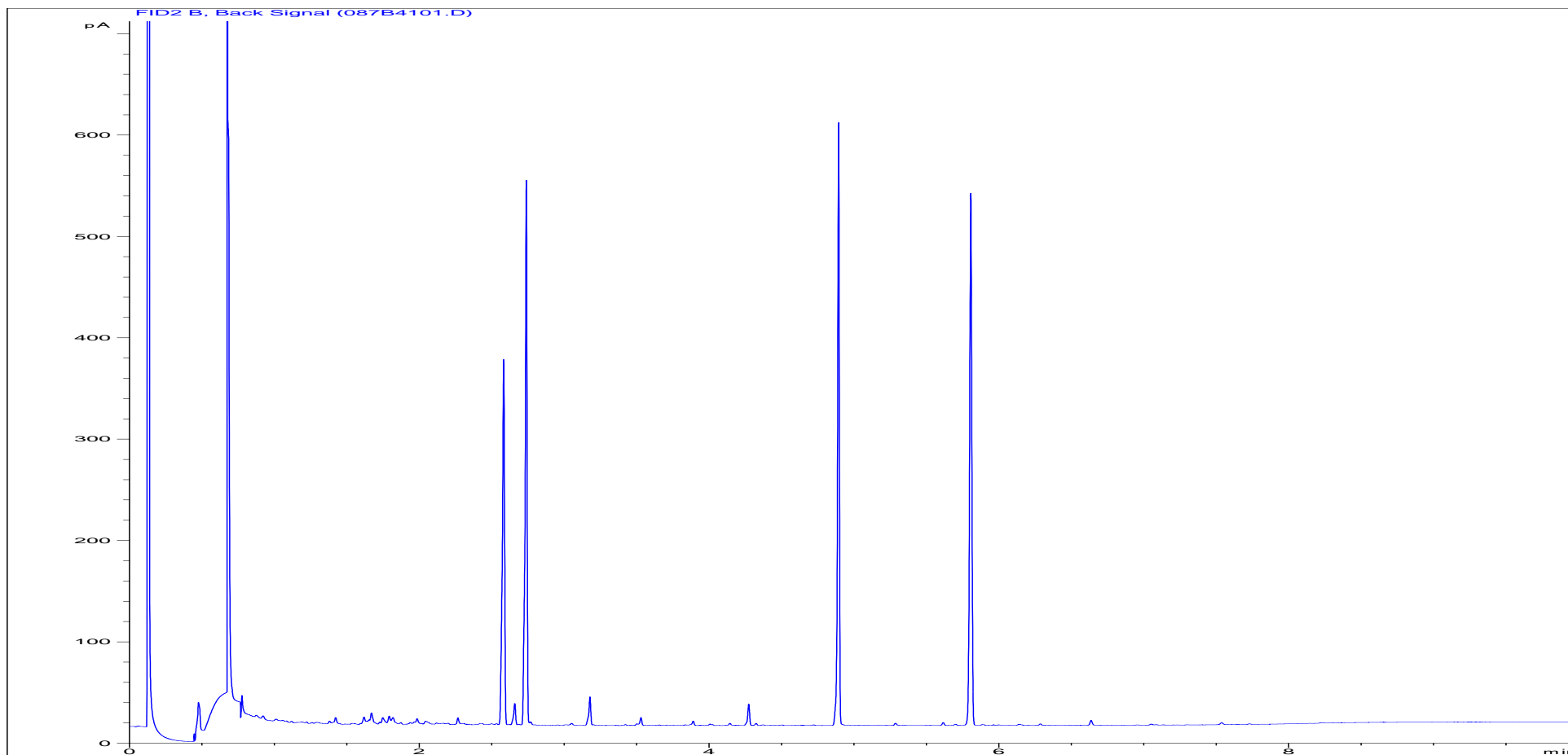
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1652844	<b>Job Number:</b>	W21_2494
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV/13
<b>Acquisition Date/Time:</b>	16-Jan-16, 04:25:52		
<b>Datafile:</b>	D:\TES\DATA\Y2016\011516TPH_GC17\011516 2016-01-15 16-36-39\086B4001.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID

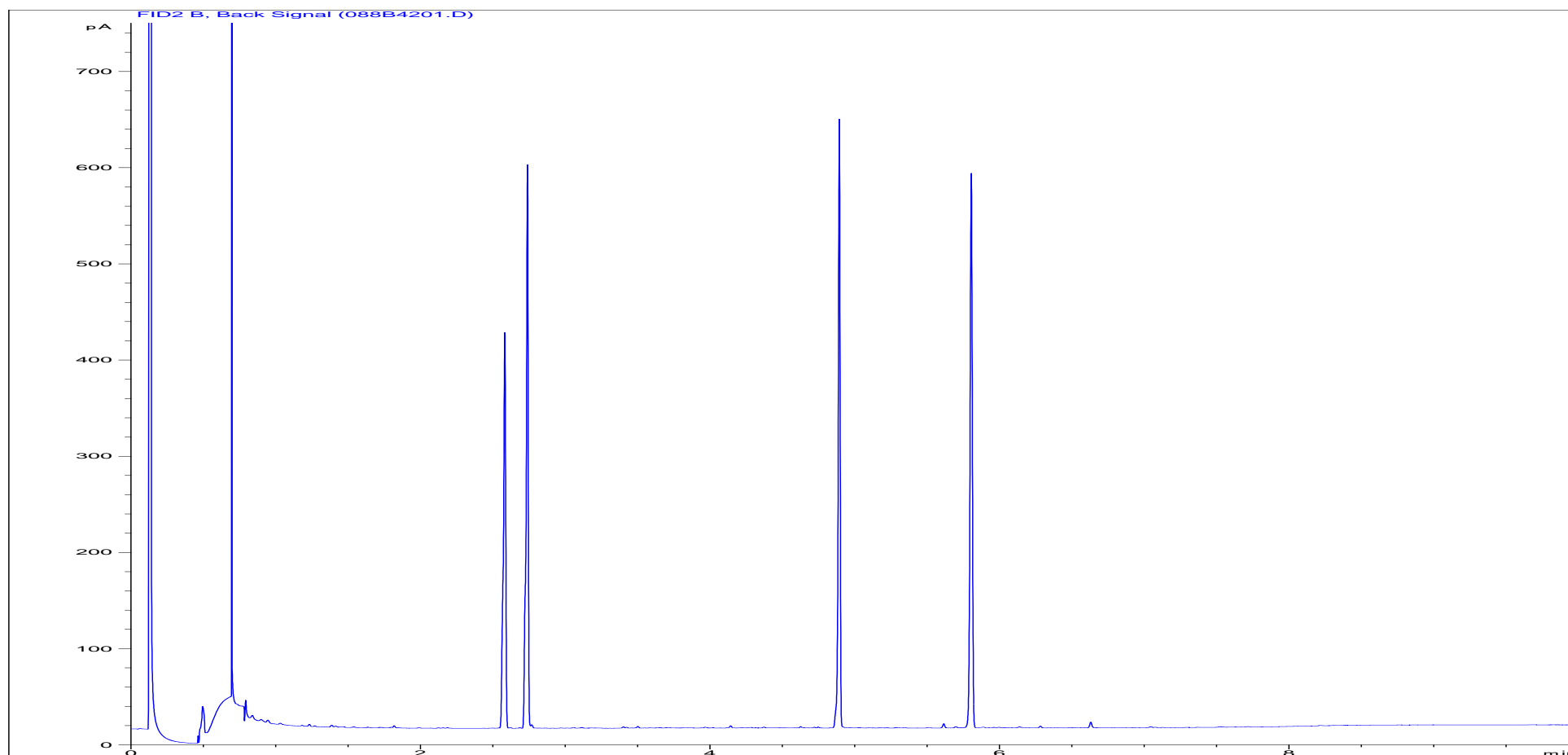


<b>Sample ID:</b>	EX1652845	<b>Job Number:</b>	W21_2494
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	DW/13
<b>Acquisition Date/Time:</b>	16-Jan-16, 04:43:50		
<b>Datafile:</b>	D:\TES\DATA\Y2016\011516TPH_GC17\011516 2016-01-15 16-36-39\087B4101.D		

Where individual results are flagged see report notes for status.



# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1652846	<b>Job Number:</b>	W21_2494
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gasses in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	WH/13
<b>Acquisition Date/Time:</b>	16-Jan-16, 05:01:12		
<b>Datafile:</b>	D:\TES\DATA\Y2016\011516TPH_GC17\011516 2016-01-15 16-36-39\088B4201.D		

Where individual results are flagged see report notes for status.

Customer Envireau Water  
Site Dissolved Gasses in Waters  
Report No W212494

Consignment No W98375  
Date Logged 14-Jan-2016

Report Due 21-Jan-2016

WSLM3	pH units	✓
WSLM27	Total Dissolved Solids	
WSLM2	Conductivity uS/cm @ 25C	✓
	Bicarbonate Alkalinity as CaCO3	✓
	Total Alkalinity as CaCO3	✓
	P Alkalinity as CaCO3	✓
	TPH GC	✓
KONENS	Chloride as Cl (Kone)	✓
	Aluminium as Al (Dissolved) VAR	
	Iron as Fe (Dissolved) VAR	✓
	Manganese as Mn (Dissolved) VAR	✓
	Potassium as K (Dissolved) VAR	✓
	Sodium as Na (Dissolved) VAR	✓
	Magnesium as Mg (Dissolved) VAR	✓
	Calcium as Ca (Dissolved) VAR	✓
	Total Sulphur as SO4 (Diss) VAR	✓
DISGAS1	^Dissolved Methane	
CUSTSERV	Report A	
MethodID	Sampled	
	Matrix Type	
	Description	Groundwater
ID Number		12/01/16
EX/1652839	WF/13	12/01/16
EX/1652840	HW/13	12/01/16
EX/1652841	ETF/13	12/01/16
EX/1652842	D/13U	12/01/16
EX/1652843	D/13D	12/01/16
EX/1652844	TV/13	12/01/16
EX/1652845	DW/13	12/01/16
EX/1652846	WH/13	12/01/16

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
^	Analysis Subcontracted - <b>Note: due date may vary</b>

The integrity of data for samples/analysis that have been categorised as Deviating may be compromised. Data may not be representative of the sample at the time of sampling.  
Where individual results are flagged see report notes for status.

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

# Report Notes

## Generic Notes

### **Soil/Solid Analysis**

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### **Waters Analysis**

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### **Oil analysis specific**

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup> @ 15°C

### **Gas (Tedlar bag) Analysis**

Unless stated otherwise, results are expressed as ug/l

### **Asbestos Analysis**

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

^ Sub-contracted analysis.

\$\$ Unable to analyse due to the nature of the sample

¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

¥ Results for guidance only due to possible interference

& Blank corrected result

I.S Insufficient sample to complete requested analysis

I.S(g) Insufficient sample to re-analyse, results for guidance only

Intf Unable to analyse due to interferences

N.D Not determined

N.Det Not detected

N.F No Flow

NS Information Not Supplied

Req Analysis requested, see attached sheets for results

▮ Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** Dissolved Gasses in Waters  
**Report Number :** W21\_2494

## Water Analysis Test Certificate

Round 14

Our Ref: EXR/214925 (Ver. 1)

Your Ref:

February 26, 2016



Environmental Chemistry

ESG

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Armelle Bonneton  
Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

For the attention of Armelle Bonneton

Dear Armelle Bonneton

**Sample Analysis - Dissolved Gases in Waters**

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with Environmental Scientifics Group Ltd (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for ESG

A handwritten signature in black ink, consisting of a stylized 'L' followed by a circular flourish and a horizontal line extending to the right.

L Thompson  
Project Co-ordinator  
01283 554467

# TEST REPORT



Report No. EXR/214925 (Ver. 1)

Envireau Water  
Cedars Farm Barn  
Market Street  
Draycott  
Derbyshire  
DE72 3NB

## Site: Dissolved Gases in Waters

The 8 samples described in this report were registered for analysis by ESG on 20-Feb-2016. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 26-Feb-2016

Tests where the accreditation is set to N or No, and any individual data items marked with a \* are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Pages 2 to 3)  
Table of TPH Texas banding (0.01) (Page 4)  
GC-FID Chromatograms (Pages 5 to 12)  
Analytical and Deviating Sample Overview (Pages 13 to 14)  
Table of Method Descriptions (Page 15)  
Table of Report Notes (Page 16)  
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of  
ESG :  
Declan Burns

  
Managing Director  
Multi-Sector Services

Date of Issue: 26-Feb-2016


Tests marked '^' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.



Units : Method Codes : Method Reporting Limits : UKAS Accredited :			pH units	uS/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
			WSLM3	WSLM2	WSLM12	WSLM12	KONENS	ICPWATVAR	ICPWATVAR	ICPWATVAR	ICPWATVAR	ICPWATVAR	ICPWATVAR	TPHFID	TPHFID	WSLM27	ICPWATVAR		
				100			1	3	1	1	1	1	0.01	0.01	0.01	0.01	5	0.01	
			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	
LAB ID Number	EX/	Client Sample Description	Sample Date	pH units w	Conductivity uS/cm @ 25C w	Total Alkalinity as CaCO3 w	Bicarbonate Alkalinity as CaCO3 w	Chloride as Cl w	Total Sulphur as SO4 (Dissolved) a	Calcium as Ca (Dissolved) a	Magnesium as Mg (Dissolved) a	Sodium as Na (Dissolved) a	Potassium as K (Dissolved) a	Manganese as MN (Dissolved) a	Iron as Fe (Dissolved) a	Carbon Banding	TPH GC	Total Dissolved Solids w	Aluminium as Al (Dissolved) a
1663325		WF/14	17-Feb-16 10:50	7.9	950	463	463	28	30	34	8	175	3	0.34	0.06	Req	<0.01	530	<0.01
1663326		ETF/14	17-Feb-16 10:20	7.9	3160	680	680	106	830	69	33	597	7	0.01	0.08	Req	<0.01	2100	0.02
1663327		D/14U	17-Feb-16 12:00	7.3	304	94	94	24	11	43	2	7	4	0.02	1.21	Req	0.04	180	0.15
1663328		DU/14	17-Feb-16 12:15	7.3	301	93	93	24	11	44	2	7	4	<0.01	1.34	Req	0.05	170	0.17
1663329		D/14D	17-Feb-16 11:45	7.4	311	106	106	23	11	45	2	7	4	<0.01	0.95	Req	0.06	180	0.11
1663330		TV/14	17-Feb-16 13:00	7.8	1640	650	650	47	152	23	6	365	4	0.04	0.04	Req	0.01	950	<0.01
1663331		HW/14	17-Feb-16 13:30	7.8	837	417	417	22	17	29	6	162	3	0.29	0.06	Req	0.01	450	<0.01
1663332		DW/14	17-Feb-16 13:15	6.3	<100	6	6	<1	<3	<1	<1	<1	<1	<0.01	<0.01	Req	<0.01	<5	<0.01
<div></div> <div>Bretby Business Park, Ashby Road</div> <div>Burton-on-Trent, Staffordshire, DE15 0YZ</div> <div>Tel +44 (0) 1283 554400</div> <div>Fax +44 (0) 1283 554422</div>			Client Name		Envireau Water							Sample Analysis							
			Contact		Armelle Bonneton														
			Dissolved Gases in Waters											Date Printed		25-Feb-2016			
														Report Number		EXR/214925			
														Table Number		1			

Bretby Business Park, Ashby Road  
Burton-on-Trent, Staffordshire, DE15 0YZ  
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Fax +44 (0) 1283 554422


**Client Name**  
**Contact**

**Envireau Water**  
Armelle Bonneton

# Dissolved Gases in Waters

## Sample Analysis

Date Printed	25-Feb-2016
Report Number	EXR/214925
Table Number	1

Units : Method Codes : Method Reporting Limits : UKAS Accredited :																			µg/l																
																			DISGAS1																
																			6																
LAB ID Number EX/	Client Sample Description	Sample Date	^Dissolved Methane																																
				1663325	WF/14	17-Feb-16 10:50	<4																												
				1663326	ETF/14	17-Feb-16 10:20	<4																												
				1663327	D/14U	17-Feb-16 12:00																													
				1663328	DU/14	17-Feb-16 12:15																													
				1663329	D/14D	17-Feb-16 11:45																													
				1663330	TV/14	17-Feb-16 13:00	1573																												
				1663331	HW/14	17-Feb-16 13:30	14																												
				1663332	DW/14	17-Feb-16 13:15																													
				<div></div> <div>Bretby Business Park, Ashby Road</div> <div>Burton-on-Trent, Staffordshire, DE15 0YZ</div> <div>Tel +44 (0) 1283 554400</div> <div>Fax +44 (0) 1283 554422</div>			Client Name	Envireau Water								Sample Analysis																			
							Contact	Armelle Bonneton																											
Dissolved Gases in Waters								Date Printed	25-Feb-2016																										
								Report Number	EXR/214925																										
								Table Number	1																										

Bretby Business Park, Ashby Road  
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Tel +44 (0) 1283 554400  
Fax +44 (0) 1283 554422

**Client Name**  
**Contact**

# Envireau Water

Armelle Bonneton

# Dissolved Gases in Waters

# Sample Analysis

Date Printed	25-Feb-2016
Report Number	EXR/214925
Table Number	1

# Total Petroleum Hydrocarbons (TPH) Carbon Ranges

**Customer and Site Details:**  
**Job Number:**  
**QC Batch Number:**  
**Directory:**  
**Method:**

Envireau Water : Dissolved Gases in Waters  
W21\_4925  
160115  
D:\TES\DATA\Y2016\022316TPH\_GC15\022316B 2016-02-24 08-15-37\049B2901.D  
Bottle

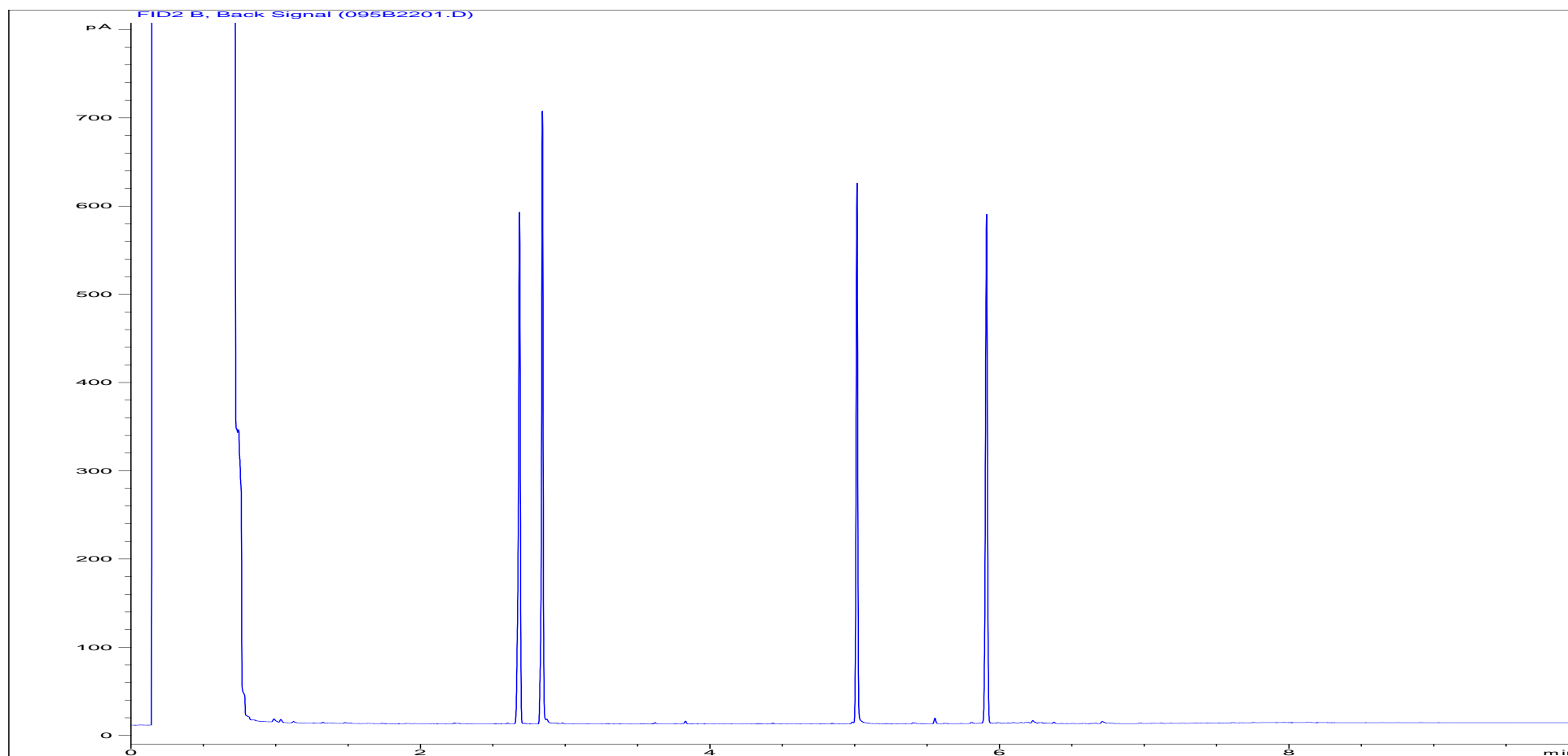
**Matrix:**  
**Date Booked in:**  
**Date Extracted:**  
**Date Analysed:**

Water  
20-Feb-16  
23-Feb-16  
24-Feb-16, 16:10:41

\* Sample data with an asterisk are not UKAS accredited.

		Concentration, (mg/l)				
Sample ID	Client ID	>C8 - C10	>C10 - C12	>C12 - C16	>C16 - C21	>C21 - C35
EX1663331	HW/14	<0.01	<0.01	<0.01	<0.01	<0.01
EX1663332	DW/14	<0.01	<0.01	<0.01	<0.01	<0.01

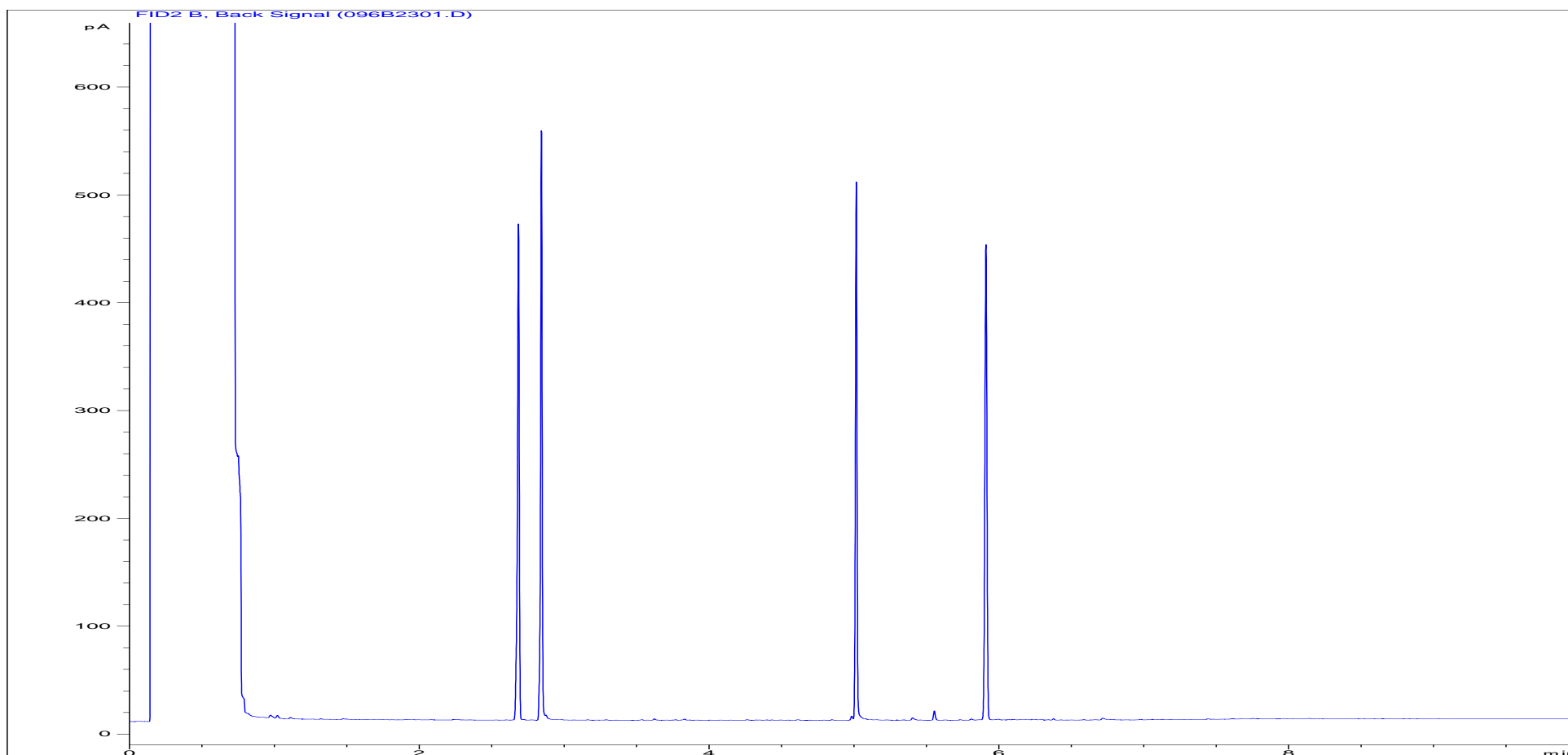
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1663325	<b>Job Number:</b>	W21_4925
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gases in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	WF/14
<b>Acquisition Date/Time:</b>	24-Feb-16, 14:11:47		
<b>Datafile:</b>	D:\TES\DATA\Y2016\022316TPH_GC15\022316B 2016-02-24 08-15-37\095B2201.D		

Where individual results are flagged see report notes for status.

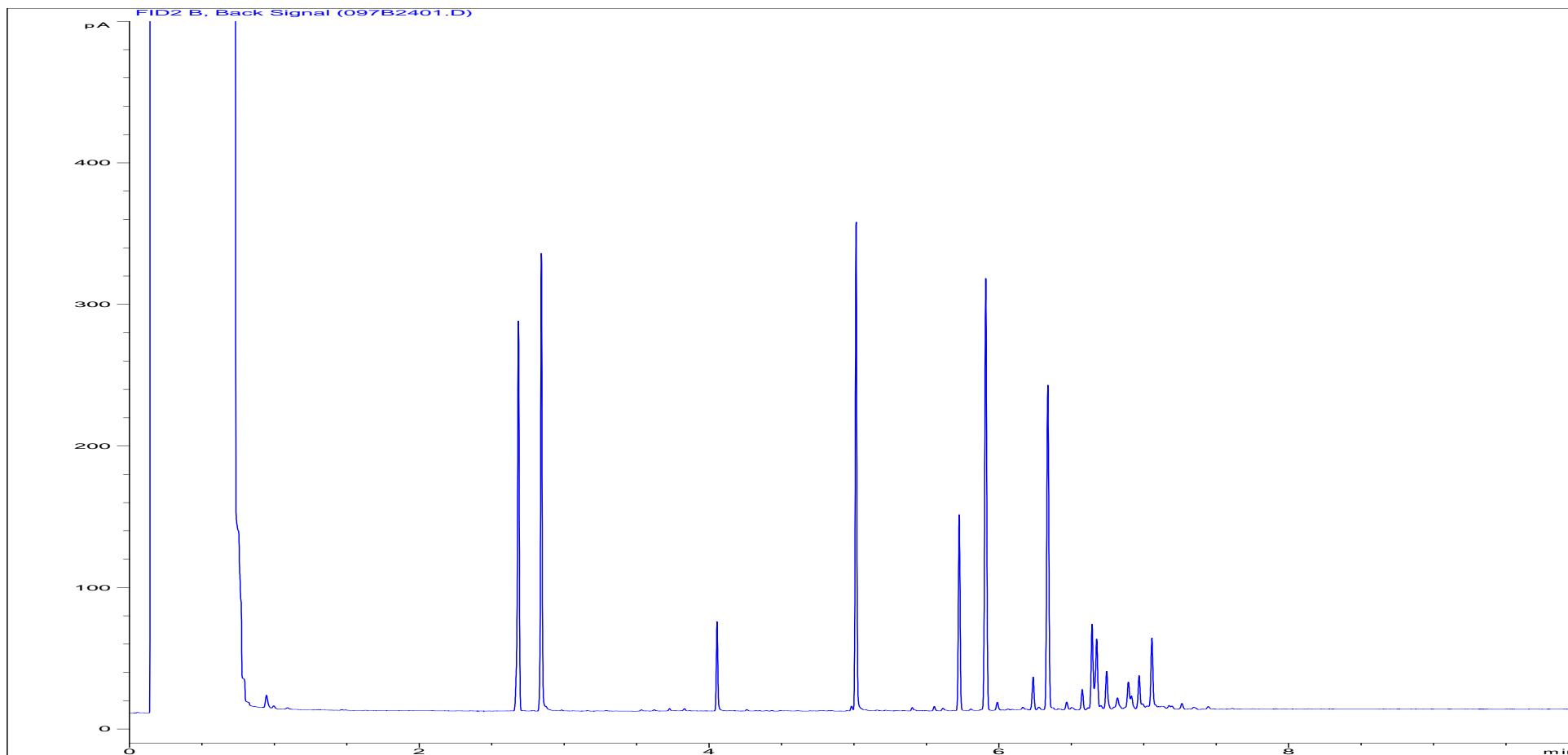
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1663326	<b>Job Number:</b>	W21_4925
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gases in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	ETF/14
<b>Acquisition Date/Time:</b>	24-Feb-16, 14:29:44		
<b>Datafile:</b>	D:\TES\DATA\Y2016\022316TPH_GC15\022316B 2016-02-24 08-15-37\096B2301.D		

Where individual results are flagged see report notes for status.

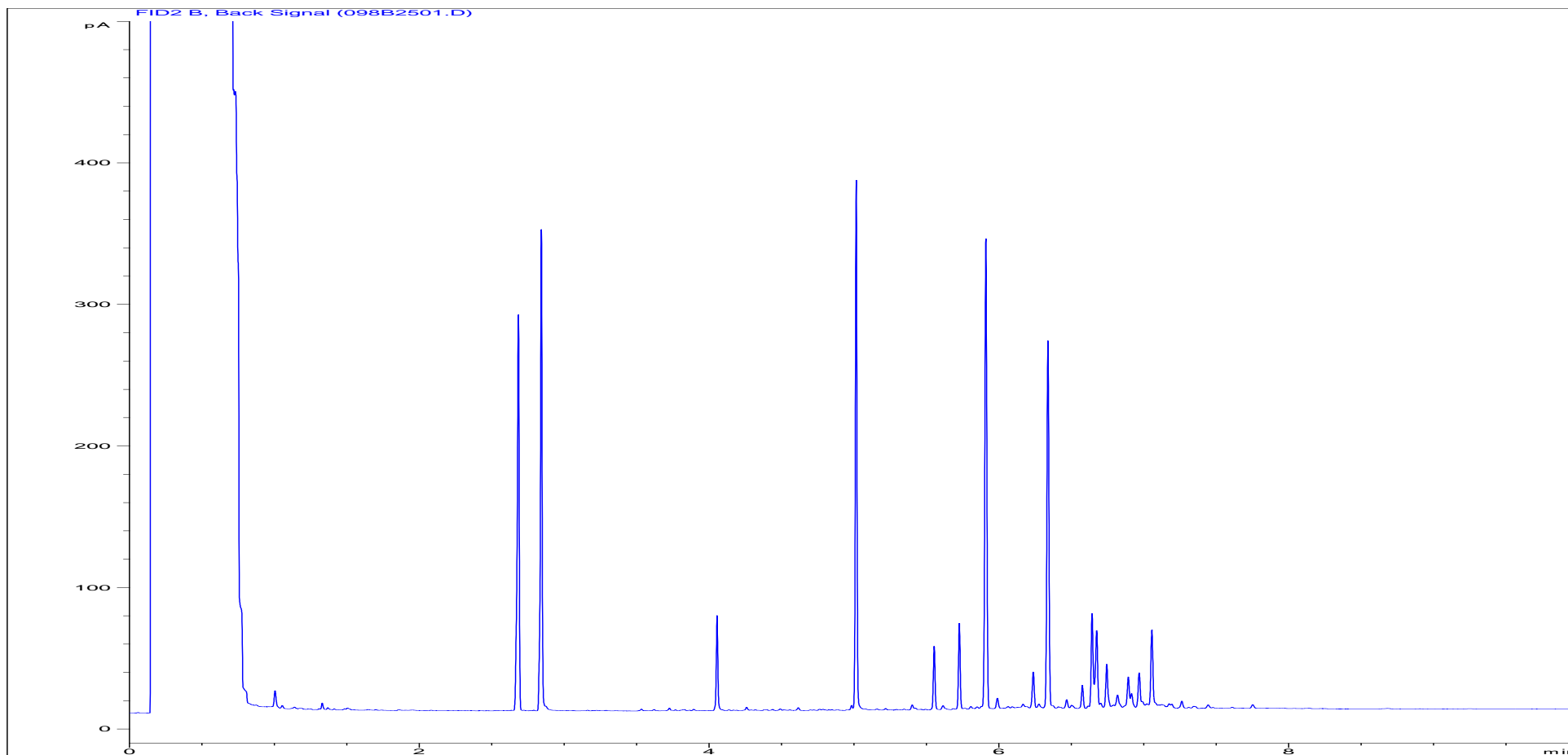
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1663327	<b>Job Number:</b>	W21_4925
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gases in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	D/14U
<b>Acquisition Date/Time:</b>	24-Feb-16, 14:46:21		
<b>Datafile:</b>	D:\TES\DATA\Y2016\022316TPH_GC15\022316B 2016-02-24 08-15-37\097B2401.D		

Where individual results are flagged see report notes for status.

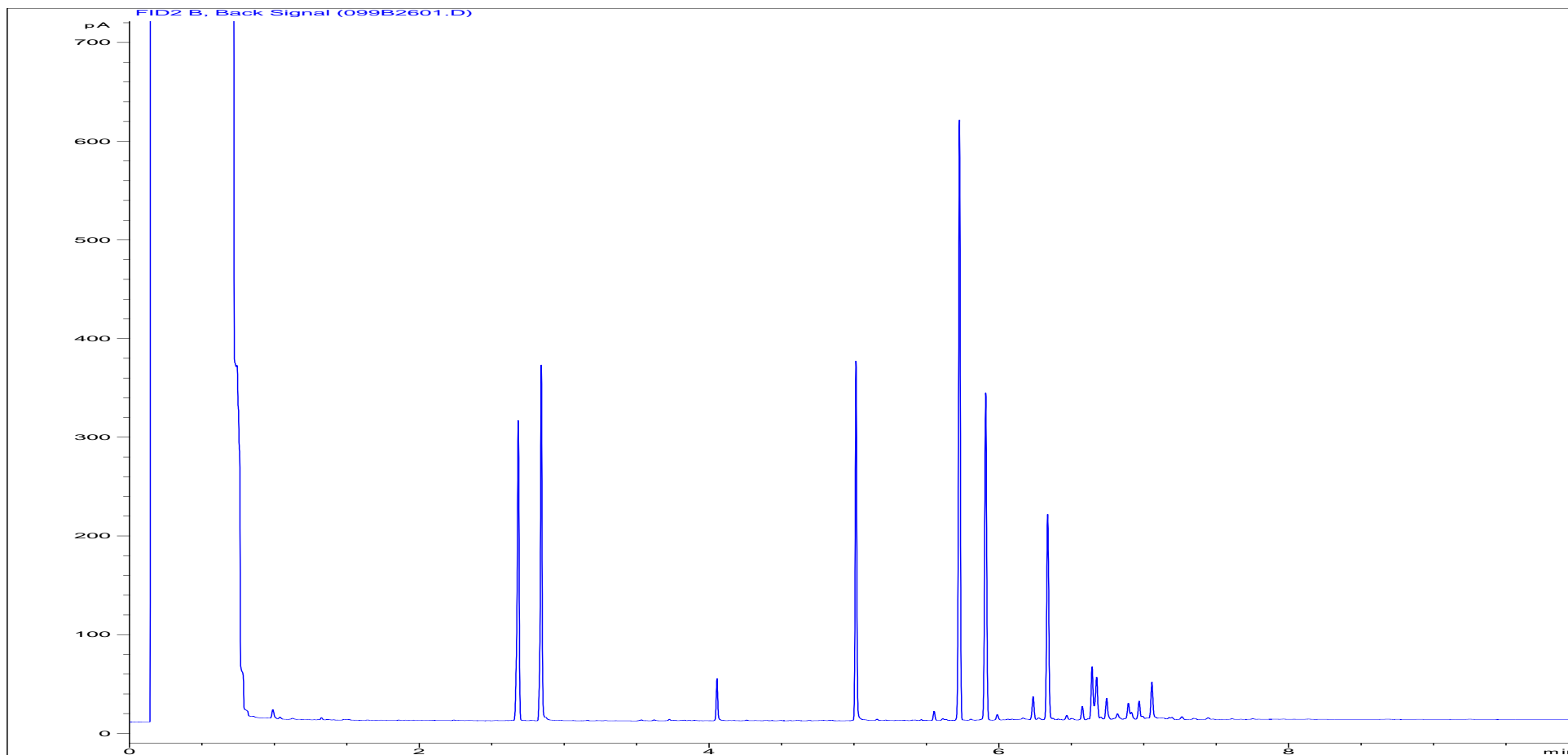
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1663328	Job Number:	W21_4925
Multiplier:	0.005	Client:	Envireau Water
Dilution:	1	Site:	Dissolved Gases in Waters
Acquisition Method:	TPH_RUNF.M	Client Sample Ref:	DU/14
Acquisition Date/Time:	24-Feb-16, 15:04:25		
Datafile:	D:\TES\DATA\Y2016\022316TPH_GC15\022316B 2016-02-24 08-15-37\098B2501.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID

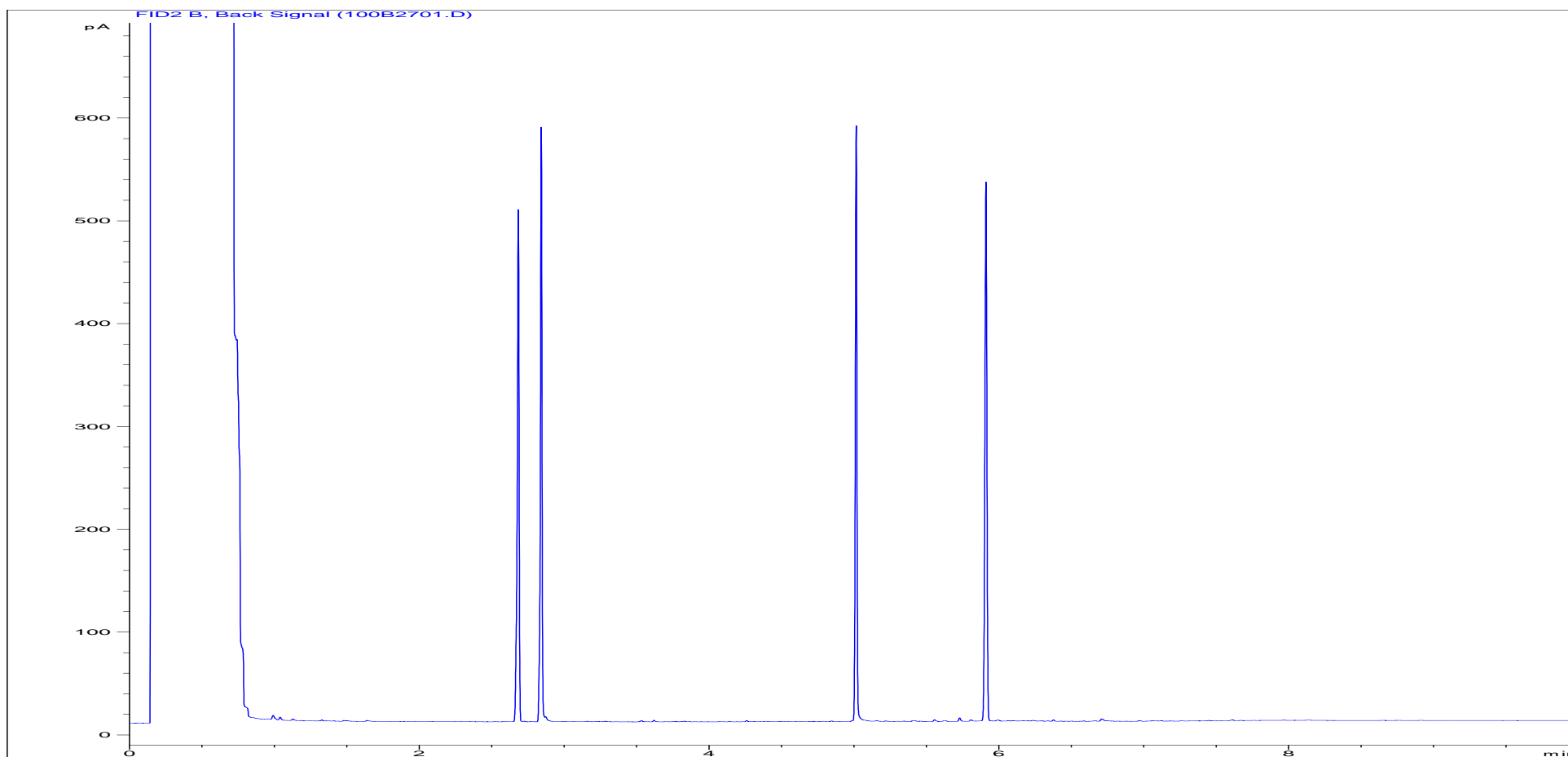


<b>Sample ID:</b>	EX1663329	<b>Job Number:</b>	W21_4925
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gases in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	D/14D
<b>Acquisition Date/Time:</b>	24-Feb-16, 15:20:52		
<b>Datafile:</b>	D:\TES\DATA\Y2016\022316TPH_GC15\022316B 2016-02-24 08-15-37\099B2601.D		

Where individual results are flagged see report notes for status.



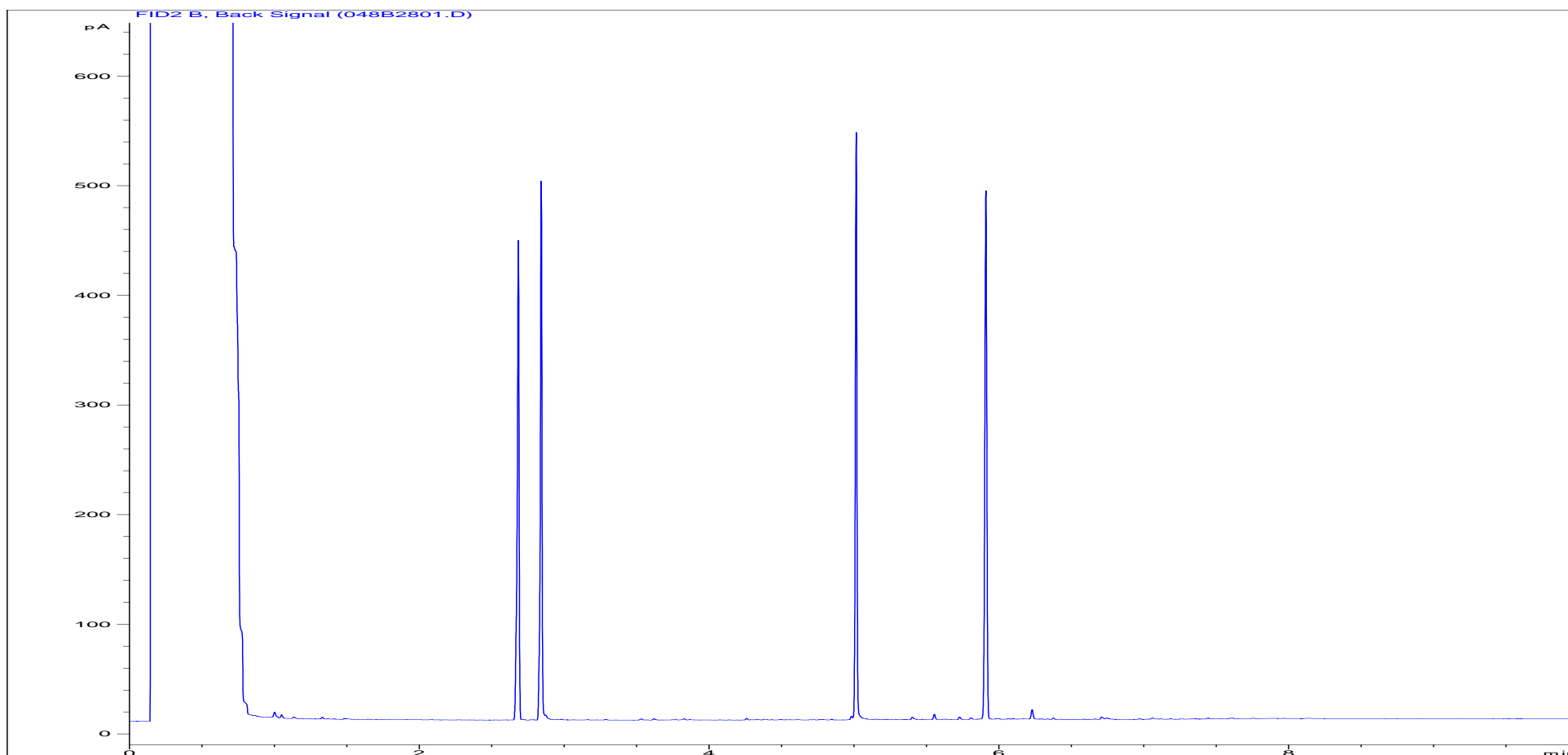
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1663330	<b>Job Number:</b>	W21_4925
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gases in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	TV/14
<b>Acquisition Date/Time:</b>	24-Feb-16, 15:37:39		
<b>Datafile:</b>	D:\TES\DATA\Y2016\022316TPH_GC15\022316B 2016-02-24 08-15-37\100B2701.D		

Where individual results are flagged see report notes for status.

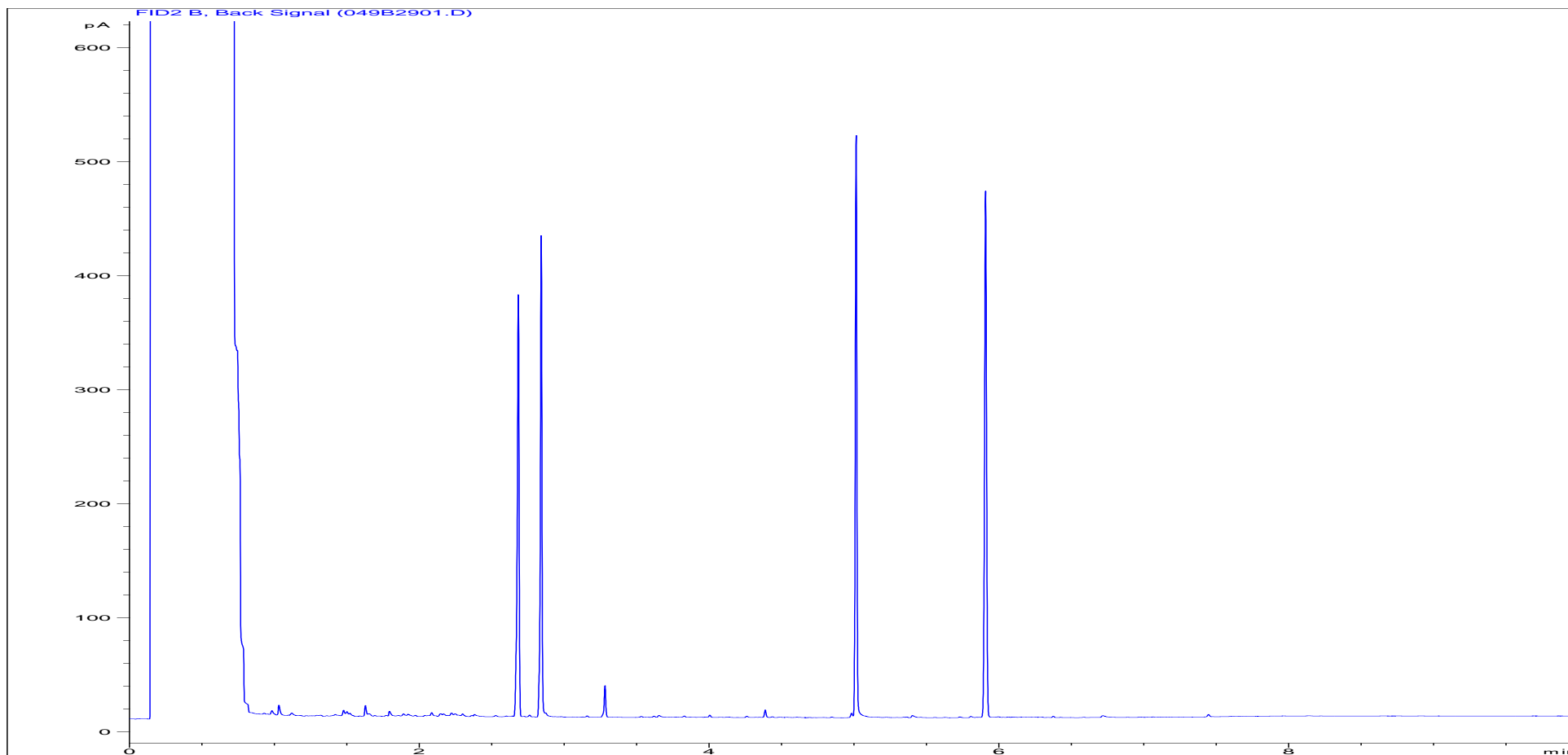
# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1663331	<b>Job Number:</b>	W21_4925
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gases in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	HW/14
<b>Acquisition Date/Time:</b>	24-Feb-16, 15:54:16		
<b>Datafile:</b>	D:\TES\DATA\Y2016\022316TPH_GC15\022316B 2016-02-24 08-15-37\048B2801.D		

Where individual results are flagged see report notes for status.

# Petroleum Hydrocarbons (C8 to C40) by GC/FID



<b>Sample ID:</b>	EX1663332	<b>Job Number:</b>	W21_4925
<b>Multiplier:</b>	0.005	<b>Client:</b>	Envireau Water
<b>Dilution:</b>	1	<b>Site:</b>	Dissolved Gases in Waters
<b>Acquisition Method:</b>	TPH_RUNF.M	<b>Client Sample Ref:</b>	DW/14
<b>Acquisition Date/Time:</b>	24-Feb-16, 16:10:41		
<b>Datafile:</b>	D:\TES\DATA\Y2016\022316TPH_GC15\022316B 2016-02-24 08-15-37\049B2901.D		

Where individual results are flagged see report notes for status.

Customer Envireau Water  
Site Dissolved Gases in Waters  
Report No W214925

Consignment No W100263  
Date Logged 20-Feb-2016

Report Due 26-Feb-2016

WSLM3	pH units	✓																								
WSLM27	Total Dissolved Solids																									
WSLM2	Conductivity uS/cm @ 25C	✓																								
WSLM12	Bicarbonate Alkalinity as CaCO3	✓																								
	Total Alkalinity as CaCO3	✓																								
	P Alkalinity as CaCO3	✓																								
	TPH GC	✓																								
TPHFID	TPH Carbon Banding	✓																								
KONENS	Chloride as Cl (Kone)	✓																								
	Aluminium as Al (Dissolved) VAR																									
	Iron as Fe (Dissolved) VAR	✓																								
	Manganese as Mn (Dissolved) VAR	✓																								
	Potassium as K (Dissolved) VAR	✓																								
	Sodium as Na (Dissolved) VAR	✓																								
	Magnesium as Mg (Dissolved) VAR	✓																								
	Calcium as Ca (Dissolved) VAR	✓																								
ICPMATVAR	Total Sulphur as SO4 (Diss) VAR	✓																								
DISGAS1	^Dissolved Methane																									
CUSTSERV	Report A																									
MethodID	Sampled																									
	Matrix Type																									
ID Number	Description	Groundwater	17/02/16																							
			17/02/16																							
			17/02/16																							
			17/02/16																							
			17/02/16																							
			17/02/16																							
			17/02/16																							
			17/02/16																							
			17/02/16																							
WF/14																										
ETF/14																										
D/14U																										
DU/14																										
D/14D																										
TV/14																										
HW/14																										
DW/14																										

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
^	Analysis Subcontracted - <b>Note: due date may vary</b>

The integrity of data for samples/analysis that have been categorised as Deviating may be compromised. Data may not be representative of the sample at the time of sampling.  
Where individual results are flagged see report notes for status.

Customer Envireau Water  
Site Dissolved Gases in Waters  
Report No W214925

Consignment No W100263  
Date Logged 20-Feb-2016

Report Due 26-Feb-2016

ID Number	Description	MethodID		WSLM3
		Matrix Type	Sampled	pH units
				✓
EX/1663325	WF/14	Groundwater	17/02/16	
EX/1663326	ETF/14	Groundwater	17/02/16	
EX/1663327	D/14U	Groundwater	17/02/16	
EX/1663328	DU/14	Surface Water	17/02/16	
EX/1663329	D/14D	Surface Water	17/02/16	
EX/1663330	TV/14	Groundwater	17/02/16	
EX/1663331	HW/14	Surface Water	17/02/16	
EX/1663332	DW/14	Groundwater	17/02/16	

**Note:** For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

**In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.**

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - <b>Note: due date may be affected if triggered</b>
	No analysis scheduled
^	Analysis Subcontracted - <b>Note: due date may vary</b>

The integrity of data for samples/analysis that have been categorised as Deviating may be compromised. Data may not be representative of the sample at the time of sampling.  
Where individual results are flagged see report notes for status.

# Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	DISGAS1	As Received	Ultrasonic Extraction , dispersive IR and GC Detection
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM2	As Received	Determination of the Electrical Conductivity ( $\mu\text{S}/\text{cm}$ ) by electrical conductivity probe.
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

# Report Notes

## Generic Notes

### **Soil/Solid Analysis**

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.  
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

### **Waters Analysis**

Unless stated otherwise results are expressed as mg/l

**Nil:** Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

### **Oil analysis specific**

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm<sup>3</sup> @ 15°C

### **Gas (Tedlar bag) Analysis**

Unless stated otherwise, results are expressed as ug/l

### **Asbestos Analysis**

**CH** Denotes Chrysotile

**TR** Denotes Tremolite

**CR** Denotes Crocidolite

**AC** Denotes Actinolite

**AM** Denotes Amosite

**AN** Denotes Anthophyllite

**NAIIS** No Asbestos Identified in Sample

**NADIS** No Asbestos Detected In Sample

## Symbol Reference

^ Sub-contracted analysis.

\$\$ Unable to analyse due to the nature of the sample

¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

¥ Results for guidance only due to possible interference

& Blank corrected result

I.S Insufficient sample to complete requested analysis

I.S(g) Insufficient sample to re-analyse, results for guidance only

Intf Unable to analyse due to interferences

N.D Not determined

N.Det Not detected

N.F No Flow

NS Information Not Supplied

Req Analysis requested, see attached sheets for results

▮ Raised detection limit due to nature of the sample

\* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

**Note:** The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

## Sample Descriptions

**Client :** Envireau Water  
**Site :** Dissolved Gases in Waters  
**Report Number :** W21\_4925



## Water Analysis Test Certificate

Round 15



# Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point  
Zone 3  
Deeside Industrial Park  
Deeside  
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Cedars Farm Barn  
Market Street  
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Derby  
DE72 3NB

Tel: +44 (0) 1244 833780  
Fax: +44 (0) 1244 833781



<b>Attention :</b>	Phil Ham
<b>Date :</b>	12th April, 2016
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 16/6703 Batch 1
<b>Location :</b>	Various
<b>Date samples received :</b>	24th March, 2016
<b>Status :</b>	Final report
<b>Issue :</b>	1

Eleven samples were received for analysis on 24th March, 2016 of which eleven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Simon Gomery BSc**  
**Project Manager**

**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham  
**JE Job No.:** 16/6703

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-43	44-51	52-59	Please see attached notes for all abbreviations and acronyms		
Sample ID	WF/15	ETF/15	D/15U	D/15D	TV/15	HW/15	DW/15	BA/15	BB/15	BC/15			
Depth													
COC No / misc													
Containers	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G			
Sample Date	22/03/2016 12:20	22/03/2016 11:00	22/03/2016 13:15	22/03/2016 12:45	22/03/2016 14:30	22/03/2016 15:00	22/03/2016 14:35	22/03/2016 16:00	22/03/2016 17:00	23/03/2016 09:50			
Sample Type	Ground Water	Ground Water	Surface Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	24/03/2016	24/03/2016	24/03/2016	24/03/2016	24/03/2016	24/03/2016	24/03/2016	24/03/2016	24/03/2016	24/03/2016	LOD/LOR	Units	Method No.
Dissolved Aluminium #	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	ug/l	TM30/PM14
Dissolved Antimony #	-	-	-	-	-	-	-	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Arsenic #	-	-	-	-	-	-	-	<2.5	<2.5	<2.5	<2.5	ug/l	TM30/PM14
Dissolved Barium #	-	-	-	-	-	-	-	84	26	189	<3	ug/l	TM30/PM14
Dissolved Beryllium	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Boron	-	-	-	-	-	-	-	70	125	82	<12	ug/l	TM30/PM14
Dissolved Cadmium #	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Calcium #	35.6	63.3	116.8	98.3	24.2	29.3	<0.2	315.3 <sup>AA</sup>	298.7 <sup>AA</sup>	216.1 <sup>AA</sup>	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	-	-	-	-	-	-	-	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	-	-	-	-	-	-	-	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Copper #	-	-	-	-	-	-	-	<7	<7	<7	<7	ug/l	TM30/PM14
Total Dissolved Iron #	<20	280	<20	<20	156	167	<20	1032	1075	2298	<20	ug/l	TM30/PM14
Dissolved Lead #	-	-	-	-	-	-	-	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Lithium	-	-	-	-	-	-	-	66	76	46	<5	ug/l	TM30/PM14
Dissolved Magnesium #	7.2	30.5	8.5	7.4	6.1	5.4	<0.1	6.4	11.0	14.2	<0.1	mg/l	TM30/PM14
Dissolved Manganese #	320	3	3	<2	36	275	<2	179	148	66	<2	ug/l	TM30/PM14
Dissolved Mercury #	-	-	-	-	-	-	-	<1	<1	<1	<1	ug/l	TM30/PM14
Dissolved Nickel #	-	-	-	-	-	-	-	3	<2	<2	<2	ug/l	TM30/PM14
Dissolved Potassium #	3.3	5.9	6.0	5.1	3.7	2.8	<0.1	2.9	3.2	2.2	<0.1	mg/l	TM30/PM14
Dissolved Selenium #	-	-	-	-	-	-	-	<3	<3	<3	<3	ug/l	TM30/PM14
Dissolved Silver	-	-	-	-	-	-	-	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Sodium #	185.7	635.9 <sup>AB</sup>	31.1	28.7	367.2 <sup>AA</sup>	160.7	<0.1	34.9	31.9	22.9	<0.1	mg/l	TM30/PM14
Dissolved Strontium	-	-	-	-	-	-	-	455	519	421	<5	ug/l	TM30/PM14
Dissolved Vanadium #	-	-	-	-	-	-	-	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Zinc #	-	-	-	-	-	-	-	<3	<3	<3	<3	ug/l	TM30/PM14
Total Iron	<20	3042	108	37	159	172	<20	1038	1559	2308	<20	ug/l	TM30/PM14
Total Manganese	322	11	3	<2	38	291	<2	203	168	68	<2	ug/l	TM30/PM14
EPH (C8-C40) #	<10	<10	<10	<10	<10	<10	<10	-	-	-	<10	ug/l	TM5/PM30
EPH >C8-C10	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C10-C16	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C16-C24	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C24-C40	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C8-C40	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
GRO (>C4-C8) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
Benzene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
Toluene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
o-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12

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## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/6703

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

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It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

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As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Please include all sections of this report if it is reproduced

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution



JE Job No: 16/6703

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Modified USEPA 8163. Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			

JE Job No: 16/6703

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM37	Modified USEPA 160.2. Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			

JE Job No: 16/6703

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM59	As received solid samples are extracted with water in a 1:1 water to solid ratio using end over end.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				



## *Jones Environmental Laboratory*

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Envireau Ltd  
Cedars Farm Barn  
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Zone 3  
Deeside Industrial Park  
Deeside  
CH5 2UA

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781

<b>Attention :</b>	Phil Ham
<b>Date :</b>	29th April, 2016
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 16/6703 Batch 1 Schedule C
<b>Location :</b>	Various
<b>Date samples received :</b>	24th March, 2016
<b>Status :</b>	Final report
<b>Issue :</b>	1

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**Compiled By:**

A handwritten signature in black ink, appearing to read "S. Gomery", written over a horizontal line.

**Simon Gomery BSc**  
**Project Manager**



**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/6703

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*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range



JE Job No: 16/6703

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				



# Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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<b>Attention :</b>	Phil Ham
<b>Date :</b>	12th April, 2016
<b>Your reference :</b>	KM8 Baseline
<b>Our reference :</b>	Test Report 16/6988 Batch 1
<b>Location :</b>	KMA
<b>Date samples received :</b>	1st April, 2016
<b>Status :</b>	Final report
<b>Issue :</b>	1

Two samples were received for analysis on 1st April, 2016 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Paul Lee-Boden BSc**  
**Project Manager**

**Client Name:** Envireau Ltd  
**Reference:** KM8 Baseline  
**Location:** KMA  
**Contact:** Phil Ham  
**JE Job No.:** 16/6988

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-8	9-16											
Sample ID	BD/15	DB/15											
Depth													
COC No / misc													
Containers	V H HN P BOD G	V H HN P BOD G											
Sample Date	31/03/2016 12:30	31/03/2016 12:45											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1											
Date of Receipt	01/04/2016	01/04/2016											
											LOD/LOR	Units	Method No.
Dissolved Aluminium #	1074	1089									<20	ug/l	TM30/PM14
Dissolved Antimony #	4	-									<2	ug/l	TM30/PM14
Dissolved Arsenic #	<2.5	-									<2.5	ug/l	TM30/PM14
Dissolved Barium #	19	-									<3	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	-									<0.5	ug/l	TM30/PM14
Dissolved Boron	234	-									<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	-									<0.5	ug/l	TM30/PM14
Dissolved Calcium #	0.7	0.5									<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	-									<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	<2	-									<2	ug/l	TM30/PM14
Dissolved Copper #	<7	-									<7	ug/l	TM30/PM14
Total Dissolved Iron #	31	<20									<20	ug/l	TM30/PM14
Dissolved Lead #	<5	-									<5	ug/l	TM30/PM14
Dissolved Lithium	125	-									<5	ug/l	TM30/PM14
Dissolved Magnesium #	<0.1	<0.1									<0.1	mg/l	TM30/PM14
Dissolved Manganese #	<2	<2									<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	-									<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	-									<2	ug/l	TM30/PM14
Dissolved Potassium #	10.5	10.9									<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3	-									<3	ug/l	TM30/PM14
Dissolved Silver	<5	-									<5	ug/l	TM30/PM14
Dissolved Sodium #	728.7 <sup>AA</sup>	704.1 <sup>AA</sup>									<0.1	mg/l	TM30/PM14
Dissolved Strontium	60	-									<5	ug/l	TM30/PM14
Dissolved Vanadium #	<1.5	-									<1.5	ug/l	TM30/PM14
Dissolved Zinc #	<3	-									<3	ug/l	TM30/PM14
Total Iron	57320 <sup>AA</sup>	57910 <sup>AA</sup>									<20	ug/l	TM30/PM14
Total Manganese	607	599									<2	ug/l	TM30/PM14
EPH (C8-C40) #	-	<10									<10	ug/l	TM5/PM30
EPH >C8-C10	<10	-									<10	ug/l	TM5/PM30
EPH >C10-C16	<10	-									<10	ug/l	TM5/PM30
EPH >C16-C24	<10	-									<10	ug/l	TM5/PM30
EPH >C24-C40	<10	-									<10	ug/l	TM5/PM30
EPH >C8-C40	<10	-									<10	ug/l	TM5/PM30
GRO (>C4-C8) #	<10	<10									<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10									<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10									<10	ug/l	TM36/PM12
MTBE #	<5	<5									<5	ug/l	TM36/PM12
Benzene #	<5	<5									<5	ug/l	TM36/PM12
Toluene #	<5	<5									<5	ug/l	TM36/PM12
Ethylbenzene #	<5	<5									<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5									<5	ug/l	TM36/PM12
o-Xylene #	<5	<5									<5	ug/l	TM36/PM12

Please see attached notes for all abbreviations and acronyms

Please see attached notes for all abbreviations and acronyms

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/6988

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Please include all sections of this report if it is reproduced

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution

JE Job No: 16/6988

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Modified USEPA 8163. Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			

JE Job No: 16/6988

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			



JE Job No: 16/6988

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM59	As received solid samples are extracted with water in a 1:1 water to solid ratio using end over end.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				

## Water Analysis Test Certificate

Round 16



# Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point  
Zone 3  
Deeside Industrial Park  
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Tel: +44 (0) 1244 833780  
Fax: +44 (0) 1244 833781



<b>Attention :</b>	Phil Ham
<b>Date :</b>	6th May, 2016
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 16/7892 Batch 1
<b>Location :</b>	Various
<b>Date samples received :</b>	21st April, 2016
<b>Status :</b>	Final report
<b>Issue :</b>	1

Thirteen samples were received for analysis on 21st April, 2016 of which thirteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Simon Gomery BSc**  
**Project Manager**

**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham  
**JE Job No.:** 16/7892

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-6	7-12	13-18	19-24	25-30	31-36	37-42	43-51	52-60	61-69	Please see attached notes for all abbreviations and acronyms		
Sample ID	WF/16	ETF/16	D/16U	D/16D	TV/16	HW/16	DW/16	BA/16	BB/16	BC/16			
Depth													
COC No / misc													
Containers	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H H N P BOD G	V H H N P BOD G	V H H N P BOD G			
Sample Date	20/04/2016 15:15	20/04/2016 14:15	20/04/2016 13:45	20/04/2016 13:30	20/04/2016 16:00	20/04/2016 15:45	20/04/2016 16:15	19/04/2016 15:00	19/04/2016 17:00	20/04/2016 09:30			
Sample Type	Ground Water	Ground Water	Surface Water	Surface Water	Ground Water	Ground Water	Surface Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016	LOD/LOR	Units	Method No.
Dissolved Aluminium #	<20	<20	-	-	<20	<20	-	<20	<20	<20	<20	ug/l	TM30/PM14
Dissolved Antimony #	-	-	-	-	-	-	-	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Arsenic #	-	-	-	-	-	-	-	<2.5	<2.5	<2.5	<2.5	ug/l	TM30/PM14
Dissolved Barium #	-	-	-	-	-	-	-	80	22	180	<3	ug/l	TM30/PM14
Dissolved Beryllium	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Boron	-	-	-	-	-	-	-	75	131	88	<12	ug/l	TM30/PM14
Dissolved Cadmium #	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Calcium #	32.7	54.4	124.2	127.6	23.2	28.2	<0.2	332.4 <sup>AA</sup>	308.4 <sup>AA</sup>	194.8	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	-	-	-	-	-	-	-	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	-	-	-	-	-	-	-	2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Copper #	-	-	-	-	-	-	-	<7	<7	<7	<7	ug/l	TM30/PM14
Total Dissolved Iron #	<20	288	-	-	131	119	-	642	1113	1906	<20	ug/l	TM30/PM14
Dissolved Lead #	-	-	-	-	-	-	-	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Lithium	-	-	-	-	-	-	-	65	76	46	<5	ug/l	TM30/PM14
Dissolved Magnesium #	7.5	28.8	8.5	7.3	6.3	5.5	<0.1	6.9	11.5	14.7	<0.1	mg/l	TM30/PM14
Dissolved Manganese #	310	3	-	-	34	263	-	169	138	64	<2	ug/l	TM30/PM14
Dissolved Mercury #	-	-	-	-	-	-	-	<1	<1	<1	<1	ug/l	TM30/PM14
Dissolved Nickel #	-	-	-	-	-	-	-	2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Potassium #	3.0	5.4	12.7	9.0	3.5	2.6	<0.1	2.7	3.0	2.1	<0.1	mg/l	TM30/PM14
Dissolved Selenium #	-	-	-	-	-	-	-	<3	<3	<3	<3	ug/l	TM30/PM14
Dissolved Silver	-	-	-	-	-	-	-	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Sodium #	161.3	638.2 <sup>AB</sup>	27.4	24.7	370.5 <sup>AA</sup>	146.7	<0.1	34.9	30.7	22.5	<0.1	mg/l	TM30/PM14
Dissolved Strontium	-	-	-	-	-	-	-	479	531	434	<5	ug/l	TM30/PM14
Dissolved Vanadium #	-	-	-	-	-	-	-	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Zinc #	-	-	-	-	-	-	-	<3	<3	<3	<3	ug/l	TM30/PM14
Total Iron	<20	1171	471	111	134	142	<20	2297	1486	2119	<20	ug/l	TM30/PM14
Total Manganese	317	6	13	<2	35	276	<2	191	142	66	<2	ug/l	TM30/PM14
EPH (C8-C40) #	<10	<10	<10	<10	<10	<10	<10	-	-	-	<10	ug/l	TM5/PM30
EPH >C8-C10	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C10-C16	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C16-C24	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C24-C40	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C8-C40	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
GRO (>C4-C8) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
Benzene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
Toluene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
o-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12

Please see attached notes for all abbreviations and acronyms

**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham  
**JE Job No.:** 16/7892

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	70-77	78-86	87-92									
Sample ID	BD/16	BE/16	ETF/16D									
Depth												
COC No / misc												
Containers	V H HN P BOD G	V H HN P BOD G	V HN P G									
Sample Date	20/04/2016 11:30	20/04/2016 12:50	20/04/2016 14:25									
Sample Type	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1									
Date of Receipt	21/04/2016	21/04/2016	21/04/2016									
										LOD/LOR	Units	Method No.
Dissolved Aluminium #	699	<20	<20							<20	ug/l	TM30/PM14
Dissolved Antimony #	2	<2	-							<2	ug/l	TM30/PM14
Dissolved Arsenic #	<2.5	<2.5	-							<2.5	ug/l	TM30/PM14
Dissolved Barium #	25	12	-							<3	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	-							<0.5	ug/l	TM30/PM14
Dissolved Boron	237	1584	-							<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	-							<0.5	ug/l	TM30/PM14
Dissolved Calcium #	0.8	43.7	55.1							<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	-							<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	<2	<2	-							<2	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	-							<7	ug/l	TM30/PM14
Total Dissolved Iron #	<20	433	289							<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	-							<5	ug/l	TM30/PM14
Dissolved Lithium	130	47	-							<5	ug/l	TM30/PM14
Dissolved Magnesium #	0.2	6.9	28.7							<0.1	mg/l	TM30/PM14
Dissolved Manganese #	<2	14	<2							<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	-							<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	-							<2	ug/l	TM30/PM14
Dissolved Potassium #	11.3	3.2	5.4							<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3	<3	-							<3	ug/l	TM30/PM14
Dissolved Silver	<5	<5	-							<5	ug/l	TM30/PM14
Dissolved Sodium #	707.1 <sup>AB</sup>	375.7 <sup>AA</sup>	661.1 <sup>AB</sup>							<0.1	mg/l	TM30/PM14
Dissolved Strontium	66	920	-							<5	ug/l	TM30/PM14
Dissolved Vanadium #	<1.5	<1.5	-							<1.5	ug/l	TM30/PM14
Dissolved Zinc #	<3	<3	-							<3	ug/l	TM30/PM14
Total Iron	8405	555	1187							<20	ug/l	TM30/PM14
Total Manganese	102	15	7							<2	ug/l	TM30/PM14
EPH (C8-C40) #	-	-	<10							<10	ug/l	TM5/PM30
EPH >C8-C10	<10	<10	-							<10	ug/l	TM5/PM30
EPH >C10-C16	<10	<10	-							<10	ug/l	TM5/PM30
EPH >C16-C24	<10	<10	-							<10	ug/l	TM5/PM30
EPH >C24-C40	<10	<10	-							<10	ug/l	TM5/PM30
EPH >C8-C40	<10	<10	-							<10	ug/l	TM5/PM30
GRO (>C4-C8) #	<10	<10	<10							<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10	<10							<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10	<10							<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5							<5	ug/l	TM36/PM12
Benzene #	<5	<5	<5							<5	ug/l	TM36/PM12
Toluene #	<5	<5	<5							<5	ug/l	TM36/PM12
Ethylbenzene #	<5	<5	<5							<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5	<5							<5	ug/l	TM36/PM12
o-Xylene #	<5	<5	<5							<5	ug/l	TM36/PM12

Please see attached notes for all abbreviations and acronyms

Please see attached notes for all abbreviations and acronyms

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/7892

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Please include all sections of this report if it is reproduced



**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution

JE Job No: 16/7892

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Modified USEPA 8163. Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				

JE Job No: 16/7892

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM37	Modified USEPA 160.2. Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				

JE Job No: 16/7892

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM59	As received solid samples are extracted with water in a 1:1 water to solid ratio using end over end.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				

## Water Analysis Test Certificate

Round 17



# Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point  
Zone 3  
Deeside Industrial Park  
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Envireau Ltd  
Cedars Farm Barn  
Market Street  
Draycott  
Derby  
DE72 3NB

Tel: +44 (0) 1244 833780  
Fax: +44 (0) 1244 833781



<b>Attention :</b>	Phil Ham
<b>Date :</b>	10th June, 2016
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 16/9455 Batch 1
<b>Location :</b>	Various
<b>Date samples received :</b>	26th May, 2016
<b>Status :</b>	Final report
<b>Issue :</b>	1

Thirteen samples were received for analysis on 26th May, 2016 of which thirteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Paul Lee-Boden BSc**  
**Project Manager**

Client Name: Envireau Ltd  
Reference: KMA  
Location: Various  
Contact: Phil Ham  
JE Job No.: 16/9455

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-6	7-12	13-18	19-24	25-30	31-36	37-42	43-51	52-60	61-69	Please see attached notes for all abbreviations and acronyms		
Sample ID	WF/17	ETF/17	D/17U	D/17D	TV/17	HW/17	B/17	BA/17	BB/17	BC/17			
Depth													
COC No / misc													
Containers	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G			
Sample Date	25/05/2016 12:30	25/05/2016 12:00	25/05/2016 15:15	25/05/2016 14:40	25/05/2016 13:00	25/05/2016 14:00	25/05/2016 14:20	25/05/2016 10:30	25/05/2016 12:05	25/05/2016 13:05			
Sample Type	Ground Water	Ground Water	Surface Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	26/05/2016	26/05/2016	26/05/2016	26/05/2016	26/05/2016	26/05/2016	26/05/2016	26/05/2016	26/05/2016	26/05/2016	LOD/LOR	Units	Method No.
Dissolved Aluminium #	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	ug/l	TM30/PM14
Dissolved Antimony #	-	-	-	-	-	-	-	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Arsenic #	-	-	-	-	-	-	-	<2.5	<2.5	<2.5	<2.5	ug/l	TM30/PM14
Dissolved Barium #	-	-	-	-	-	-	-	90	21	172	<3	ug/l	TM30/PM14
Dissolved Beryllium	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Boron	-	-	-	-	-	-	-	82	143	92	<12	ug/l	TM30/PM14
Dissolved Cadmium #	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Calcium #	33.7	75.9	101.2	76.4	23.1	28.1	<0.2	300.2 <sup>AA</sup>	300.7 <sup>AA</sup>	249.8 <sup>AA</sup>	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	-	-	-	-	-	-	-	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	-	-	-	-	-	-	-	<2	2	<2	<2	ug/l	TM30/PM14
Dissolved Copper #	-	-	-	-	-	-	-	<7	<7	<7	<7	ug/l	TM30/PM14
Total Dissolved Iron #	447	674	99	26	55	236	<20	633	1326	1351	<20	ug/l	TM30/PM14
Dissolved Lead #	-	-	-	-	-	-	-	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Lithium	-	-	-	-	-	-	-	62	80	42	<5	ug/l	TM30/PM14
Dissolved Magnesium #	7.4	36.1	7.2	4.5	6.2	5.4	<0.1	6.2	11.0	15.5	<0.1	mg/l	TM30/PM14
Dissolved Manganese #	147	<2	14	<2	22	186	<2	157	118	42	<2	ug/l	TM30/PM14
Dissolved Mercury #	-	-	-	-	-	-	-	<1	<1	<1	<1	ug/l	TM30/PM14
Dissolved Nickel #	-	-	-	-	-	-	-	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Potassium #	3.0	5.8	12.2	9.0	3.5	2.6	<0.1	2.5	2.8	2.3	<0.1	mg/l	TM30/PM14
Dissolved Selenium #	-	-	-	-	-	-	-	<3	<3	<3	<3	ug/l	TM30/PM14
Dissolved Silver	-	-	-	-	-	-	-	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Sodium #	170.3	730.6 <sup>AB</sup>	23.2	31.3	411.0 <sup>AA</sup>	150.3	<0.1	31.1	29.4	23.6	<0.1	mg/l	TM30/PM14
Dissolved Strontium	-	-	-	-	-	-	-	442	522	444	<5	ug/l	TM30/PM14
Dissolved Vanadium #	-	-	-	-	-	-	-	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Zinc #	-	-	-	-	-	-	-	<3	<3	<3	<3	ug/l	TM30/PM14
Total Iron	480	1112	501	628	66	298	<20	751	1668	1831	<20	ug/l	TM30/PM14
Total Manganese	243	<2	26	2	31	278	<2	164	123	65	<2	ug/l	TM30/PM14
EPH (C8-C40) #	<10	<10	<10	<10	<10	<10	<10	-	-	-	<10	ug/l	TM5/PM30
EPH >C8-C10	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C10-C16	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C16-C24	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C24-C40	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C8-C40	-	-	-	-	-	-	-	<10	<10	<10	<10	ug/l	TM5/PM30
GRO (>C4-C8) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
Benzene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
Toluene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
o-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12

Please include all sections of this report if it is reproduced

**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham  
**JE Job No.:** 16/9455

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-6	7-12	13-18	19-24	25-30	31-36	37-42	43-51	52-60	61-69	Please see attached notes for all abbreviations and acronyms		
Sample ID	WF/17	ETF/17	D/17U	D/17D	TV/17	HW/17	B/17	BA/17	BB/17	BC/17			
Depth													
COC No / misc													
Containers	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H H N P BOD G	V H H N P BOD G	V H H N P BOD G			
Sample Date	25/05/2016 12:30	25/05/2016 12:00	25/05/2016 15:15	25/05/2016 14:40	25/05/2016 13:00	25/05/2016 14:00	25/05/2016 14:20	25/05/2016 10:30	25/05/2016 12:05	25/05/2016 13:05			
Sample Type	Ground Water	Ground Water	Surface Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	26/05/2016	26/05/2016	26/05/2016	26/05/2016	26/05/2016	26/05/2016	26/05/2016	26/05/2016	26/05/2016	26/05/2016	LOD/LOR	Units	Method No.
Fluoride	-	-	-	-	-	-	-	<0.3	<0.3	0.4	<0.3	mg/l	TM27/PM0
Bromide	-	-	-	-	-	-	-	0.15	0.09	0.09	<0.05	mg/l	TM27/PM0
Sulphate #	36.01	721.93	39.68	54.25	146.20	16.78	1.31	219.92	288.72	194.59	<0.05	mg/l	TM38/PM0
Chloride #	28.5	95.0	48.3	49.6	49.0	22.6	<0.3	88.6	56.0	35.3	<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	-	-	-	-	-	-	-	0.4	0.4	0.4	<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	mg/l	TM38/PM0
Ortho Phosphate as P #	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	mg/l	TM38/PM0
Monoethylene glycol	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	mg/l	TM24/PM30
Ammoniacal Nitrogen as N #	-	-	-	-	-	-	-	0.09	0.16	0.20	<0.03	mg/l	TM38/PM0
Dissolved Methane #	11	<1	-	-	<1	<1	-	<1	11	6	<1	ug/l	TM25/PM0
Dissolved Ethane #	-	-	-	-	-	-	-	<1	<1	<1	<1	ug/l	TM25/PM0
Dissolved Carbon Dioxide	-	-	-	-	-	-	-	253159**	269315**	181860**	<1	ug/l	TM25/PM0
Dissolved Propane	-	-	-	-	-	-	-	<1	<1	<1	<1	ug/l	TM25/PM0
Dissolved Butane	-	-	-	-	-	-	-	<1	<1	<1	<1	ug/l	TM25/PM0
Acetic Acid	-	-	-	-	-	-	-	<10	<10	<10	<10	mg/l	TM127/PM0
Total Alkalinity as CaCO3 #	418	648	202	149	615	387	9	420	420	384	<1	mg/l	TM75/PM0
Bicarbonate Alkalinity as CaCO3	418	648	202	149	615	387	9	420	420	384	<1	mg/l	TM75/PM0
Acrylamide	-	-	-	-	-	-	-	<50	<50	<50	<50	ug/l	TM103/PM59
Anionic Surfactants	-	-	-	-	-	-	-	0.8	1.4	0.4	<0.2	mg/l	TM33/PM0
BOD (Settled) #	-	-	-	-	-	-	-	<1	<1	2	<1	mg/l	TM58/PM0
COD (Settled) #	-	-	-	-	-	-	-	27	22	31	<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	927	2641	577	501	1376	729	18	1334	1307	1078	<2	uS/cm	TM76/PM0
Formaldehyde	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	mg/l	TM51/PM0
pH #	7.93	8.02	7.73	7.76	8.12	7.96	5.63	7.41	7.30	7.51	<0.01	pH units	TM73/PM0
Redox	-	-	-	-	-	-	-	518	487	498		mV	TM72/PM0
Salinity	-	-	-	-	-	-	-	0.8	0.8	0.6	<0.1	%	TM64/PM0
Sodium Persulphate	-	-	-	-	-	-	-	702	<60	71	<60	mg/l	TM100/PM0
Total Dissolved Solids #	588	1968	466	368	970	518	<10	1026	1060	868	<10	mg/l	TM20/PM0
Total Suspended Solids #	-	-	-	-	-	-	-	15	43	<10	<10	mg/l	TM37/PM0



**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham  
**JE Job No.:** 16/9455

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	70-78	79-87	88-93									
Sample ID	BD/17	BE/17	DD/17D									
Depth												
COC No / misc												
Containers	V H HN P BOD G	V H HN P BOD G	V HN P G									
Sample Date	25/05/2016 14:25	25/05/2016 15:20	25/05/2016 14:45									
Sample Type	Ground Water	Ground Water	Surface Water									
Batch Number	1	1	1									
Date of Receipt	26/05/2016	26/05/2016	26/05/2016									
										LOD/LOR	Units	Method No.
Dissolved Aluminium #	421	<20	<20							<20	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	-							<2	ug/l	TM30/PM14
Dissolved Arsenic #	<2.5	<2.5	-							<2.5	ug/l	TM30/PM14
Dissolved Barium #	36	11	-							<3	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	-							<0.5	ug/l	TM30/PM14
Dissolved Boron	246	1803	-							<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	-							<0.5	ug/l	TM30/PM14
Dissolved Calcium #	0.8	36.6	73.9							<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	-							<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	<2	<2	-							<2	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	-							<7	ug/l	TM30/PM14
Total Dissolved Iron #	<20	221	26							<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	-							<5	ug/l	TM30/PM14
Dissolved Lithium	132	46	-							<5	ug/l	TM30/PM14
Dissolved Magnesium #	0.3	6.2	4.4							<0.1	mg/l	TM30/PM14
Dissolved Manganese #	<2	<2	<2							<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	-							<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	-							<2	ug/l	TM30/PM14
Dissolved Potassium #	10.7	3.0	8.7							<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3	<3	-							<3	ug/l	TM30/PM14
Dissolved Silver	<5	<5	-							<5	ug/l	TM30/PM14
Dissolved Sodium #	771.0 <sup>AB</sup>	415.0 <sup>AA</sup>	30.5							<0.1	mg/l	TM30/PM14
Dissolved Strontium	87	848	-							<5	ug/l	TM30/PM14
Dissolved Vanadium #	<1.5	<1.5	-							<1.5	ug/l	TM30/PM14
Dissolved Zinc #	<3	<3	-							<3	ug/l	TM30/PM14
Total Iron	446	262	403							<20	ug/l	TM30/PM14
Total Manganese	<2	5	<2							<2	ug/l	TM30/PM14
EPH (C8-C40) #	-	-	<10							<10	ug/l	TM5/PM30
EPH >C8-C10	<10	<10	-							<10	ug/l	TM5/PM30
EPH >C10-C16	<10	<10	-							<10	ug/l	TM5/PM30
EPH >C16-C24	<10	<10	-							<10	ug/l	TM5/PM30
EPH >C24-C40	<10	<10	-							<10	ug/l	TM5/PM30
EPH >C8-C40	<10	<10	-							<10	ug/l	TM5/PM30
GRO (>C4-C8) #	<10	<10	<10							<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10	<10							<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10	<10							<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5							<5	ug/l	TM36/PM12
Benzene #	<5	<5	<5							<5	ug/l	TM36/PM12
Toluene #	<5	<5	<5							<5	ug/l	TM36/PM12
Ethylbenzene #	<5	<5	<5							<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5	<5							<5	ug/l	TM36/PM12
o-Xylene #	<5	<5	<5							<5	ug/l	TM36/PM12

Please see attached notes for all abbreviations and acronyms

Please see attached notes for all abbreviations and acronyms

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/9455

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Please include all sections of this report if it is reproduced

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution

JE Job No: 16/9455

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Modified USEPA 8163. Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				

JE Job No: 16/9455

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM37	Modified USEPA 160.2. Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				

JE Job No: 16/9455

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM59	As received solid samples are extracted with water in a 1:1 water to solid ratio using end over end.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				

## Water Analysis Test Certificate

Round 18





# Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point  
Zone 3  
Deeside Industrial Park  
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DE72 3NB

Tel: +44 (0) 1244 833780  
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<b>Attention :</b>	Phil Ham
<b>Date :</b>	4th July, 2016
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 16/10466 Batch 1
<b>Location :</b>	Various
<b>Date samples received :</b>	18th June, 2016
<b>Status :</b>	Final report
<b>Issue :</b>	1

Eleven samples were received for analysis on 18th June, 2016 of which eleven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Simon Gomery BSc**  
**Project Manager**

Client Name: Envireau Ltd  
Reference: KMA  
Location: Various  
Contact: Phil Ham  
JE Job No.: 16/10466

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-6	7-12	13-18	19-24	25-30	31-39	40-48	49-57	58-66	67-75	Please see attached notes for all abbreviations and acronyms		
Sample ID	WF/18	ETF/18	TV/18	HW/18	DW/18	BA/18	BB/18	BC/18	BD/18	BE/18			
Depth													
COC No / misc													
Containers	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H H N P B O D G	V H H N P B O D G	V H H N P B O D G	V H H N P B O D G	V H H N P B O D G			
Sample Date	15/06/2016 17:30	15/06/2016 17:00	15/06/2016 15:45	15/06/2016 16:30	16/06/2016 16:00	16/06/2016 10:05	16/06/2016 10:50	16/06/2016 12:15	16/06/2016 14:05	16/06/2016 15:00			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	18/06/2016	18/06/2016	18/06/2016	18/06/2016	18/06/2016	18/06/2016	18/06/2016	18/06/2016	18/06/2016	18/06/2016	LOD/LOR	Units	Method No.
Dissolved Aluminium #	-	-	-	-	-	<20	<20	<20	354	<20	<20	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	<2	<2	<2	<2	<2	<2	2	<2	<2	ug/l	TM30/PM14
Dissolved Arsenic #	-	-	-	-	-	6.7	6.1	4.0	4.6	6.7	<2.5	ug/l	TM30/PM14
Dissolved Barium #	-	-	-	-	-	93	24	175	35	13	<3	ug/l	TM30/PM14
Dissolved Beryllium	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Boron	-	-	-	-	-	69	131	89	236	1619	<12	ug/l	TM30/PM14
Dissolved Cadmium #	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Calcium #	33.9	84.3	22.4	28.7	<0.2	299.7 <sup>AA</sup>	292.8 <sup>AA</sup>	195.6	0.7	41.8	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	-	-	-	-	-	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	-	-	-	-	-	<2	3	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Copper #	-	-	-	-	-	<7	<7	<7	<7	<7	<7	ug/l	TM30/PM14
Total Dissolved Iron #	1006	781	122	271	<20	1439	1188	2271	<20	511	<20	ug/l	TM30/PM14
Dissolved Lead #	-	-	-	-	-	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Lithium	-	-	-	-	-	59	69	40	141	46	<5	ug/l	TM30/PM14
Dissolved Magnesium #	7.7	40.4	6.2	5.7	<0.1	6.2	11.6	14.6	0.3	6.8	<0.1	mg/l	TM30/PM14
Dissolved Manganese #	332	8	37	271	<2	150	133	64	<2	13	<2	ug/l	TM30/PM14
Dissolved Mercury #	-	-	-	-	-	<1	<1	<1	<1	<1	<1	ug/l	TM30/PM14
Dissolved Nickel #	-	-	-	-	-	<2	<2	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Potassium #	3.1	6.7	3.6	2.9	<0.1	2.6	3.1	2.2	12.0	3.4	<0.1	mg/l	TM30/PM14
Dissolved Selenium #	-	-	-	-	-	<3	<3	<3	<3	<3	<3	ug/l	TM30/PM14
Dissolved Silver	-	-	-	-	-	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Sodium #	177.8	554.7 <sup>AA</sup>	362.2 <sup>AA</sup>	158.8	<0.1	31.5	30.3	21.8	713.1 <sup>AA</sup>	390.1 <sup>AA</sup>	<0.1	mg/l	TM30/PM14
Dissolved Strontium	-	-	-	-	-	453	523	429	84	924	<5	ug/l	TM30/PM14
Dissolved Vanadium #	-	-	-	-	-	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Zinc #	-	-	-	-	-	<3	<3	<3	<3	<3	<3	ug/l	TM30/PM14
Total Iron	1018	1075	131	277	<20	2430	1196	2931	69	535	<20	ug/l	TM30/PM14
Total Manganese	338	10	37	278	<2	156	139	64	<2	13	<2	ug/l	TM30/PM14
EPH (C8-C40) #	<10	<10	<10	<10	<10	-	-	-	-	-	<10	ug/l	TM5/PM30
EPH >C8-C10	-	-	-	-	-	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C10-C16	-	-	-	-	-	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C16-C24	-	-	-	-	-	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C24-C40	-	-	-	-	-	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
EPH >C8-C40	-	-	-	-	-	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
GRO (>C4-C8) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
Benzene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
Toluene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
o-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12

Please include all sections of this report if it is reproduced

Please see attached notes for all abbreviations and acronyms

Please see attached notes for all abbreviations and acronyms

Please see attached notes for all abbreviations and acronyms

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/10466

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Please include all sections of this report if it is reproduced

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution

JE Job No: 16/10466

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Gravimetric determination of Total Dissolved Solids/Total Solids based on BS 1377-3:1990 and BSEN 15126	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			



JE Job No: 16/10466

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

JE Job No: 16/10466

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM59	As received solid samples are extracted with water in a 1:1 water to solid ratio using end over end.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				

## Water Analysis Test Certificate

Round 19



# Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point  
Zone 3  
Deeside Industrial Park  
Deeside  
CH5 2UA

Envireau Ltd  
Cedars Farm Barn  
Market Street  
Draycott  
Derby  
DE72 3NB

Tel: +44 (0) 1244 833780  
Fax: +44 (0) 1244 833781



<b>Attention :</b>	Phil Ham
<b>Date :</b>	12th August, 2016
<b>Your reference :</b>	KM8
<b>Our reference :</b>	Test Report 16/12035 Batch 1
<b>Location :</b>	Various
<b>Date samples received :</b>	22nd July, 2016
<b>Status :</b>	Final report
<b>Issue :</b>	1

Fifteen samples were received for analysis on 22nd July, 2016 of which fifteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Paul Lee-Boden BSc**  
**Project Manager**

Please see attached notes for all abbreviations and acronyms

**Client Name:** Envireau Ltd  
**Reference:** KM8  
**Location:** Various  
**Contact:** Phil Ham  
**JE Job No.:** 16/12035

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HN0<sub>3</sub>

J E Sample No.	61-66	67-73	74-79	80-85	86-91						Please see attached notes for all abbreviations and acronyms		
Sample ID	WH/19	AB/19	CB/19	CF/19	TE/19								
Depth													
COC No / misc													
Containers	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G								
Sample Date	20/07/2016 14:30	20/07/2016 14:15	20/07/2016 11:00	20/07/2016 13:15	20/07/2016 13:30								
Sample Type	Ground Water	Surface Water	Surface Water	Ground Water	Ground Water								
Batch Number	1	1	1	1	1								
Date of Receipt	22/07/2016	22/07/2016	22/07/2016	22/07/2016	22/07/2016						LOD/LOR	Units	Method No.
Dissolved Aluminium #	<20	<20	<20	<20	<20						<20	ug/l	TM30/PM14
Dissolved Calcium #	28.7	72.5	95.0	28.0	20.9						<0.2	mg/l	TM30/PM14
Total Dissolved Iron #	168	148	39	71	217						<20	ug/l	TM30/PM14
Dissolved Magnesium #	5.3	8.2	7.2	6.3	5.3						<0.1	mg/l	TM30/PM14
Dissolved Manganese #	182	2951	2	226	60						<2	ug/l	TM30/PM14
Dissolved Potassium #	2.7	7.8	2.2	2.9	3.2						<0.1	mg/l	TM30/PM14
Dissolved Sodium #	149.3	104.4	15.6	263.4 <sup>AA</sup>	197.1						<0.1	mg/l	TM30/PM14
Total Iron	225	529	181	83	599						<20	ug/l	TM30/PM14
Total Manganese	252	3942	4	230	84						<2	ug/l	TM30/PM14
EPH (C8-C40) #	<10	<10	<10	<10	<10						<10	ug/l	TM5/PM30
GRO (>C4-C8) #	<10	<10	<10	<10	<10						<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10	<10	<10	<10						<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10	<10	<10	<10						<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5	<5	<5						<5	ug/l	TM36/PM12
Benzene #	<5	<5	<5	<5	<5						<5	ug/l	TM36/PM12
Toluene #	<5	<5	<5	<5	<5						<5	ug/l	TM36/PM12
Ethylbenzene #	<5	<5	<5	<5	<5						<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5	<5	<5	<5						<5	ug/l	TM36/PM12
o-Xylene #	<5	<5	<5	<5	<5						<5	ug/l	TM36/PM12
Sulphate #	18.49	10.96	48.84	90.02	64.15						<0.05	mg/l	TM38/PM0
Chloride #	23.1	80.8	31.4	27.2	25.4						<0.3	mg/l	TM38/PM0
Total Alkalinity as CaCO <sub>3</sub> #	350	317	169	429	419						<1	mg/l	TM75/PM0
Bicarbonate Alkalinity as CaCO <sub>3</sub>	350	317	169	429	419						<1	mg/l	TM75/PM0
Dissolved Methane*	11	-	-	5	8						<1	ug/l	Subcontracted
Electrical Conductivity @25C #	783	860	590	1070	951						<2	uS/cm	TM76/PM0
pH #	7.85	7.81	7.98	7.93	8.05						<0.01	pH units	TM73/PM0
Total Dissolved Solids #	496	568	380	640	630						<35	mg/l	TM20/PM0

**Client Name:** Envireau Ltd

Reference: KM8

**Location:** Various

**Contact:** Phil Ham

**Matrix : Liquid**

[illegible]

**Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.**

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/12035

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Please include all sections of this report if it is reproduced



**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution

JE Job No: 16/12035

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Gravimetric determination of Total Dissolved Solids/Total Solids based on BS 1377-3:1990 and BSEN 15126	PM0	No preparation is required.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

JE Job No: 16/12035

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
Subcontracted	Subcontracted analysis, sent to an ISO 17025 accredited laboratory where possible.						

## Water Analysis Test Certificate

Round 20



# Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point  
Zone 3  
Deeside Industrial Park  
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Envireau Ltd  
Cedars Farm Barn  
Market Street  
Draycott  
Derby  
DE72 3NB

Tel: +44 (0) 1244 833780  
Fax: +44 (0) 1244 833781



<b>Attention :</b>	Phil Ham
<b>Date :</b>	1st September, 2016
<b>Your reference :</b>	KM8
<b>Our reference :</b>	Test Report 16/13285 Batch 1
<b>Location :</b>	Various
<b>Date samples received :</b>	19th August, 2016
<b>Status :</b>	Final report
<b>Issue :</b>	1

Fourteen samples were received for analysis on 19th August, 2016 of which fourteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Paul Lee-Boden BSc**  
**Project Manager**

Please see attached notes for all abbreviations and acronyms

Please see attached notes for all abbreviations and acronyms

**Matrix : Liquid**

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.



## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/13285

### SOILS

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JE Job No: 16/13285

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
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## Water Analysis Test Certificate

Round 21



# Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point  
Zone 3  
Deeside Industrial Park  
Deeside  
CH5 2UA

Envireau Ltd  
Cedars Farm Barn  
Market Street  
Draycott  
Derby  
DE72 3NB

Tel: +44 (0) 1244 833780  
Fax: +44 (0) 1244 833781



<b>Attention :</b>	Phil Ham
<b>Date :</b>	27th September, 2016
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 16/14463 Batch 1
<b>Location :</b>	Various
<b>Date samples received :</b>	16th September, 2016
<b>Status :</b>	Final report
<b>Issue :</b>	1

Fifteen samples were received for analysis on 16th September, 2016 of which fifteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Paul Lee-Boden BSc**  
**Project Manager**

Please see attached notes for all abbreviations and acronyms

Please see attached notes for all abbreviations and acronyms



**Client Name:** Envireau Ltd

**Matrix : Liquid**

Reference: KMA

**Location:** Various

**Contact:** Phil Ham

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

**Only analyses which are accredited are recorded as deviating if set criteria are not met.**

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/14463

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## **BASELINE WATER QUALITY DATA, APRIL – JUNE 2017**

### **KIRBY MISPERTON A WELLSITE, NORTH YORKSHIRE**



For

Third Energy UK Gas Limited  
Knapton Generating Station  
East Knapton  
Malton  
North Yorkshire  
YO17 8JF

By

Envireau Water  
Aske Stables  
Aske  
Richmond  
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## APPENDICES

Appendix A	Monitoring Locations
Appendix B	Monitoring Parameters
Appendix C	Analysis Methods
Appendix D	Analysis Results
Appendix E	Laboratory Test Certificates
Appendix F	Headspace Methane Reports

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Revision	Details	Completed by	Date	Checked by	Date
REV01	Draft	PH/DB	06/07/2017	PH	07/07/2017
REV02	Client Issue	PH/JS	14/07/2017	DB	14/07/2017
REV03	Environment Agency Issue	PH	18/07/2017	PJ	19/07/2017
REV04	Environment Agency Reissue	JS	05/09/2017	PH	05/09/2017



## **BASELINE WATER QUALITY DATA, APRIL – JUNE 2017**

### **KIRBY MISPERTON A WELLSITE, NORTH YORKSHIRE**

## **1 INTRODUCTION**

### **1.1 Background**

Third Energy UK Gas Limited (Third Energy) is proposing to hydraulically fracture an existing hydrocarbon production well (KM8) at Kirby Misperton A Wellsite, North Yorkshire (“the KMA Wellsite”).

The KM8 well was constructed in 2013 to a depth of 3099m true vertical depth (TVD) below ground level. The KM8 well is a vertical well and targets the Carboniferous Bowland Shale Formation, at depths of between c. 2000 and 3100 m TVD. The proposal is to hydraulically fracture the well at five intervals between approximately 2,123m and 3,044m TVD to enhance the production of natural gas (methane) from the target strata.

The location of the KMA Wellsite is shown on Figure 1.

### **1.2 Permit Conditions**

A mining waste and groundwater activity permit (Ref. EPR/DB3002HE; “the permit”) was issued by the Environment Agency for the hydraulic fracturing operation in April 2016 [Ref. 1]. The permit includes five pre-operational measures (PO1 – PO5). PO3 states:

*At least 4 weeks prior to commencement of permitted activities the operator shall submit to the Environment Agency for approval an updated Emissions Monitoring Plan (EMP) which will include, but is not limited to:*

- *Complete details of the baseline air quality study undertaken prior to activities commencing; and details of any changes made to the ambient air monitoring programme proposed,*
- *Complete details of the baseline surface water and groundwater study undertaken prior to activities commencing; and details of any changes made to the surface water and groundwater monitoring programme proposed. Baseline monitoring shall include as a minimum the parameters listed in table S3.5; and the locations, depth, construction method of the monitoring boreholes,*
- *The plan should also address the requisite surveillance requirements to monitor groundwater both pre-operation and over the lifetime of the activities authorised by this permit,*
- *Complete details of the surface water management procedures, and related process monitoring,*

*and shall obtain the Environment Agency’s written approval to the updated EMP.*

### 1.3 Purpose of this Report

This report provides the details of three months of baseline surface water and groundwater monitoring carried out by Third Energy between April to June 2017; in accordance with the monitoring requirements of the permit.

The three months of baseline monitoring was carried out following extensive discussions with the Environment Agency to agree a deviation from the monitoring requirements listed in Table S3.5 of the permit. The deviation is acknowledged in the Environment Agency's Compliance Assessment Report (CAR) ID: 402444/0285072 [Ref. 2], which forms an agreement in writing under Condition 3.5.1 of the permit to remove the requirement to monitor for citric acid triethyl ester, hemicellulase enzyme, maltodextrin, sodium carboxymethyl cellulose, sodium gluconate, 1,3,5 triazine and glycine as listed in Table S3.5. The deviation was required because it is not possible to analyse for these seven parameters in groundwater samples. Full details relating to this are available through the Environment Agency's online consultation hub (<https://consult.environment-agency.gov.uk/onshore-oil-and-gas/third-energy-kirby-misperton-information-page/>).

### 1.4 Previous Reports

The three months of baseline monitoring presented in this report supplements all the baseline monitoring data that has been collected from the KMA wellsite and nearby water features since February 2015, which was originally presented to the Environment Agency in November 2016 [Ref. 3].

**VERY IMPORTANT:** Please note that to ensure absolute consistency with the referencing of the wellsite monitoring boreholes in the permit (and the permit decision document and permit application documents), there has been a change to the way in which the KMA wellsite monitoring boreholes have been referenced in this report. To avoid potential confusion with previous submissions, and as agreed with the Environment Agency, Ref. 3 has been updated to reflect the changes and resubmitted to the Environment Agency.

## **2 BASELINE MONITORING**

### **2.1 Overview**

The environmental permit requires baseline monitoring to be undertaken at five on-site monitoring boreholes (BHA to BHE) at the KMA Wellsite and nine offsite monitoring locations, for a period of at least three months prior to the hydraulic fracturing operation.

### **2.2 Monitoring Points**

The locations of the groundwater monitoring boreholes at the KMA Wellsite and the offsite surface water and groundwater monitoring points are shown on Figure 1. Note that, in addition to the single monitoring location on the Sugar Hill Drain (S1) specified in the environmental permit, water samples have also been collected from a location upstream of the KMA Wellsite on the Sugar Hill Drain (S4).

Summary details of the monitoring locations, including the depth and construction method of the monitoring boreholes are provided in Tables A1 – A3 in Appendix A.

### **2.3 Monitoring Frequency**

Water sampling has been carried out on a monthly basis at every monitoring location (with the exception of some of the surface water points, where they were found to be essentially dry at the time of sampling). The three rounds of baseline sampling took place on 24th/25th April 2017, 17th/18th May 2017 and 14th/15th June 2017.

### **2.4 Sampling Method**

Water samples have been collected from the various surface water and groundwater features with reference to relevant parts of BS ISO 5667 (Water Quality Sampling). The sampling techniques are described in a separate sampling protocol that has been prepared by Envireau Water and adopted as a Third Energy operational technique [Ref. 4].

In accordance with the surface water and groundwater monitoring requirements listed in the permit, monitoring has also been undertaken for headspace methane (i.e. gas phase methane occurring in the atmosphere above the water level in the enclosed monitoring boreholes). Monitoring for headspace methane was carried out by staff from Ground Gas Solutions Ltd using portable gas analysers as follows:

- Monitoring of the onsite boreholes (BHA to BHE) was carried out using either a GFM400 series or GA5000 gas analyser. The gas analysers were connected to gas ports located at the top of the boreholes. Headspace gas was then pumped out of the sealed borehole top and through the detector, and flow rates, bulk gas concentrations (methane, carbon dioxide and oxygen), and trace gas compounds (hydrogen sulphide and carbon monoxide) were measured. Methane, carbon dioxide and oxygen were measured as volume % in air whilst hydrogen sulphide and carbon monoxide were measured in parts per million by volume (ppmv). During gas sampling the exhaust of the gas analyser was attached to the inlet of a TDL-500 gas analyser to additionally allow more sensitive measurements of methane as low as 1 ppmv.
- The offsite monitoring boreholes and water wells are not fitted with gas ports and therefore monitoring was carried out using a TDL-500 gas analyser to detect methane at levels as low as 1 ppmv. In these cases, water samples were collected and the inlet tubing of the TDL was placed insider the sample container to

obtain a methane measurement. These determinations are therefore not made in the well headspace, but rather made in the headspace of the sample container.

## 2.5 Analysis Methods

The final list of monitoring parameters is presented as Appendix B. This is based on the requirements of the permit [Ref. 1] and the deviation that was agreed with the Environment Agency [Ref. 2].

Field analysis has been carried out using handheld devices for determination of water temperature, pH, electrical conductivity (EC) and redox potential (ORP), and also headspace methane.

Water samples have been submitted for laboratory analysis to Jones Environmental Laboratory and the University of Durham (the latter for stable isotope analysis only). Summary details of the analysis methods used by Jones Environmental Laboratory are provided in Appendix C. The method used by the University of Durham for stable isotope ( $^{13}\text{C}$ ) analysis was based on Roberts and Shiller [Ref. 5].

## 3 BASELINE RESULTS

### 3.1 Availability

Data are available for all three sampling rounds. It should be noted that the Sugar Hill Drain (locations S1 downstream of the KMA Wellsite and S4 upstream of the KMA Wellsite) was dry during all three sampling rounds and therefore no analysis results are reported. Ackland Beck (location S3) was almost dry during the June sampling round and it was not possible to collect a water sample to carry out meaningful analysis.

### 3.2 Results

The results from the three rounds of baseline water sampling have been tabulated and are provided in the data file in Appendix D. The full laboratory test certificates are presented in Appendix E. The results from headspace methane monitoring are presented in Appendix F. The following sections discuss the results from these three sampling rounds and provide a general comparison, and comment on consistency with the earlier baseline sampling presented in Ref. 3.

### 3.3 Trends

Selected chemical indicators have been plotted graphically to illustrate the trends in water chemistry across the monitoring period. The indicators include major ions and other minor constituents and have been chosen to align with the BGS baseline data that is currently available in a graphical format through the BGS website (<http://www.bgs.ac.uk/research/groundwater/shaleGas/monitoring/waterQualityYorkshire.html>). It should be noted that the charts present selected indicator analytes and not the full suite of analytes, simply to make presentation of a manageable size for a summary report. The full list of analytes and their concentrations are presented in Appendices D, E & F.

Surface water data are presented on Figure 2 and groundwater data are presented on Figures 3a, 3b and 3c. Data have also been plotted as a Piper diagram and the resulting chart is presented on Figure 4. The Piper diagram is a common presentation, used to plot the relative proportions (in milliequivalents per litre) of the major cations and anions ( $\text{Na}^+$ ,  $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$ ,  $\text{K}^+$ ,  $\text{Cl}^-$ ,  $\text{SO}_4^-$  and  $\text{HCO}_3^-$ ) in a water sample. The water sample depths are illustrated on the generalised vertical section on Figure 5.

### 3.3.1 Summary of Surface Water

Ackland Beck (location S3) was almost dry during the June sampling round and a sample was not submitted to the laboratory for analysis. Furthermore, the Sugar Hill Drain (locations S1 and S4) was dry during all three sampling rounds and therefore no samples are reported.

In Ackland Beck (S3), therefore, only two new samples were available. Concentrations of some major ions (calcium, sodium, chloride, sulphate) exhibit a decrease in concentration from April – June 2017, while others (potassium, alkalinity) exhibit a modest increase. As observed in the previous report [Ref. 3], Ackland Beck (S3) has generally higher concentrations of calcium, magnesium sodium, potassium, alkalinity and chloride than Costa Beck (S2). Nitrate concentrations are somewhat lower in Ackland Beck (S3 – 0.3-0.4 mg/l as  $\text{NO}_3^-$ ) than were recorded in the preceding baseline period.

In Costa Beck (S2), concentrations of plotted parameters are relatively consistent across the sampling period April-June 2017. Nitrate concentrations are in the range 26-29 mg/l (as  $\text{NO}_3^-$ ), which is consistent with the previous baseline period.

The results for iron ('dissolved' iron, using laboratory parlance) show that concentrations were all below 100  $\mu\text{g/l}$  for the most recent sampling period (April-June 2017).

The surface waters tend to have rather variable pH and alkalinity. The field pH was in the range 7.3 to 8.2 for this latest sampling period (as compared with 7 - 8.7 for the previous baseline series), with laboratory alkalinities in the range 3.8 to 4.6 meq/l (Costa Beck) and 5.8 to 6.3 meq/l (Ackland Beck). It is likely that the variability reflects responses to rainfall and surface run-off. Ackland Beck (S3) still exhibits slightly higher pH and higher alkalinity than the Costa Beck (S2).

Both surface waters contained concentrations of dissolved oxygen (9.5 to 13.5 mg/l), which were close to saturation.

The results from this latest sampling period are broadly consistent, in terms of major ion chemistry, with the results from the previous baseline report.

### 3.3.2 Summary of Groundwater Data

The major ion chemistry of the groundwater samples has remained consistent across the monitoring period, with the minor exceptions of:

- G6 (The Ellers), which has exhibited a modest decrease in most major ion parameters from April-June 2017.
- BoreholeBHA, which has exhibited a modest decline in  $\text{Mg}^{++}$  and  $\text{SO}_4^-$  and a slight increase in alkalinity during the period April-June 2017.

Selected indicator analytes are shown on Figures 3a, 3b and 3c.

#### *Superficial Deposits / Weathered Kimmeridge Clay*

As was deduced from the previous baseline water quality data set [Ref. 3], the latest data set supports the assertion that, on the basis of major ion data, the boreholes targeting the superficial deposits / weathered Kimmeridge Clay can be divided into three main groups: the KMA Wellsite boreholes (BHA, BHB and BHC), the borehole at The Villa

(G3) and the remaining offsite groundwater sources (G2, G4, G5, G6). The main differences in water chemistry between the three groups are that, in general:

- The KMA Wellsite boreholes have higher concentrations of calcium, chloride, sulphate and iron, and lower concentrations of sodium and oxygen. These are all Ca-HCO<sub>3</sub>-SO<sub>4</sub> or Ca-SO<sub>4</sub>-HCO<sub>3</sub> waters.
- The borehole at The Villa (G3) has higher concentrations of sodium and methane, somewhat elevated chloride and lower concentrations of calcium and iron. This is a Na-HCO<sub>3</sub> water.
- The remaining offsite groundwater sources (G2, G4, G5, G6) have a very similar composition with lower concentrations of calcium, chloride and sulphate, and intermediate concentrations of sodium. They tend to exhibit moderate to relatively high concentrations of dissolved oxygen. These are Na-HCO<sub>3</sub> waters.

During April-June 2017 (and this is consistent with the findings from the previous baseline reporting period), the boreholes in superficial deposits / weathered Kimmeridge Clay typically exhibit laboratory alkalinities in the range 7 to 10 meq/l (i.e. higher than surface waters), although borehole G3 at The Villa exhibits typical alkalinities of 12 to 13 meq/l. Monitoring locations G2 to G5 typically yield groundwaters with field pH in the range 7 to 8 (with borehole G6 yielding water with a pH in excess of 8). The on-site boreholes BHA to BHC yield water with lower field pH, in the range 6.89 to 7.0.

As regards dissolved oxygen, the groundwaters range from rather anoxic (<0.5 mg/l O<sub>2</sub>) in the on-site boreholes BHA-BHC, to essentially oxygen-saturated (G6). The other groundwater sources exhibit intermediate dissolved oxygen contents. It should be noted that, especially in the offsite wells, the dissolved oxygen content may be influenced by the pumping methodology and equipment from which samples are collected.

Nitrate concentrations range from below detection limit to c. 2.7 mg/l during the period April-June 2017.

The groundwater chemistry of these wells and boreholes is broadly consistent with the previous reported period of groundwater monitoring with the following exceptions:

- Dissolved iron concentrations in well G2 seem somewhat higher in April-June 2017 than in the previous baseline period.
- Calcium concentrations in well G6 seem somewhat lower in April-June 2017 than in the previous baseline period.
- Sodium, calcium, magnesium and sulphate concentrations are somewhat higher in Borehole BHC in April-June 2017 than in the previous baseline period.
- Calcium, magnesium, manganese, alkalinity and, especially, sulphate (and, to a lesser extent, potassium and sodium) are significantly higher in Borehole BHA in April-June 2017 than in the previous baseline period.

#### *Kimmeridge Clay*

The major ion data show that the water from the borehole at Elm Tree Farm (G1) is more mineralised than the water from the intermediate borehole at the KMA Wellsite (BHD). In general, the water at Elm Tree Farm has the higher concentrations of the key chemical indicators, the most notable difference being the concentration of

sulphate, which is at least three times greater at Elm Tree Farm than at BHD at the KMA wellsite. These observations are entirely consistent with the preceding baseline water quality data set [Ref. 3].

Nitrate was consistently below detection limit (<0.2 mg/l) in both wells G1 and BHD in the period April-June 2017.

As regards pH, the water from G1 exhibits a typical range of around 7.6 to 7.85 (field pH) and a laboratory total alkalinity of 12.6 to 13.3 meq/l. BHD exhibits a field pH of 7.8 to 8.1 in the period April-June 2017 and a laboratory total alkalinity of around 13 meq/l. These values are consistent with the previous baseline data set, although the current BHD alkalinity is a little higher than previously (typically c. 12 meq/l in the previous reporting period).

The groundwater chemistry of these wells is broadly consistent with the previous reported period of groundwater monitoring with the following exceptions:

- Calcium and magnesium concentrations are now somewhat lower in Borehole BHD in April-June 2017 than in the previous baseline period.

#### *Corallian Group*

The Corallian Group borehole (BHE) at the KMA Wellsite exhibits relatively stable indicator parameter concentrations across the monitoring period. The main differences between the water composition from the Corallian Group and the other monitoring points is that the concentrations of chloride (and methane) are much higher, being over six (6) times greater than the highest concentrations from the other monitoring points. The water has a high (alkaline) field pH of 9.1 to 9.9 in the period April-June 2017 and a laboratory total alkalinity of around 10.4 to 11.1 meq/l. These values are consistent with the preceding baseline water quality data set [Ref. 3]. It is noteworthy that the water is very poor in calcium and magnesium (< 1 mg/l of each): this is most likely due to the high pH having caused these elements to precipitate out as carbonate minerals.

The very low sulphate and oxygen concentrations in the groundwater at BHE suggest highly reducing conditions. The very high methane concentrations confirm the very reducing nature of the water. The low dissolved iron and manganese concentrations likely represent the low solubility of these metals in a sulphide-rich environment. There is thus a large contrast between the moderately brackish, highly reducing, sulphate-poor Corallian water and the sulphate-rich, fresher, generally more oxidising waters of the superficial deposits.

The groundwater chemistry of this borehole is broadly consistent with the previous reported period of groundwater monitoring with the following exceptions:

- Sulphate concentrations are now lower in Borehole BHE in April-June 2017 than in the previous baseline period, although they had previously been exhibiting a declining trend.

Some of the above observations suggest that the groundwater as sampled (especially from the new monitoring boreholes) may still be in the process of reaching a representative equilibrium with the aquifer.

#### 3.3.3 Piper Diagram

The Piper diagram on Figure 4 illustrates the major ion composition of the water samples and indicates that the water from the monitoring points can be split into five main groups:

- The surface water monitoring points. The surface waters can be described as calcium-bicarbonate (Ca-HCO<sub>3</sub>) type, which is indicative of reasonably fresh water from shallow systems.

- The KMA Wellsite superficial deposits boreholes (BHA to BHC). These bear many resemblances to the surface waters in composition. The boreholes have, however, a somewhat higher sulphate concentration than the surface water monitoring points and can be described as  $\text{Ca-HCO}_3\text{-SO}_4$  or  $\text{Ca-SO}_4\text{-HCO}_3$  waters. These might be expected to originate from oxidation of sulphide minerals or dissolution of secondary sulphate minerals in the clay horizons encountered in the boreholes.
- The offsite superficial deposits/weathered Kimmeridge Clay groundwater sources (G2 to G6) and the Kimmeridge Clay borehole at the KMA Wellsite (BHD) have a sodium-bicarbonate type composition. This difference in composition suggests that the boreholes are drawing on deeper, more hydrochemically mature water, in comparison with the onsite superficial deposits boreholes. The chemical signature may reflect cation exchange processes or other preferential sodium accumulation processes.
- Groundwater from the Kimmeridge Clay borehole at Elm Tree Farm (G1) has a higher sulphate concentration than the offsite superficial boreholes and can be described as having a sodium-sulphate-bicarbonate ( $\text{Na-SO}_4\text{-HCO}_3$ ) type composition. The source of the sulphide is likely to be either oxidation of sulphide minerals in the clay, or dissolution of secondary sulphate minerals. Overall, the water from this borehole is more mineralised.
- Groundwater from the Corallian Group borehole (BHE) has a higher chloride concentration than the other monitoring points and can be described as having a sodium-chloride ( $\text{Na-Cl}$ ) type composition. The water has a relatively high mineralisation and salinity, which is indicative of the deep and confined nature of the Corallian limestone at this location. The low sulphate and oxygen concentrations, coupled with the elevated dissolved methane content, suggest that the water is highly reducing in nature.

The interpretation of the samples and their positions on the Piper Diagram remains essentially unchanged from the previously baseline data period, although some minor differences in the plotting of the surface water samples can be ascertained, ascribable to their natural variability.

#### 3.3.4 Hydrocarbons including Methane

A key aspect of the baseline water quality programme is the analysis of dissolved hydrocarbons, including methane. Results from the water sampling carried out by Third Energy are presented in Appendices D and E by carbon banding. Dissolved methane, ethane, propane and butane have been analysed in all groundwater and surface water samples.

Methane analyses of the surface waters showed modest, but detectable, methane concentrations, typically of around 8-12  $\mu\text{g/l}$  in the two streams (the first sample from Ackland Beck returned <1  $\mu\text{g/l}$ ).

Dissolved methane concentrations in the groundwater samples from boreholes targeting the superficial deposits and Kimmeridge Clay range between <1  $\mu\text{g/l}$  to 3.5  $\text{mg/l}$ . Lower concentrations of <1 to several tens of  $\mu\text{g/l}$  were recorded from G2, G4, G5, G6, BHA, BHB and BHC. The higher concentrations were from G1 (0.6 – 0.8  $\text{mg/l}$ ), G3 (2.9 – 3.5  $\text{mg/l}$ ) and BHD (0.09 - 0.12  $\text{mg/l}$ ). Methane concentrations in the Corallian borehole at the KMA Wellsite (BHE) range between 36 - 65  $\text{mg/l}$ . The highest values should be treated with some caution as they are outside the calibration limits of the analytical equipment.

All the above are wholly consistent with the preceding period of baseline sampling.



The results of the methane isotope analysis (Appendices D and E), as shown in Figure 6, exhibit a significant degree of variation. Most of the groundwater (and all of the surface water) samples exhibit  $\delta^{13}\text{C}$  of methane ( $\text{CH}_4$ ) of between -45 and -70‰. Most thermogenic methane signatures are heavier (i.e. higher) than -55 to -50‰ [Ref. 5, Ref. 6]. The two most likely explanations for the bulk of the methane signatures from this study are:

- That the methane is derived from biogenic acetate fermentation processes typical of shallow onshore environments, or
- That the low methane content had equilibrated with ambient laboratory atmosphere by the time of analysis.

The  $\delta^{13}\text{C}$  of the dissolved  $\text{CO}_2$  in these water samples is around -26‰, which is very typical of soil gas-derived  $\text{CO}_2$ . Two of the samples (from borehole BHD) have slightly heavier  $\delta^{13}\text{CH}_4$  signatures of -39 to -43‰. Heavy  $\delta^{13}\text{CH}_4$  could indicate a contribution of thermogenic methane or may simply be the result of isotopic fractionation during methane oxidation.

All the samples from the deep borehole BHE (and two other samples, from BHB and G1) exhibit a very distinctive  $\delta^{13}\text{CH}_4$  signature in the range -70 to -84‰. This is most likely ascribable to deep biogenic methane, formed by processes of carbon dioxide reduction, rather than acetate fermentation [Ref. 6, Ref. 7, Ref. 8, Ref. 9]. These samples also exhibit a heavy  $\delta^{13}\text{CO}_2$  signature, indicating possible influence of aquifer marine carbonates.

Concentrations of dissolved ethane, propane and butane were all below the laboratories' limits of analytical detection for all surface and groundwater samples, with the exceptions of:

- Borehole BHE (deep Corallian borehole), where one ethane concentration of 9 µg/l was recorded during the April sampling round.
- Concentrations of 16-20 µg/l ethane on all three sampling rounds at the Villa (G3). Ethane was not detected at G3 during previous baseline sampling.

Aside from light hydrocarbons (methane to butane; C1-C4) discussed above, the results show that no detectable concentrations of heavier dissolved hydrocarbons or of MTBE have been observed in any of the samples from the surface water and groundwater monitoring points during the latest period of monitoring (April-June 2017), with the exception of:

- 140 µg/l C<sub>8</sub>-C<sub>10</sub> hydrocarbons in Costa Beck (S2) on 14th June 2017.
- 60 µg/l C<sub>8</sub>-C<sub>10</sub> hydrocarbons in one of two duplicate samples from Coultas Farm (G4), but not in the other duplicate, also on 14th June 2017.
- 110 µg/l C<sub>8</sub>-C<sub>10</sub> and 60 µg/l C<sub>10</sub>-C<sub>16</sub> hydrocarbons in the sample from The Ellers (G6), also on 14th June 2017.

The fact that all these positive "detects" took place from widely spaced localities on a single date is strongly suggestive of trace contamination either during sampling or analysis. All of the "detects" were made in the context of the extractable petroleum hydrocarbons (EPH) analysis. The samples were therefore reanalysed and all results were reported as below detection (< 10 µg/l).

No heavier dissolved hydrocarbons had been detected during the preceding baseline monitoring period since March 2016.

### 3.3.5 Micro-constituents

Appendix E also provides data on a number of micro-constituents.

No acetic acid, sodium persulphate, formaldehyde, non-ionic surfactants or acrylamide was detected in any of the surface water samples. Anionic surfactants were detected at around 0.5 to 0.9 mg/l in the surface water samples.

No acetic acid, acrylamide or sodium persulphate was detected in any of the groundwater samples.

Formaldehyde was detected in groundwater in one of the two duplicate samples collected from the deep Corallian borehole BHE in May 2017 at 1.3 mg/l. In the other duplicate and in all other samples from this and other wells, it remained <0.5 mg/l from April-June 2017.

Non-ionic surfactants were <5 µg/l in all groundwater samples from April-June 2017, with the exception of:

- Borehole BHA in April 2017 at 27 µg/l and June 2017 at 144 µg/l.
- Borehole BHC in April 2017 at 26 µg/l.

Anionic surfactants were detected at around 0.2 to 1.4 mg/l in all groundwater samples. These results were reconfirmed through reanalysis of the June 2017 samples. Anionic surfactants were also detected at 1.1 mg/l in one of the blank samples, which was also reconfirmed during reanalysis, so the significance of the apparent positives is difficult to determine and is discussed in more detail in Section 3.3.7.

### 3.3.6 Headspace Methane

In addition to determining concentrations of dissolved methane in water:

- Concentrations of methane (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>), oxygen (O<sub>2</sub>), hydrogen sulphide (H<sub>2</sub>S) and carbon monoxide (CO) were also determined in the air within the borehole headspace of boreholes BHA-BHE.
- Concentrations of methane (CH<sub>4</sub>) were measured in the air within the sampling containers, at the end of the hose or within the sampling bucket (surface waters and G1-G6).

As one might expect, the gas concentrations were extremely variable:

- Carbon monoxide (CO) was not detected (detection limit <1 ppmv – parts per million by volume) in the on-site boreholes BHA-BHE during any of the three sampling rounds (April-June 2017).
- Hydrogen sulphide (H<sub>2</sub>S) was only detected at around 1 ppmv in June 2017 in BHA, BHC and BHE. In all other cases, H<sub>2</sub>S was <1 ppmv in the on-site boreholes. A smell of H<sub>2</sub>S was consistently noted when sampling G1. The presence of H<sub>2</sub>S suggests sulphate-reducing conditions.
- Oxygen (O<sub>2</sub>) concentrations in the headspace of boreholes BHA-BHE varied very strongly from <1% to 20-21%v/v (the latter figure representing atmospheric partial pressure). O<sub>2</sub> content tended to be lowest in BHA and BHB during all sampling rounds, and was highest at times of high atmospheric pressure.
- Carbon dioxide (CO<sub>2</sub>) concentrations in the headspace of boreholes BHA-BHE also varied very strongly. In contrast to oxygen, the highest concentrations were typically found in BHB, then BHA, with relatively low concentrations in BHC, BHD and BHE. The generally lowest concentrations of CO<sub>2</sub> coincided with highest

atmospheric pressure. These observations suggest that the groundwater in BHA and BHB may contain the highest excess partial pressure of dissolved CO<sub>2</sub>, or that the subsurface around these boreholes is subject to especially strong soil respirative processes.

- Methane (CH<sub>4</sub>) concentrations in the headspace of BHA, BHB, BHC and BHD are typically a few ppmv or several tens of ppmv, with BHB typically yielding results at the upper end of this range. BHE yields the highest CH<sub>4</sub> concentrations in the headspace air, typically of several hundreds or several thousands of ppmv. Of the offsite wells, the only ones registering consistent CH<sub>4</sub> “detects” were G1 and G3 (as one might expect, given the dissolved CH<sub>4</sub> results, see above).

### 3.3.7 Duplicates and Blanks

Three duplicate samples were collected during the latest baseline monitoring period, from Well G4, from Borehole BHB and the deep Borehole BHE, in June, April and May 2017, respectively. Generally, reproducibility between duplicates was excellent, with the exception of bromide, where the reproducibility was rather poor, and for certain specific instances, as follows:

- For Borehole BHB (April 2017) the duplicates returned divergent values of:
  - 10 and <1 µg/l for dissolved methane.
  - 25 and 16 mg/l for total suspended solids.
  - 13 and 23 mg/l for chemical oxygen demand (COD).
- For Borehole BHE (May 2017) the duplicates returned divergent values of:
  - 6.2 and 1.9 mg/l for sulphate.
  - 1.3 and <0.5 mg/l for formaldehyde.
- For Well G4 (June 2017) the duplicates returned divergent values of:
  - 2.6 and <1.5 µg/l for vanadium. This was reported as below detection (<1.5 µg/l) on reanalysis.
  - 60 and <10 µg/l for extractable petroleum hydrocarbons (EPH) in the C<sub>8</sub> to C<sub>10</sub> range.

Three blank samples of distilled water were also submitted to the laboratory, one in connection with each of the three sampling rounds. In only three cases, were there positive “detects” registered for the blank samples:

- A “detect” of 13 µg/l dissolved methane, in the sample of April 2017, relative to a detection limit of 1 µg/l. Subsequent sampling rounds using distilled water have provided results below detection limit, as would be expected.
- A “detect” of 3 µg/l arsenic (As), relative to a detection limit of 2.5 µg/l, in June 2017. This was reported as below detection (<2.5 µg/l) on reanalysis.
- A “detect” of 1.1 mg/l anionic surfactants, relative to a detection limit of 0.2 mg/l, in June 2017. This result was reconfirmed on reanalysis, suggesting potential trace contamination during sampling or analysis.

## **4 DISCUSSION**

### **4.1 Summary**

Third Energy has collected an additional three months of baseline water quality data from a range of surface water and groundwater features at and close to the KMA Wellsite. Monitoring has been carried out in accordance with the requirements of the permit [Ref. 1] and the deviation that was agreed with the Environment Agency [Ref. 2]. The submission of this latest baseline data fulfils the requirement specified in PO3 of the permit, to provide complete details of the baseline surface water and groundwater monitoring, and will be presented to the Environment Agency as part of an updated Emissions Monitoring Plan.

There is a good correspondence between the new baseline data, the previously collected baseline data and the data that are being collected by the BGS as part of their own baseline water quality monitoring programme.

The baseline data shows clear chemical signatures for waters from different provenances; and monitoring points can be grouped together on this basis. The surface waters exhibit a calcium-bicarbonate water chemistry. The shallower groundwaters exhibit a calcium-sulphate-bicarbonate chemistry, tending towards sodium-bicarbonate-sulphate in the deeper (Kimmeridge Clay) boreholes. The deepest (Corallian) borehole exhibits a highly reducing (sulphate-poor and methane-rich) water chemistry of sodium-chloride composition.

There are some differences in the major ion chemistry in the wellsite monitoring boreholes, as compared with the previous baseline data rounds. This may suggest that the groundwater as sampled from the boreholes is still to some extent in the process of reaching a representative equilibrium with the aquifer.

As observed in the previous baseline period, there is a large range of dissolved methane concentrations across the monitoring points. The highest concentration of dissolved methane (around 36 - 65 mg/l) is found in the deepest (Corallian) borehole, BHE, along with 9 µg/l dissolved ethane in one sample.

### **4.2 Future Monitoring**

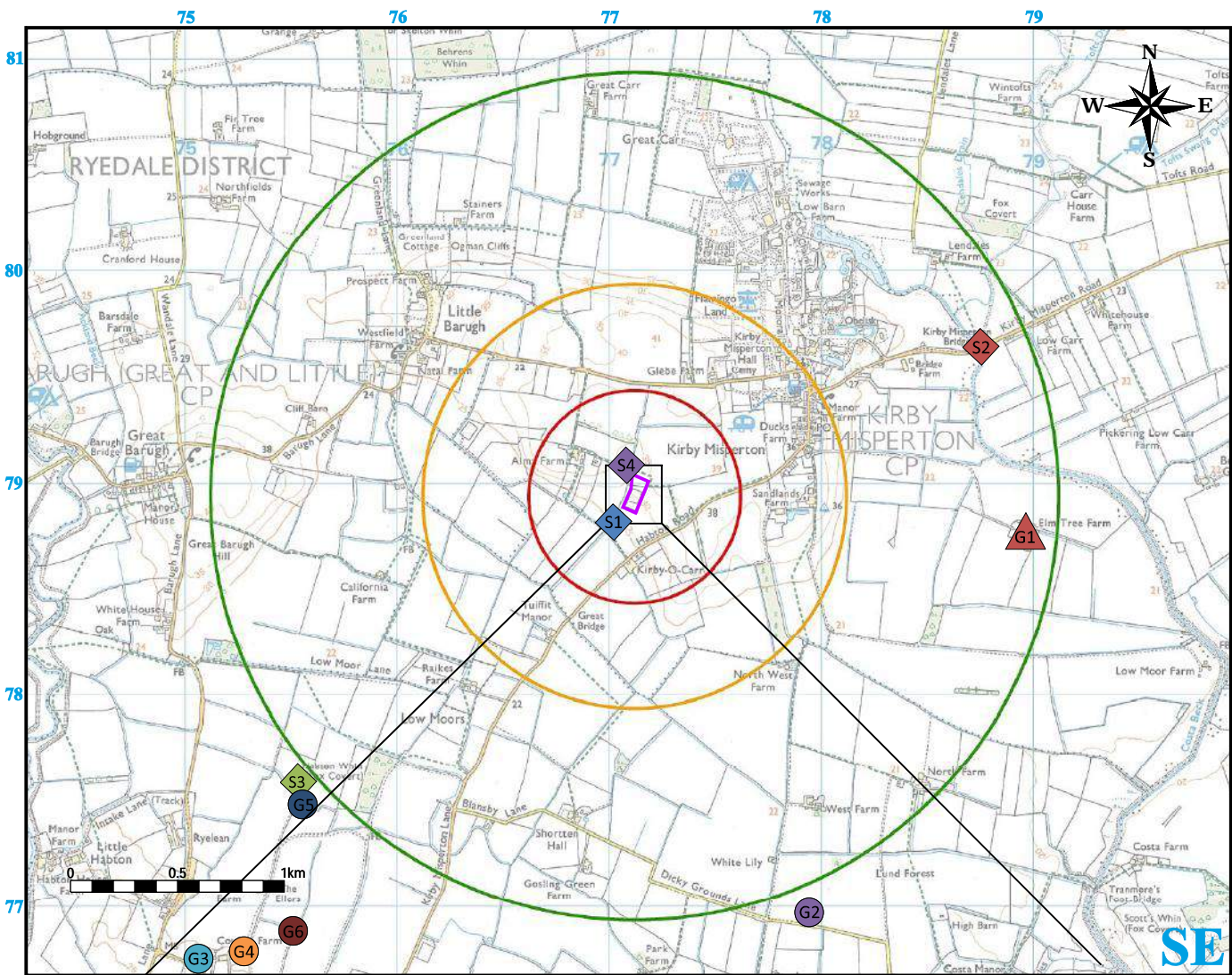
There are no proposed changes to future baseline or operational monitoring. Further rounds of baseline sampling may be carried out depending on the exact timing of the hydraulic fracturing operation and discussions with the Environment Agency.

**Envireau Water**  
**05/09/2017**

## 5 REFERENCES

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- Ref. 2** Environment Agency EPR Compliance Assessment Report ID: 402444/0285072, 19/05/2017.
- Ref. 3** Baseline Water Quality Data, Kirby Misperton A Wellsite, North Yorkshire. Prepared by Envireau Water for Third Energy UK Gas Ltd, November 2016. Report resubmitted September 2017.
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- Ref. 5** Roberts H. M. and Shiller A.M., 2015. Determination of dissolved methane in natural waters using headspace analysis with cavity ring-down spectroscopy. *Analytica Chimica Acta*, 856:68-73.
- Ref. 6** Schoell M (1980) The hydrogen and carbon isotopic composition of methane from natural gases of various origins. *Geochimica et Cosmochimica Acta* 44: 649-661.
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## **FIGURES**



Scale 1 : 30,000 (at A3)

### KEY

- KMA Wellsite boundary
- 500 m Radius
- 1 km Radius
- 2 km Radius

### Monitoring Points:

- Surface Waters:
- ◆ S1 Sugar Hill Downstream
  - ◆ S2 Costa Beck
  - ◆ S3 Ackland Beck
  - ◆ S4 Sugar Hill Upstream

### Superficial Deposits

- G2 West Farm
- G3 The Villa
- G4 Coultas Farm
- G5 Habton Whin
- G6 The Ellers

### Kimmeridge Clay:

- ▲ G1 Elm Tree Farm

### KMA Wellsite

### Monitoring Points:

#### Superficial Deposits:

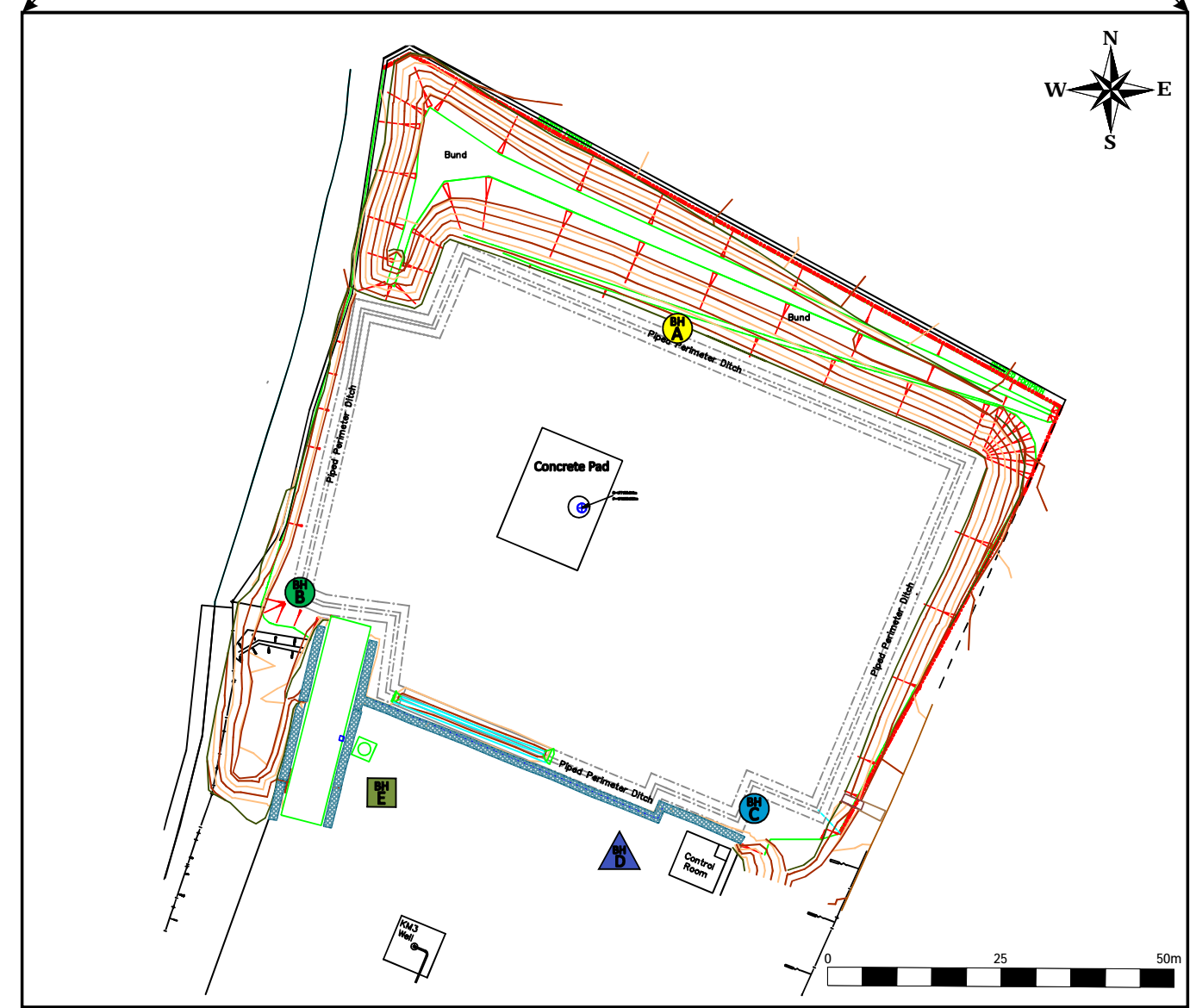
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- BH B Borehole B
- BH C Borehole C

#### Kimmeridge Clay:

- ▲ BH D Borehole D

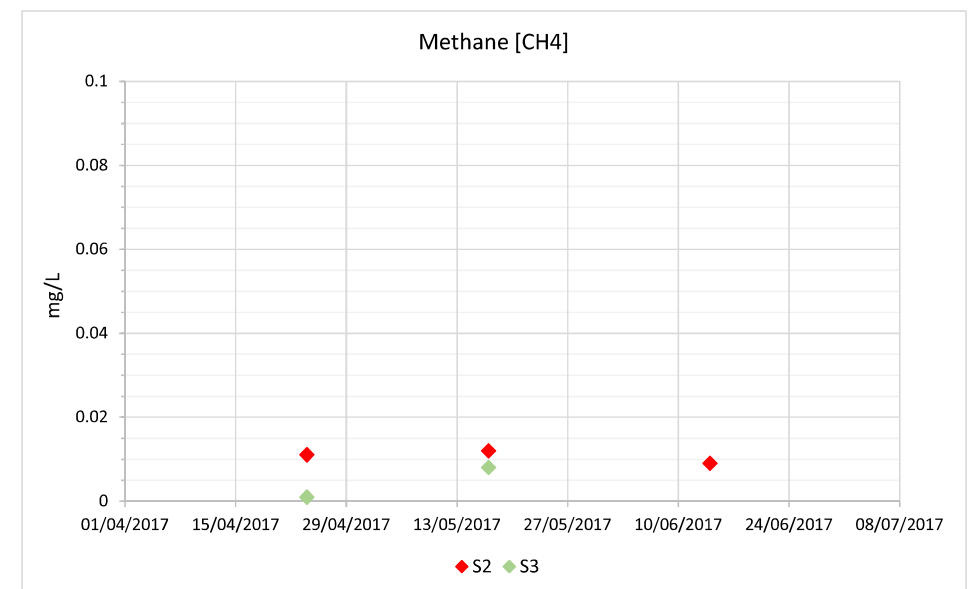
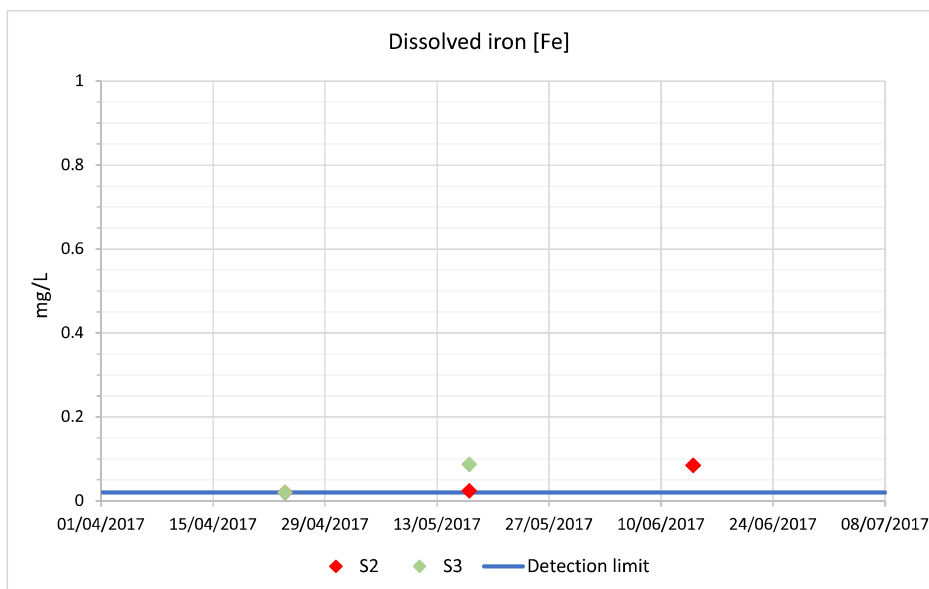
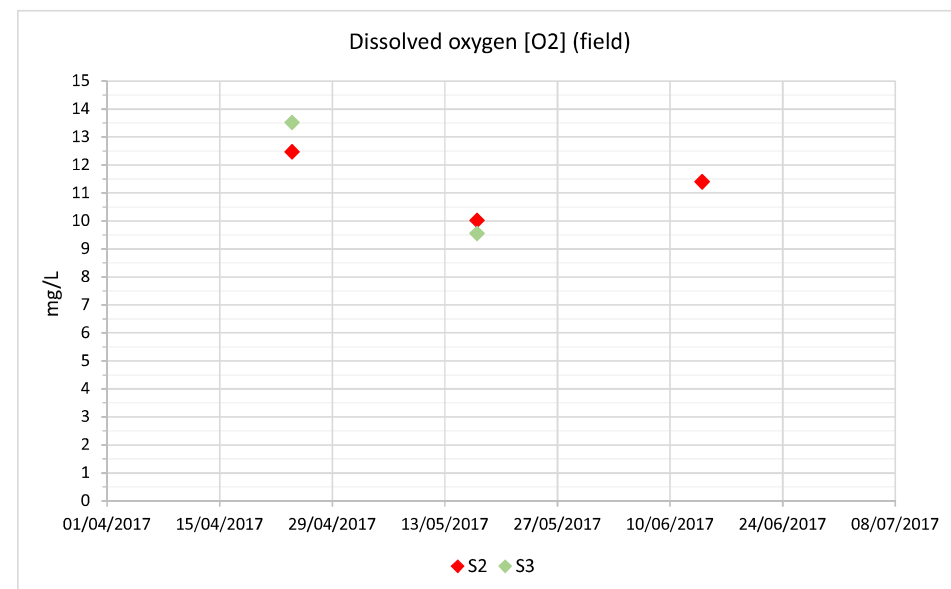
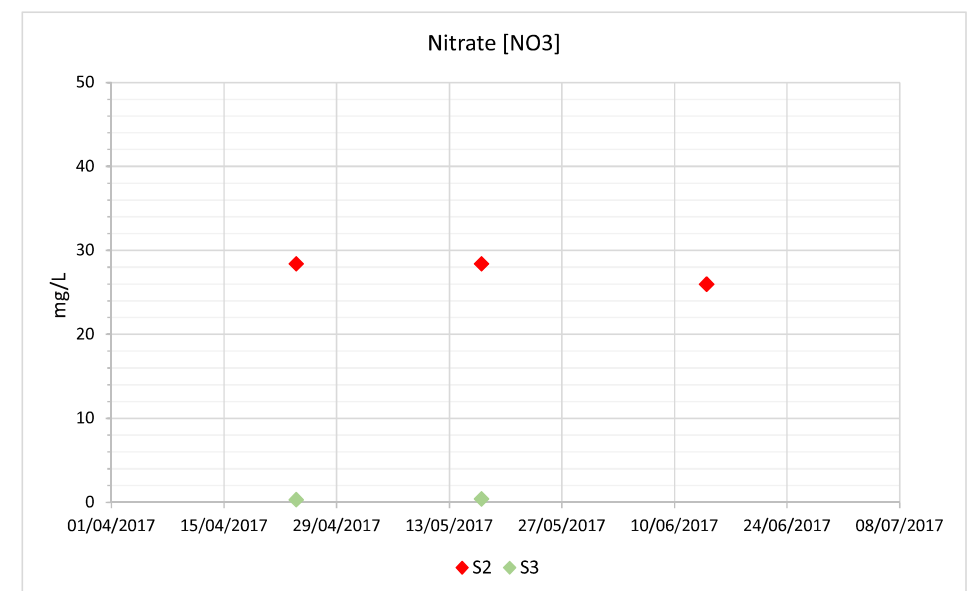
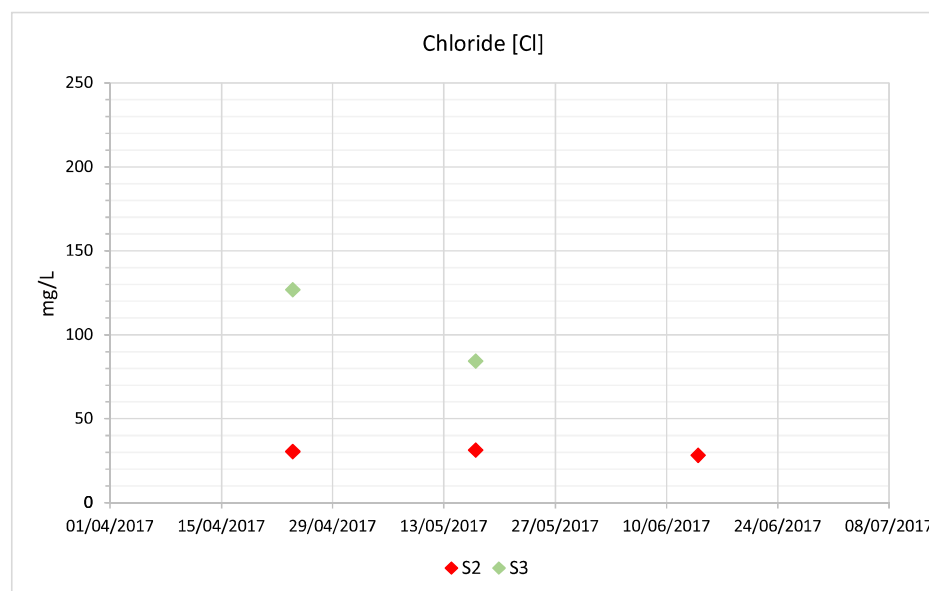
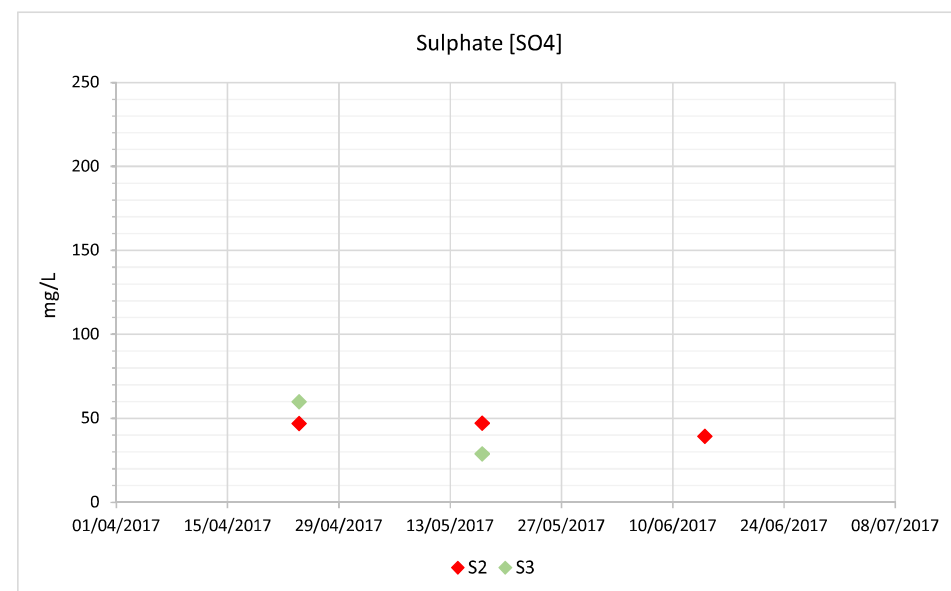
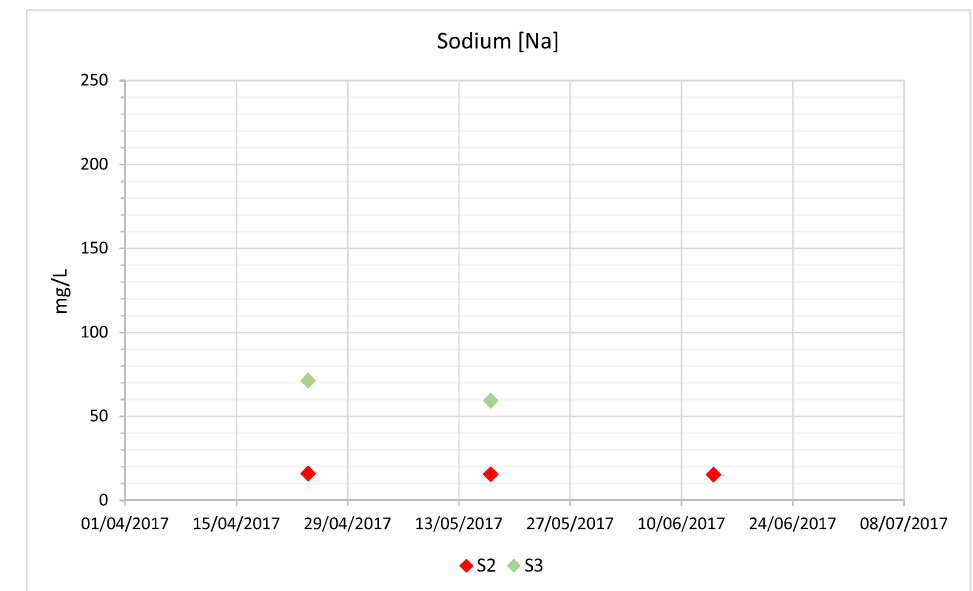
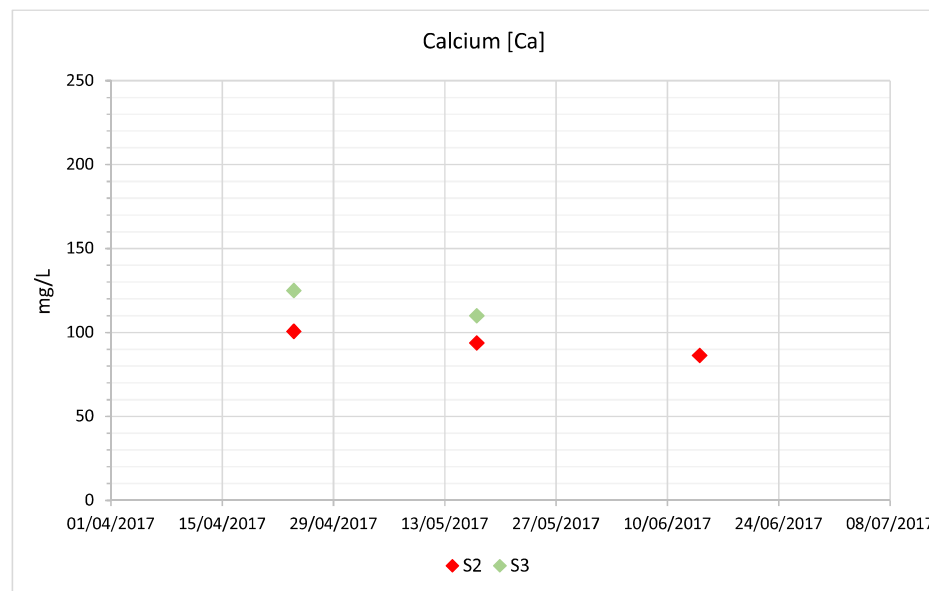
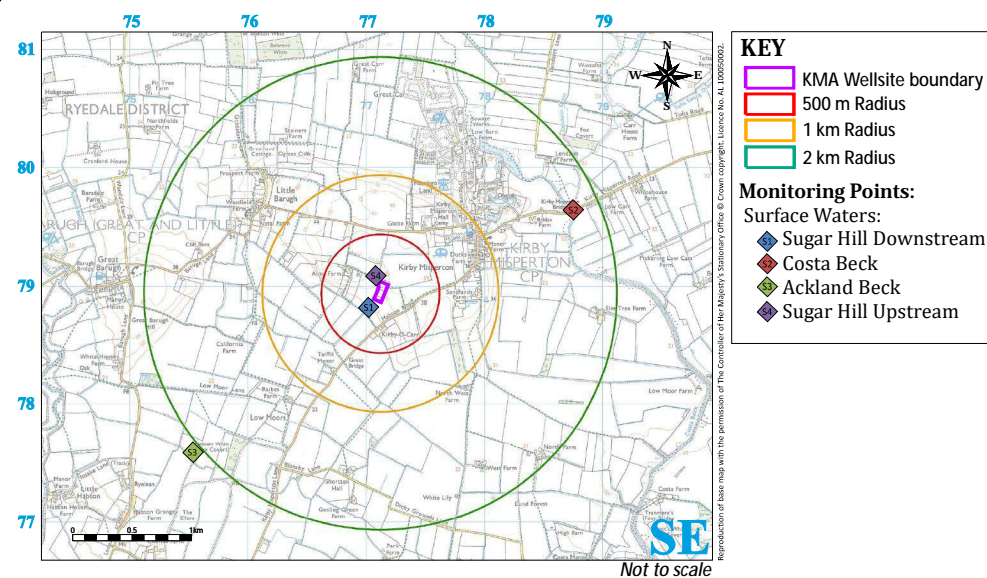
#### Corallian Group:

- BH E Borehole E

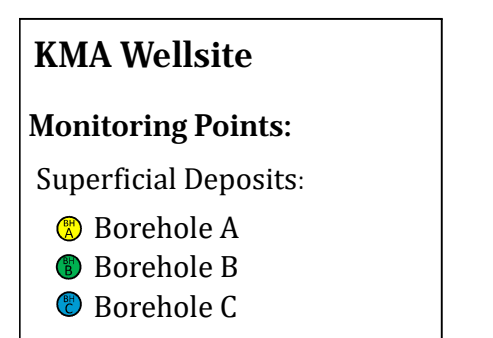
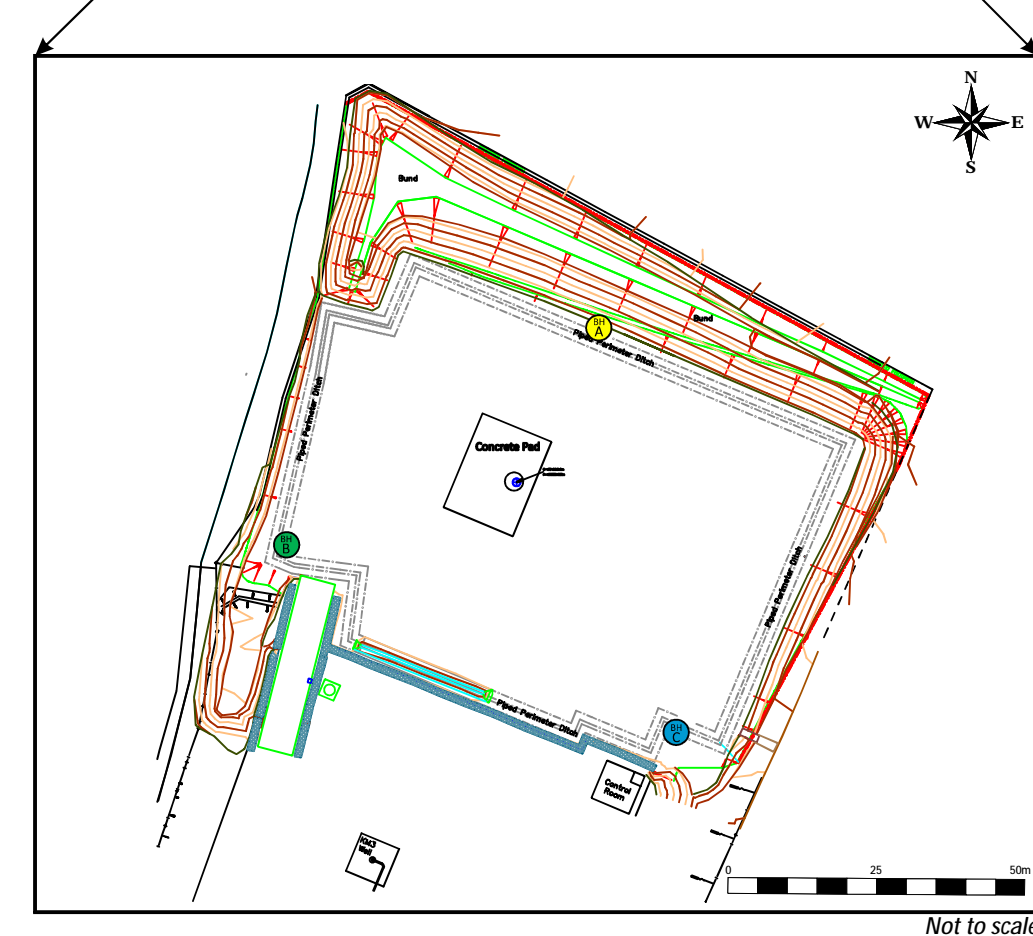
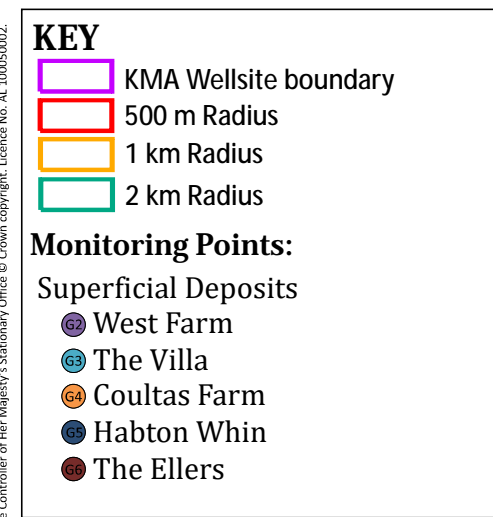
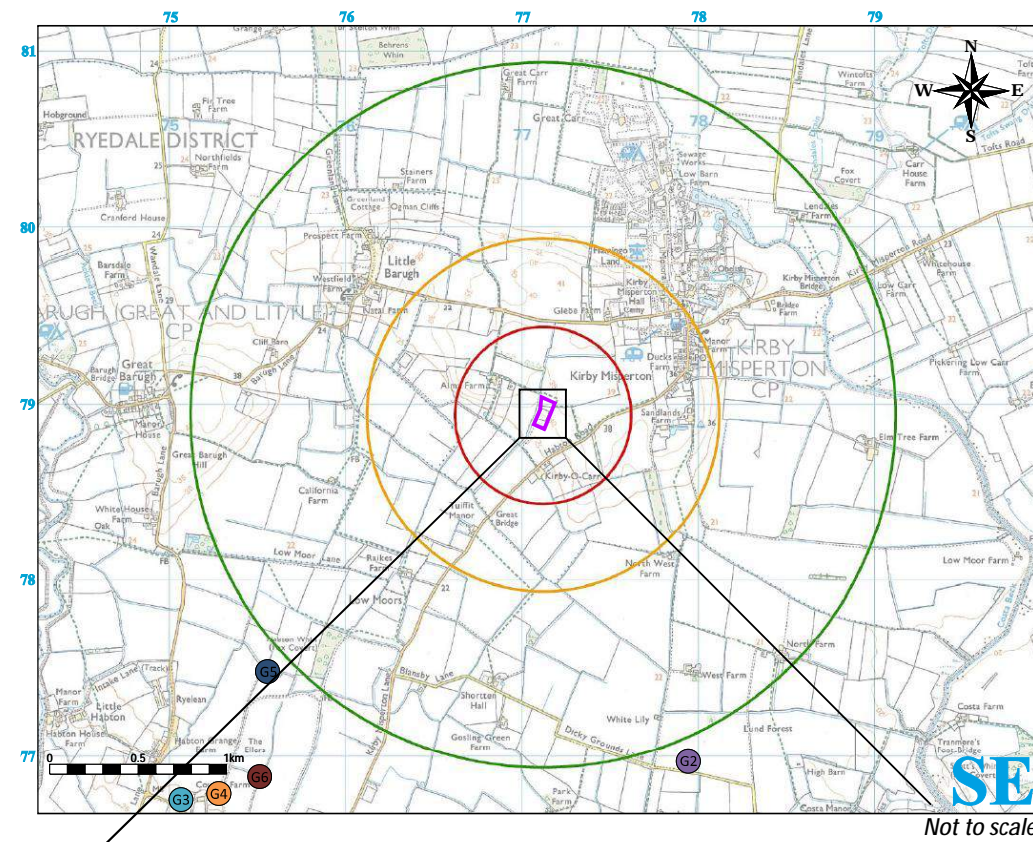
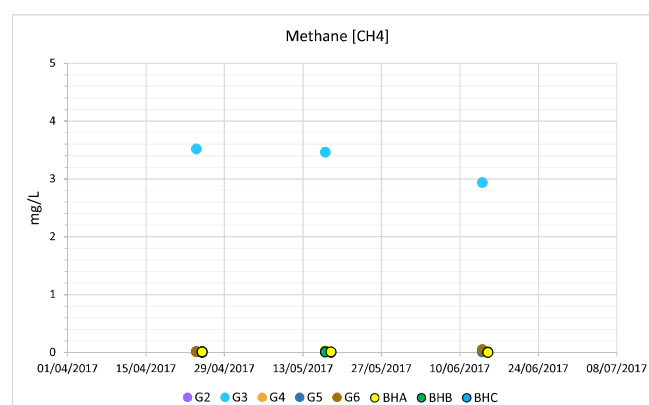
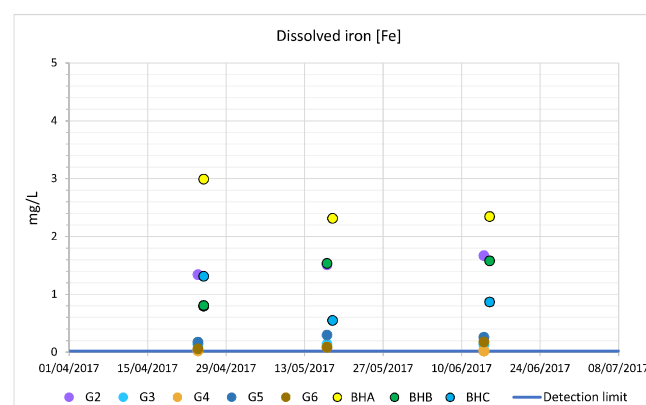
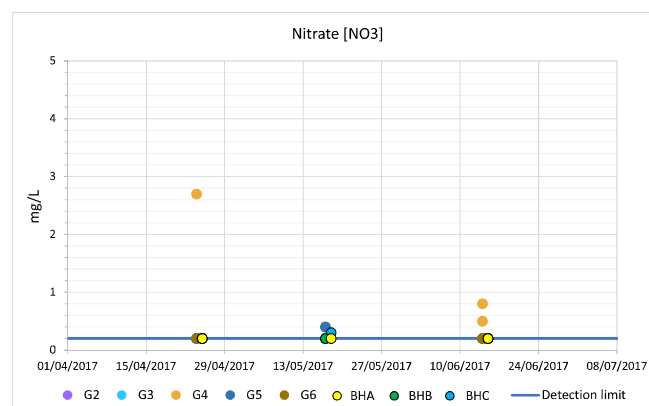
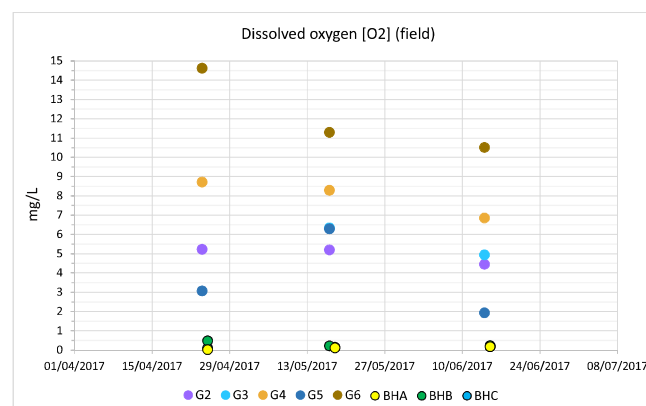
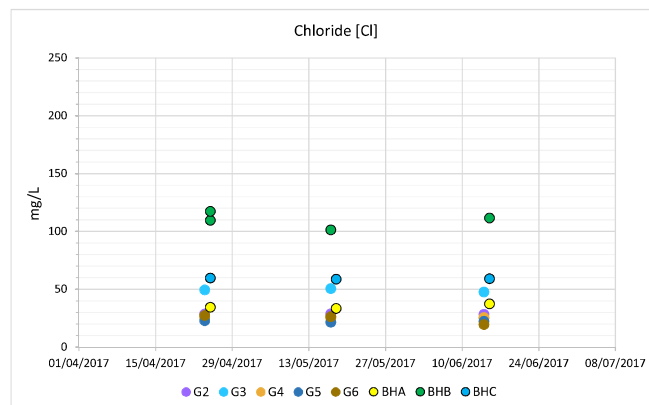
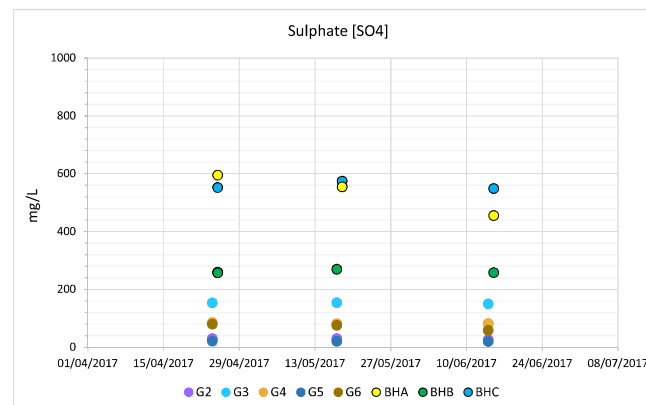
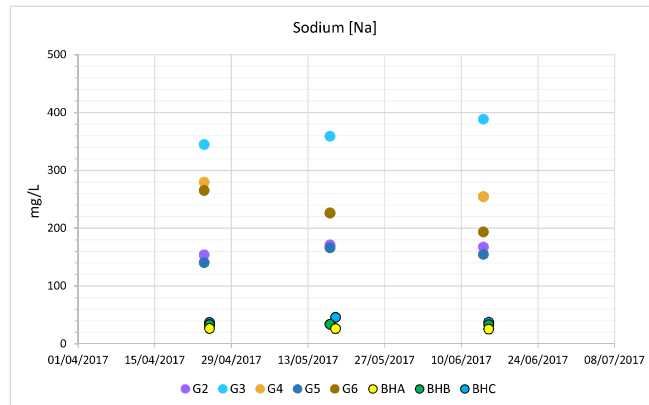
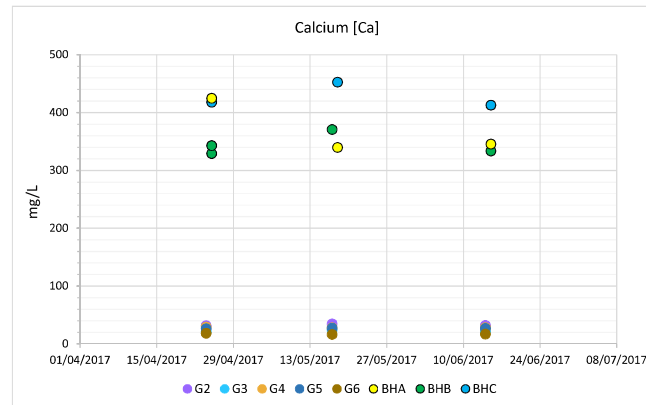


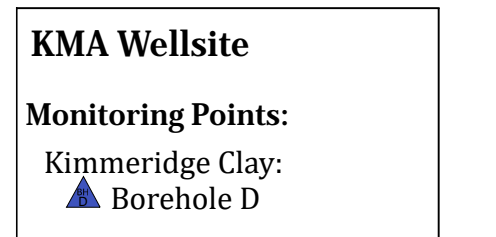
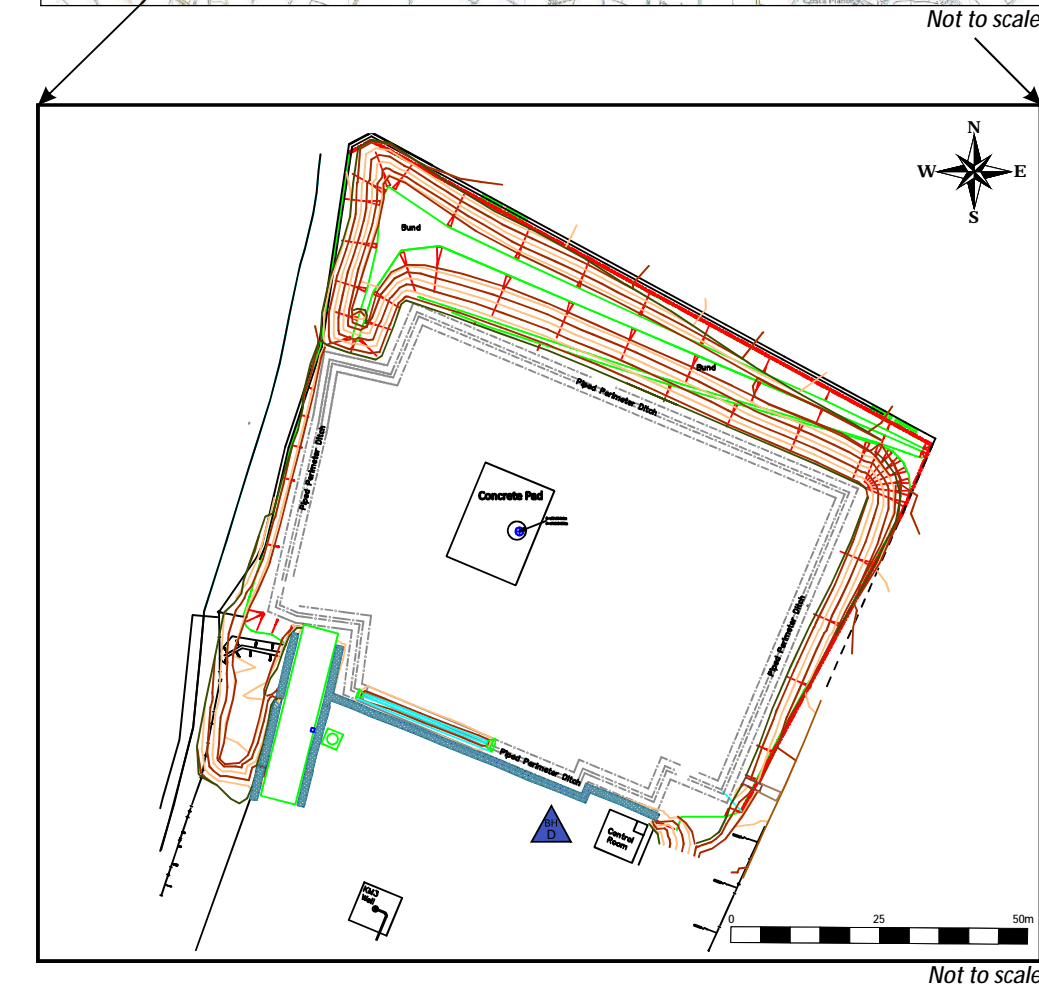
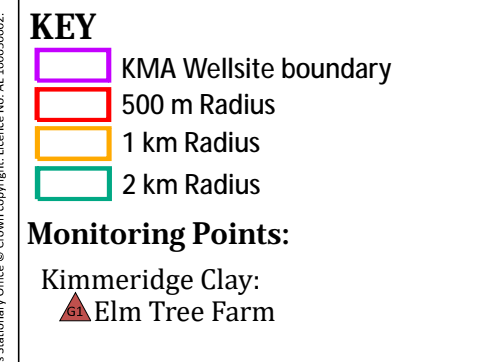
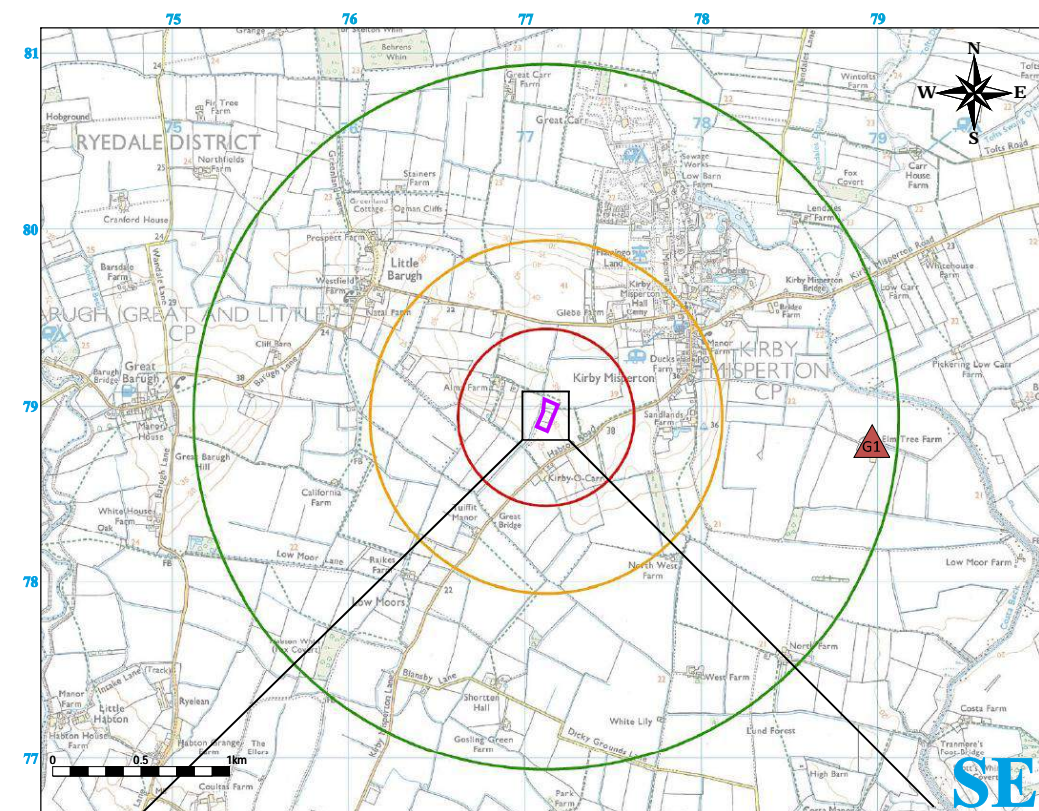
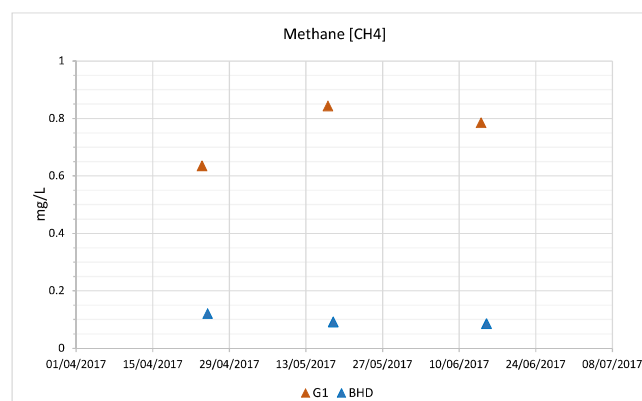
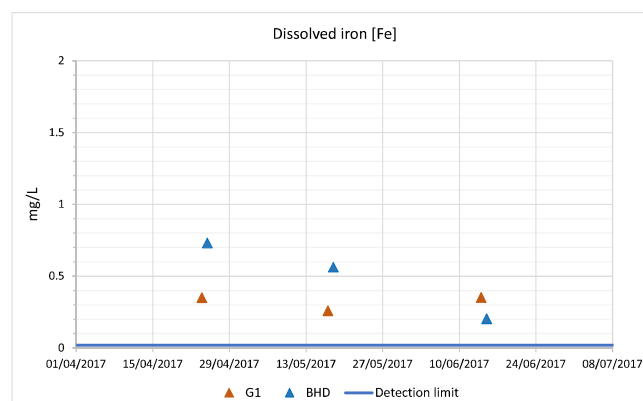
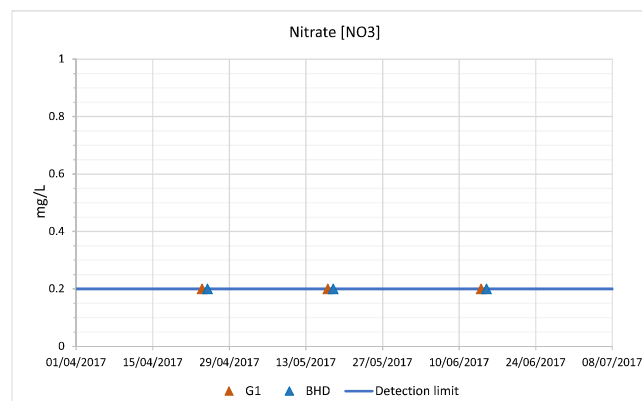
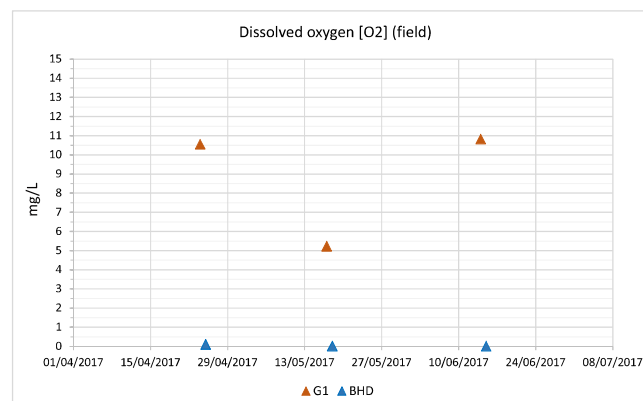
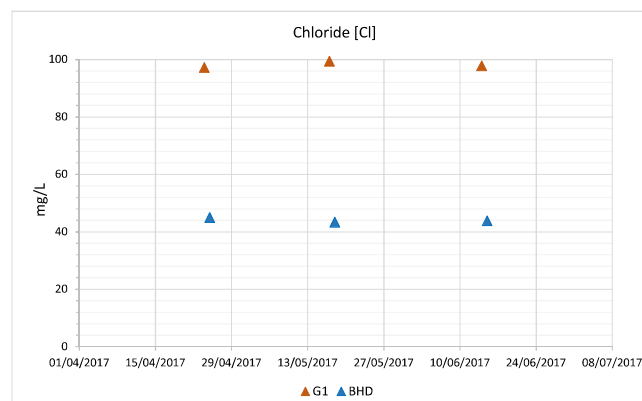
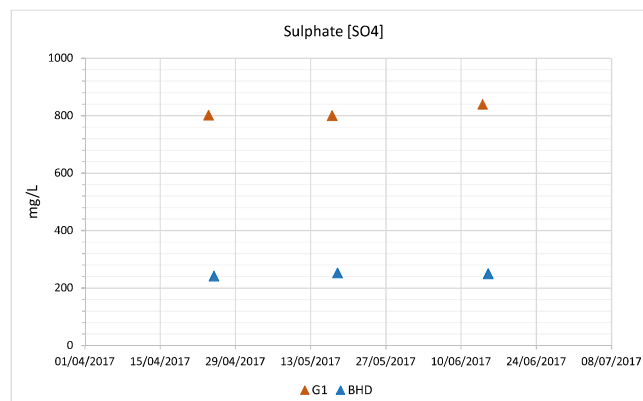
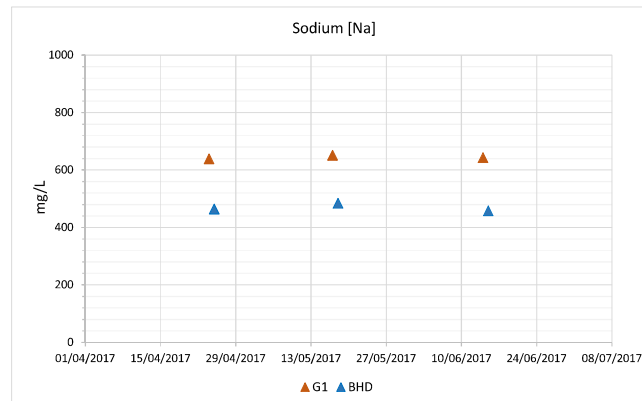
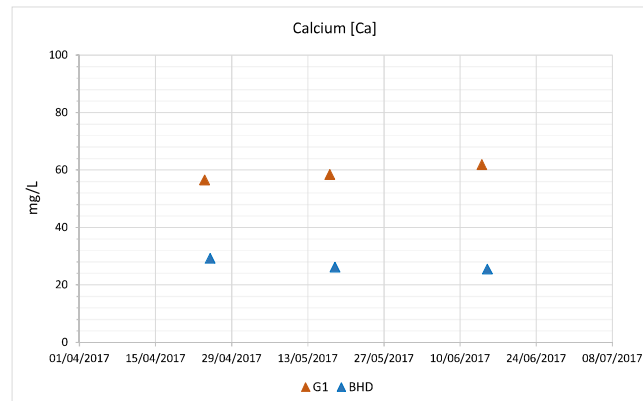
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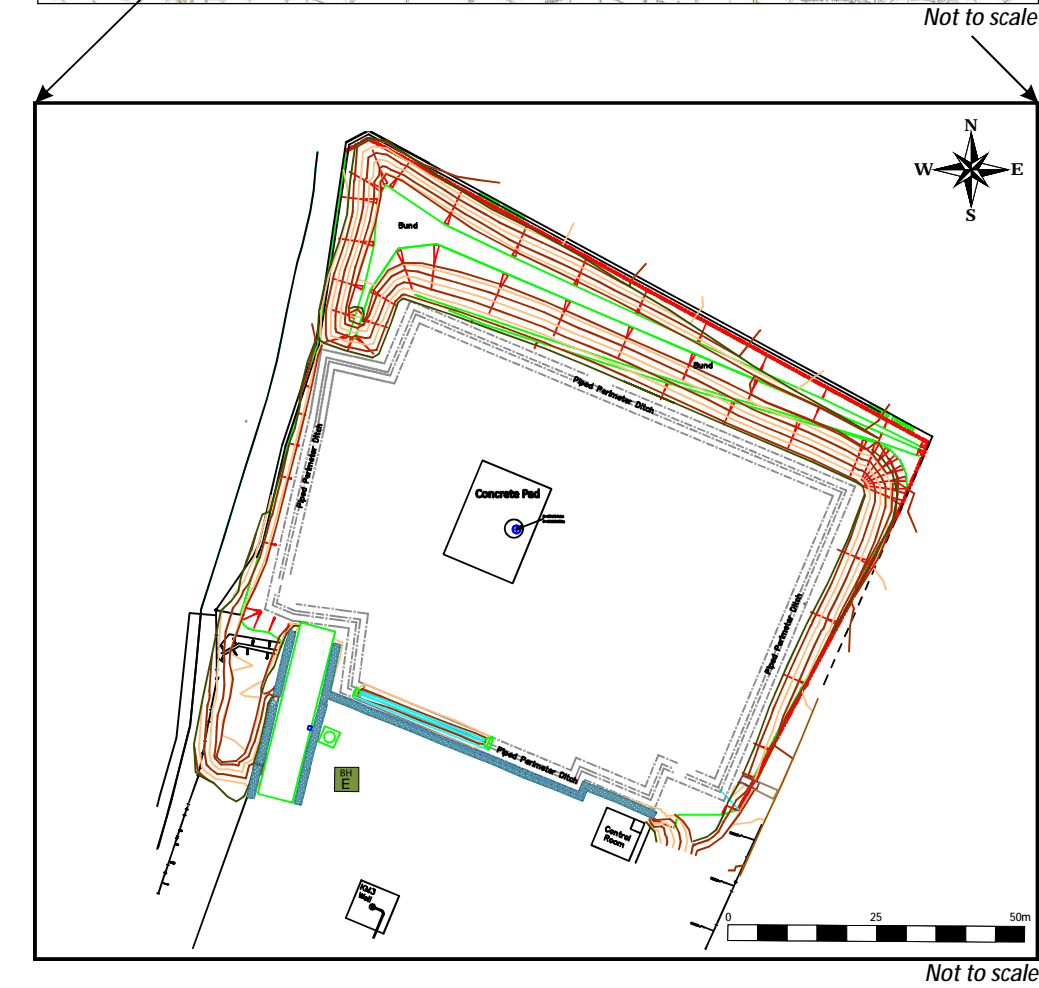
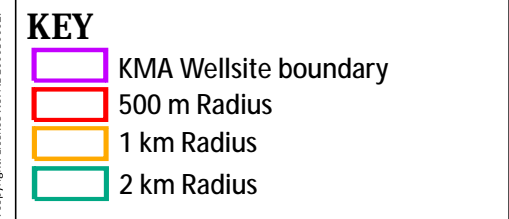
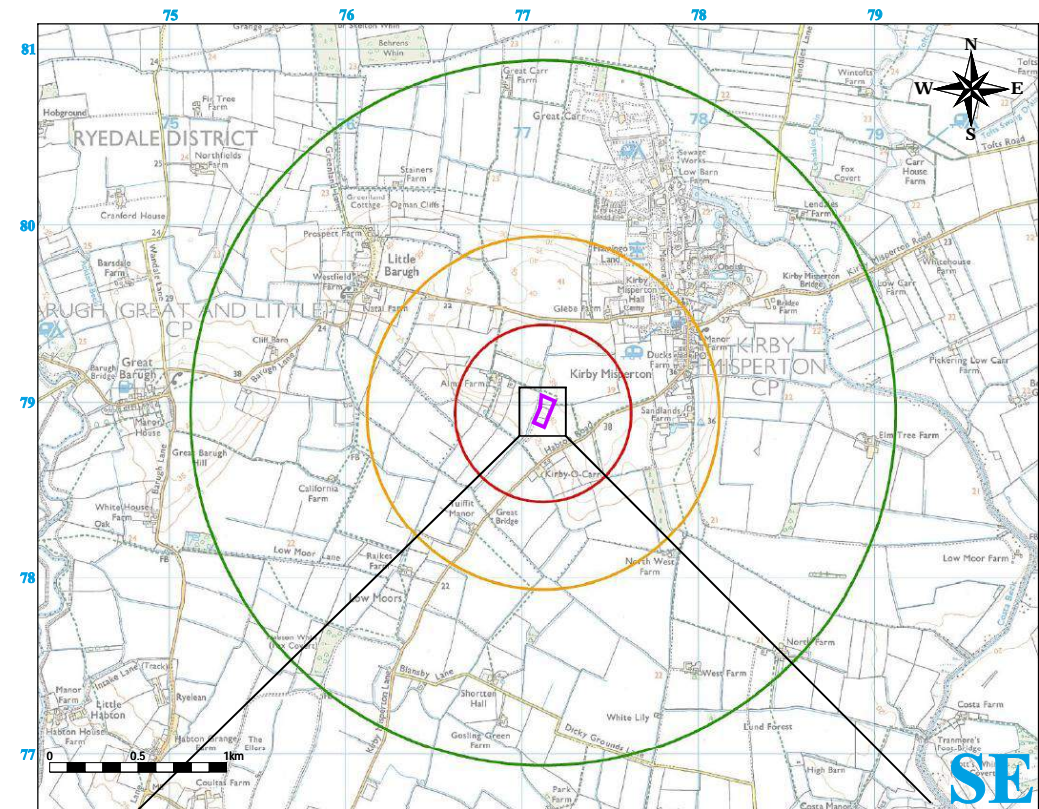
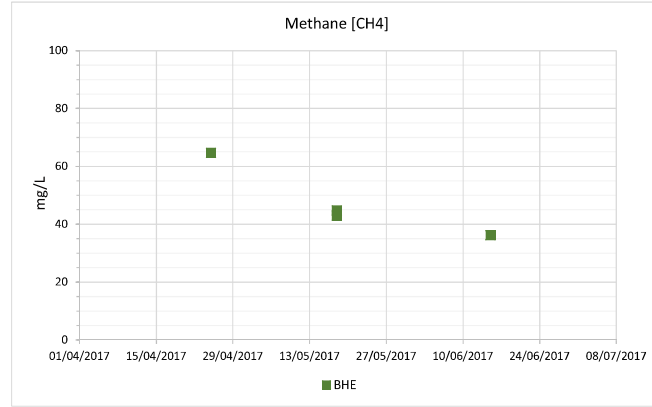
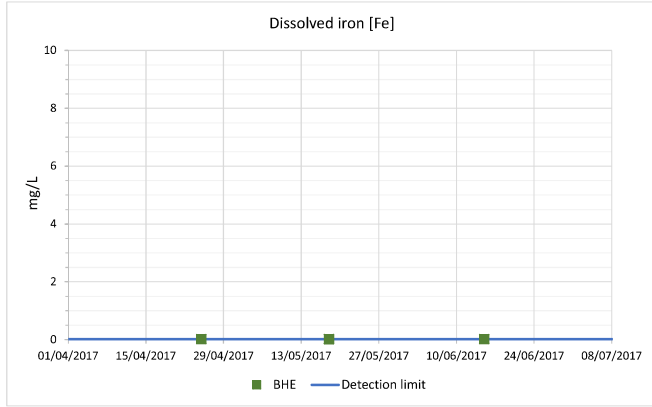
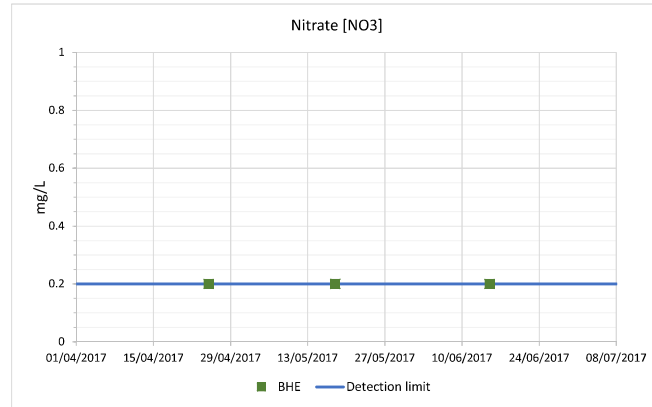
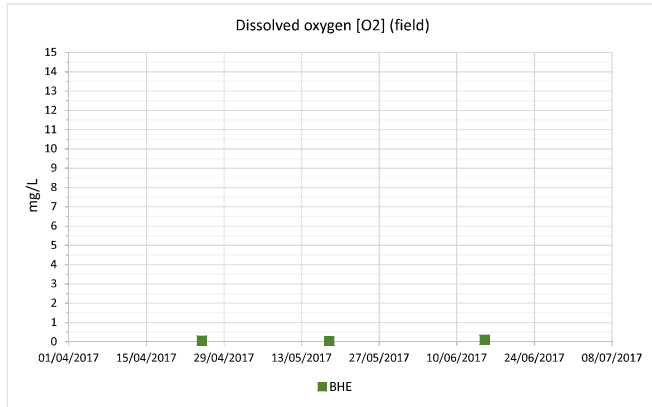
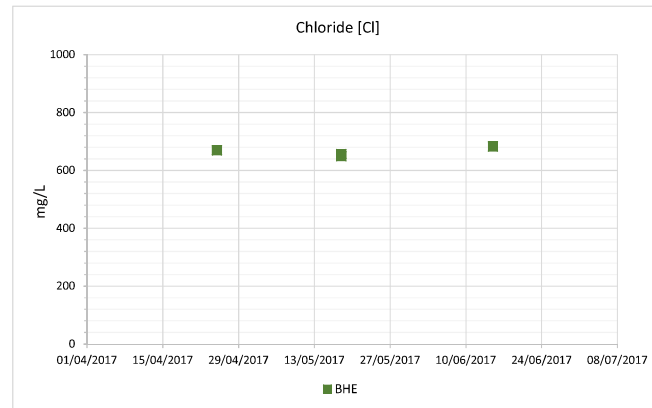
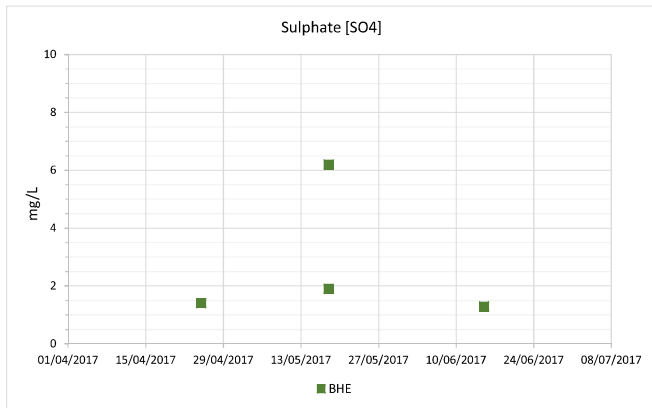
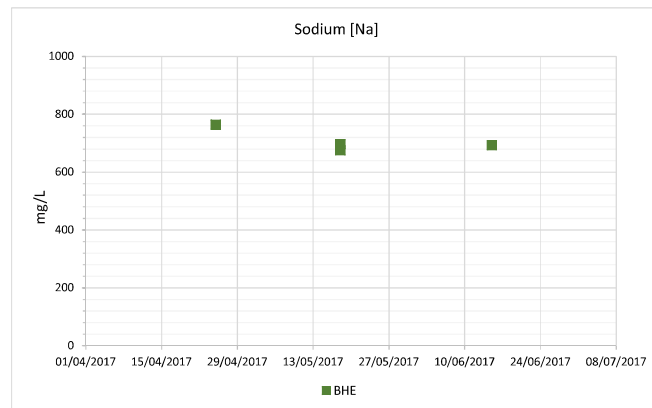
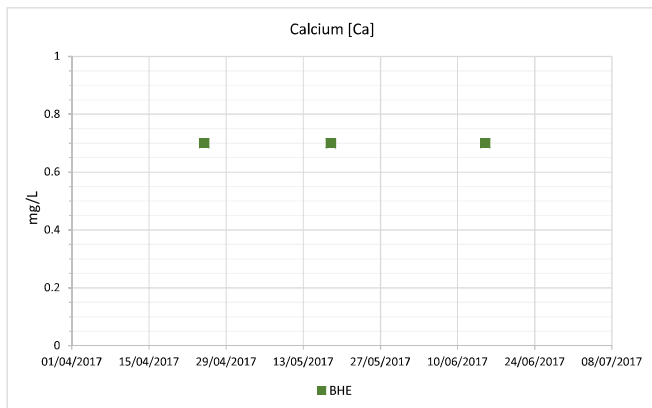






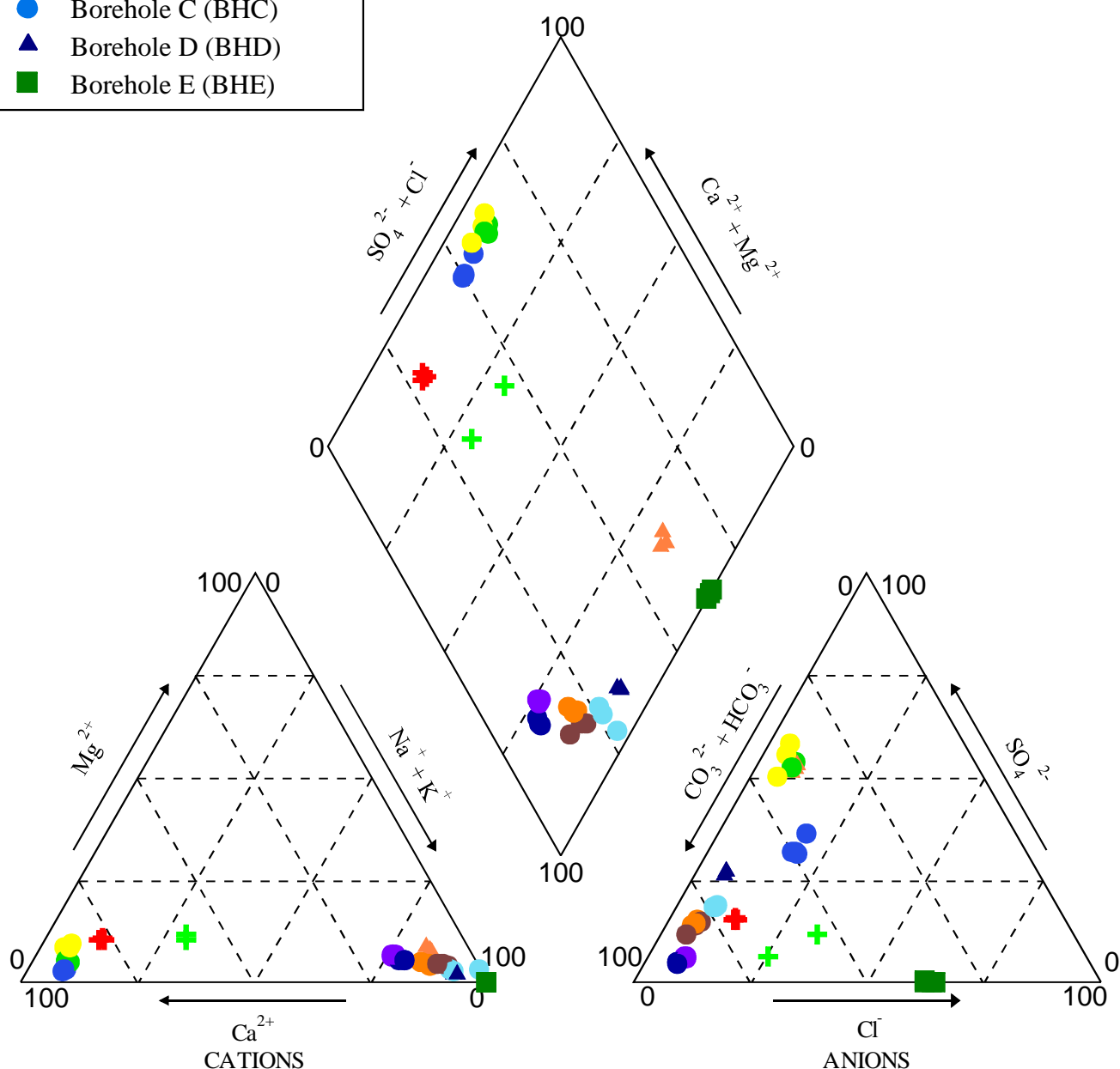






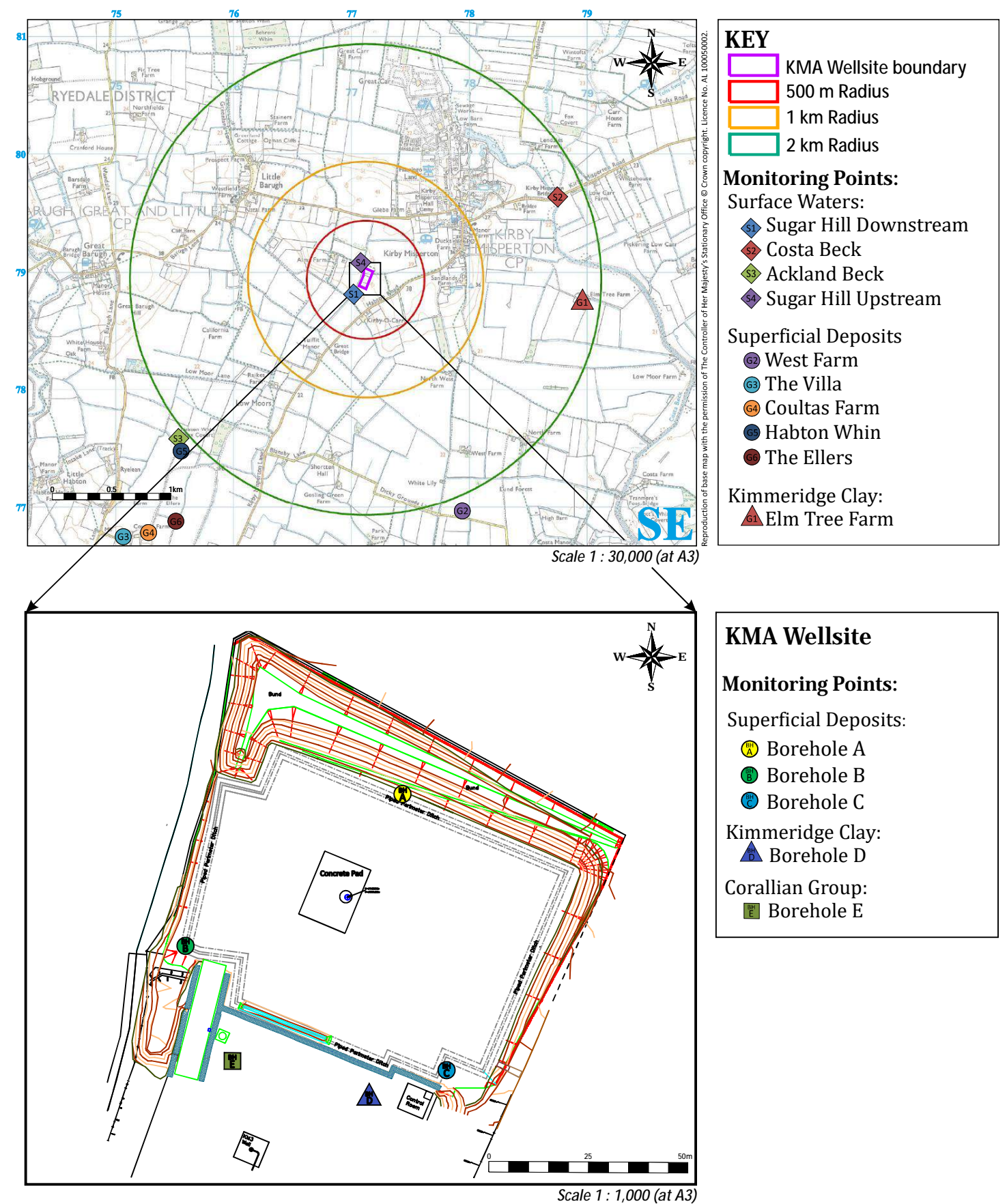
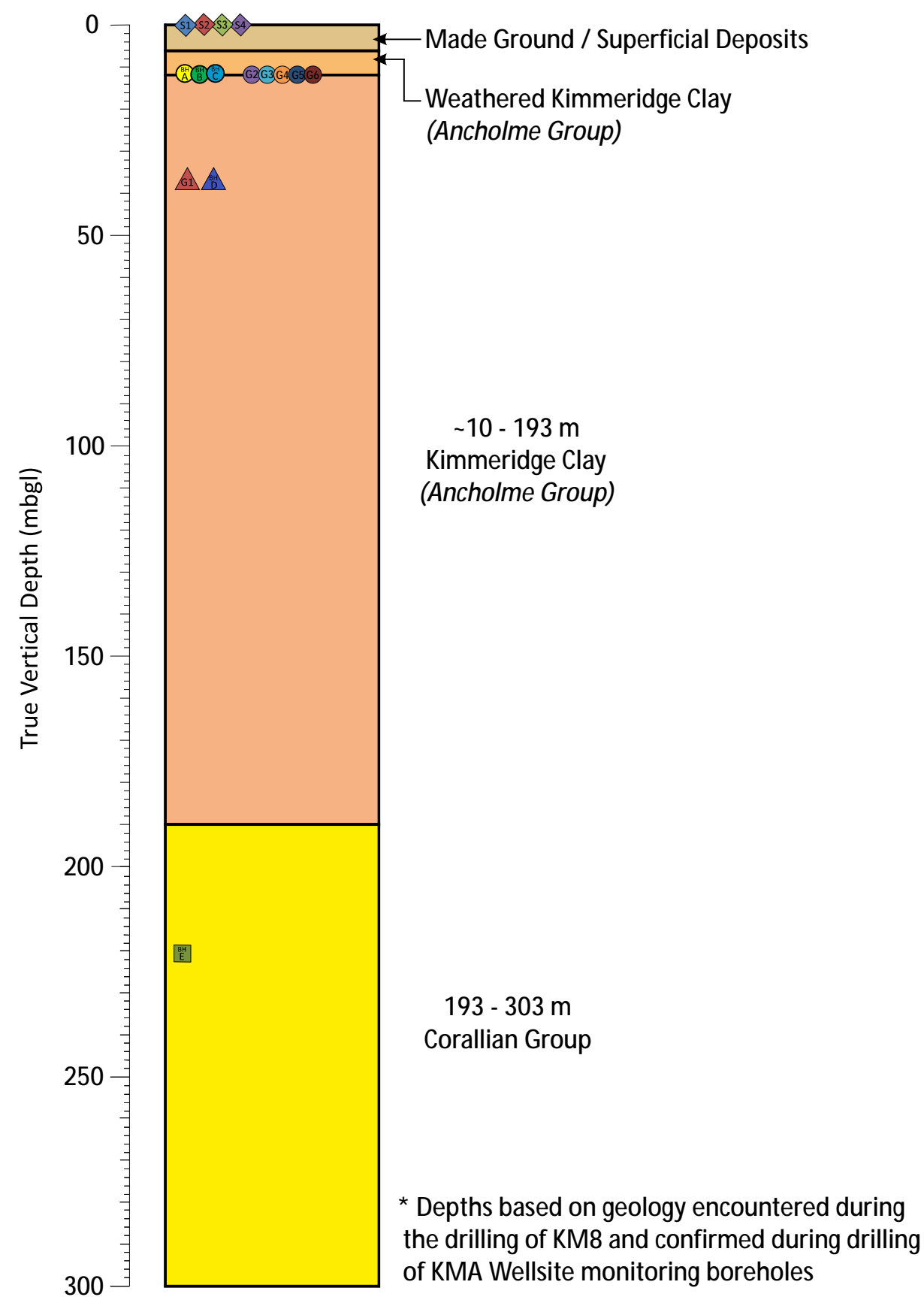
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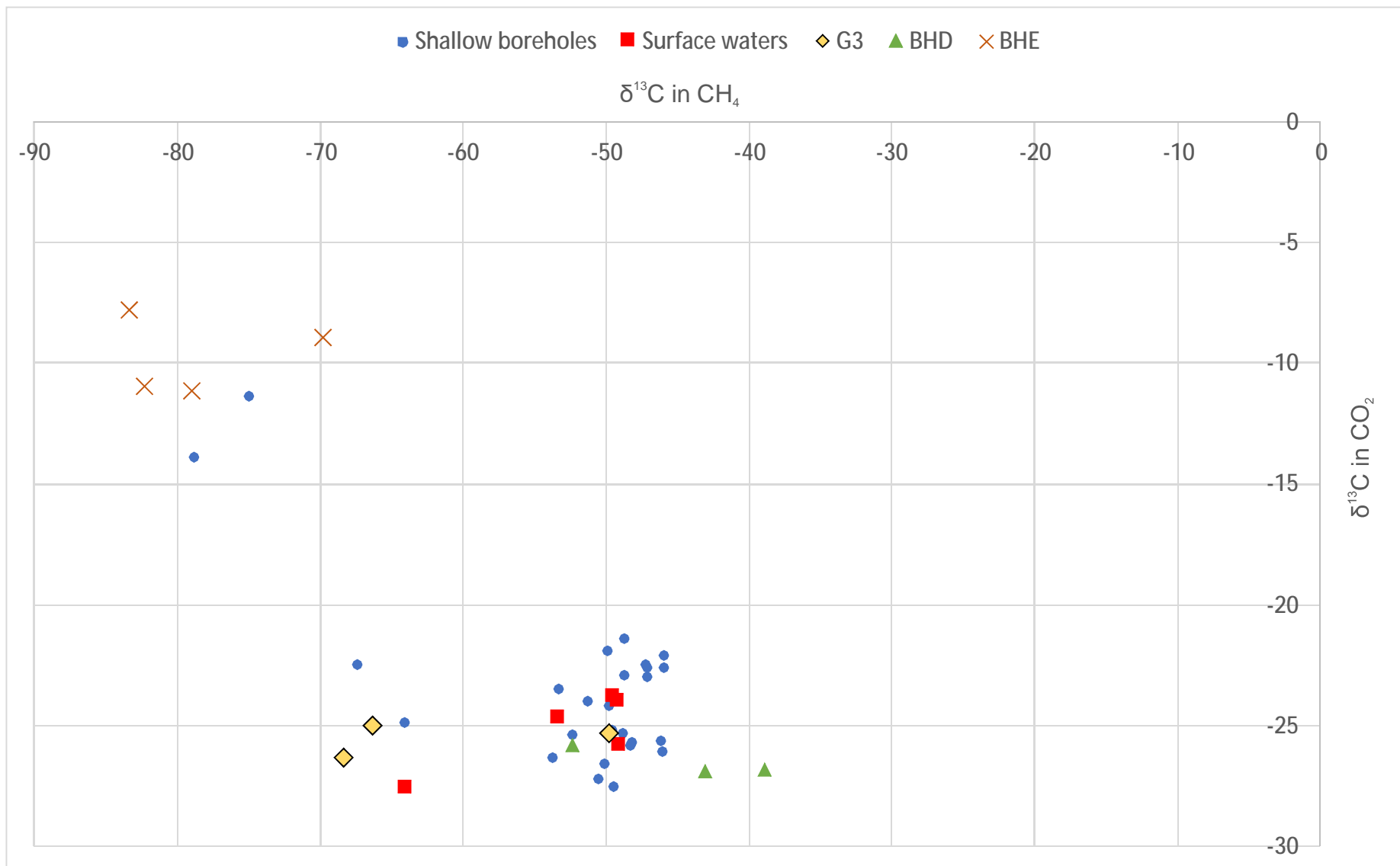
- + Costa Beck (S2)
- + Ackland Beck (S3)
- ▲ Elm Tree Farm (G1)
- West Farm (G2)
- The Villa (G3)
- Coultas Farm (G4)
- Habton Whin (G5)
- The Ellers (G6)
- Borehole A (BHA)
- Borehole B (BHB)
- Borehole C (BHC)
- ▲ Borehole D (BHD)
- Borehole E (BHE)



The Piper diagram is a common presentation, used to plot the relative proportions (in milliequivalents per litre) of the major cations and anions ( $\text{Na}^+$ ,  $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$ ,  $\text{K}^+$ ,  $\text{Cl}^-$ ,  $\text{SO}_4^{--}$  and  $\text{HCO}_3^-$ ) in a water sample







## **APPENDIX A**

### Monitoring Locations

**Table A1      Surface Water Monitoring Locations**

<b>Name</b>	<b>Monitoring Point</b>	<b>National Grid Reference</b>	<b>Ground Elevation (mAOD)</b>	<b>Description</b>
Sugar Hill Drain Downstream	S1	SE 76995 78777	23	Stream, part of a large field drainage system. Located on low permeability Glacial Till, Lacustrine deposits and the Kimmeridge Clay (Ancholme Group). Drains towards Ackland Beck and Costa Beck. Monitoring point located to the south of the KMA Wellsite.
Costa Beck	S2	SE 78730 79637	22	Medium sized river flowing in a south-easterly direction.
Ackland Beck	S3	SE 75701 77456	22	Small sized river flowing in a south-easterly direction.
Sugar Hill Drain Upstream	S4	SE 77106 79054	29	Stream, part of a large field drainage system. Located on low permeability Glacial Till, Lacustrine deposits and the Kimmeridge Clay (Ancholme Group). Drains towards Ackland Beck and Costa Beck. Monitoring point located to the north of the KMA Wellsite.



**Table A2      Offsite Groundwater Monitoring Locations**

Name	Monitoring Point	National Grid Reference	Ground Elevation (mAOD)	Construction Details		
				Target Formation <sup>1</sup>	Borehole Depth (mbgl) <sup>1</sup>	Screened Interval (mbgl)
Elm Tree Farm	G1	SE 78957 78755	22	Kimmeridge Clay (un-weathered)	36.6	18 – 36
West Farm <sup>2</sup>	G2	SE 78015 77462	22	Superficial Deposits/ Kimmeridge Clay (weathered)	24.4	Unknown
The Villa	G3	SE 75099 76592	25	Kimmeridge Clay (weathered/ un-weathered)/ Corallian Group	~50 <sup>3</sup>	Unknown <sup>3</sup>
Coultas Farm	G4	SE 75209 76743	25	Kimmeridge Clay (weathered/ un-weathered)/ Corallian Group	~50 <sup>3</sup>	Unknown <sup>3</sup>
Habton Whin	G5	SE 75705 77454	22	Superficial Deposits/ Kimmeridge Clay (weathered)	4.65	Unknown
The Ellers	G6	SE 75491 76868	23	Superficial Deposits/ Kimmeridge Clay (weathered)	21.3 <sup>4</sup>	Unknown

Notes:    1. Based on Envireau Water's interpretation of available borehole construction, geological and other data.  
              2. The sample point at West Farm is 500m north of the borehole.  
              3. No construction data available. Anecdotal information suggests the boreholes are in the region of 50m deep and target the Kimmeridge Clay (Ancholme Group).  
              4. Borehole is no longer observable. Information from landowner suggests it is located beneath the pond at The Ellers and is uncapped (feeds the pond).  
              mbgl: metres below ground level  
              mAOD: metres above Ordnance Datum

**Table A3      Onsite Groundwater Monitoring Locations**

Name	Monitoring Point	National Grid Reference	Ground Elevation (mAOD)	Construction Details		
				Target Formation <sup>1</sup>	Borehole Depth (mbgl)	Screened Interval (mbgl)
Borehole A	BHA	SE 77153 79025	32	Superficial Deposits/ Kimmeridge Clay (weathered)	11.5	8.0 to 11.0
Borehole B	BHB	SE 77099 78989	32	Superficial Deposits/ Kimmeridge Clay (weathered)	11.5	8.0 to 11.0
Borehole C	BHC	SE 77162 78964	32	Superficial Deposits/ Kimmeridge Clay (weathered)	11.5	8.0 to 11.0
Borehole D	BHD	SE 77132 78963	29	Kimmeridge Clay (un- weathered)	38.0	25.0 to 37.0
Borehole E	BHE	SE 77110 78969	29	Corallian Group	222.0	Open hole from 192.6 to 222.0

Notes:    1. Based on Envireau Water's interpretation of available borehole construction, geological and other data.  
               mbgl: metres below ground level  
               mAOD: metres above Ordnance Datum

## **APPENDIX B**

### Monitoring Parameters

No	Parameter
	<i>General Inventory:</i>
1	Methane
2	Acrylamide
3	Alkalinity as CaCO <sub>3</sub>
4	Ammoniacal Nitrogen as N
5	Arsenic
6	Aluminium
7	Antimony
8	Barium
9	Beryllium
10	BOD (settled)
11	Boron
12	Bromide
13	δ <sup>13</sup> C-CH <sub>4</sub>
14	δ <sup>13</sup> C-CO <sub>2</sub>
15	Cadmium
16	Calcium
17	Carbon Dioxide
18	Chloride
19	Chromium (total)
20	Cobalt
21	COD (Settled)
22	Copper
23	Dissolved Butane
24	Dissolved Propane
25	Dissolved Ethane
26	Dissolved Methane
27	Fluoride
28	Iron (total)
29	Lead
30	Lithium
31	Magnesium
32	Mercury
33	Nickel
34	Nitrate as NO <sub>3</sub>
35	Nitrite as NO <sub>2</sub>
36	Oxygen Reduction Potential
37	pH
38	Potassium
39	Salinity
40	Selenium
41	Silver
42	Sodium
43	Strontium
44	TPH (including Benzene, DRO (nC <sub>10</sub> to nC <sub>24</sub> ), GRO (nC <sub>5</sub> to nC <sub>10</sub> ), m/p Xylenes, o Xylene, MTBE, Toluene, Xylene, Ethylbenzene)
45	Total Dissolved Solids
46	Total Suspended Solids
47	Vanadium
48	Zinc

No	Parameter
	<i>Fracture fluid additives:</i>
49	Acetic acid;
50	Sodium persulphate;
	<i>Other chemical inventory:</i>
51	Formaldehyde;
52	Ethylene glycol;
	<i>Indicators of Fracture Fluid additives:</i>
53	Sulphate
54	Bicarbonate alkalinity
55	Anionic surfactants
56	Nonionic surfactants
	<i>Indicators of other chemical inventory:</i>
57	Phosphate

## **APPENDIX C**

### Analysis Methods

Jones Environmental Laboratory (JEL)

Analysis Methods

JE Job No: 17/10356

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM31	Modified USEPA 8015B. Determination of Methylterbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			

JE Job No: 17/10356

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM37	Modified USEPA 160.2. Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				



JE Job No: 17/10356

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				
Subcontracted	Subcontracted analysis, sent to an ISO 17025 accredited laboratory where possible.						

## **APPENDIX D**

### **Analysis Results**

## **APPENDIX E**

### Laboratory Test Certificates

## Water Analysis Test Certificates

Round 23



# Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point  
Zone 3  
Deeside Industrial Park  
Deeside  
CH5 2UA

Envireau Ltd  
Cedars Farm Barn  
Market Street  
Draycott  
Derby  
DE72 3NB

Tel: +44 (0) 1244 833780  
Fax: +44 (0) 1244 833781



<b>Attention :</b>	Phil Ham
<b>Date :</b>	13th July, 2017
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 17/7422 Batch 1
<b>Location :</b>	Various
<b>Date samples received :</b>	25th April, 2017
<b>Status :</b>	Final report
<b>Issue :</b>	1

Nine samples were received for analysis on 25th April, 2017 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Simon Gomery BSc**  
**Project Manager**

**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham  
**JE Job No.:** 17/7422

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-10	11-19	20-29	30-39	40-49	50-59	60-69	70-79	80		Please see attached notes for all abbreviations and acronyms		
Sample ID	G2/23	G1/23	G3/23	G5/23	S3/23	S2/23	G4/23	G6/23	G1/23				
Depth													
COC No / misc													
Containers	V H HN P BOD G	V HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	H				
Sample Date	24/04/2017 13:45	24/04/2017 13:00	24/04/2017 14:30	24/04/2017 16:00	24/04/2017 16:15	24/04/2017 12:00	24/04/2017 15:15	24/04/2017 15:30	24/04/2017				
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Ground Water	Surface Water	Ground Water				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	25/04/2017	25/04/2017	25/04/2017	25/04/2017	25/04/2017	25/04/2017	25/04/2017	25/04/2017	25/04/2017				
											LOD/LOR	Units	Method No.
Dissolved Aluminium #	<20	<20	<20	<20	<20	<20	<20	<20	-		<20	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	<2	<2	<2	<2	<2	<2	-		<2	ug/l	TM30/PM14
Dissolved Arsenic #	3.6	<2.5	3.5	<2.5	<2.5	<2.5	3.5	3.5	-		<2.5	ug/l	TM30/PM14
Dissolved Barium #	67	11	24	99	65	67	30	22	-		<3	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-		<0.5	ug/l	TM30/PM14
Dissolved Boron	464	2315	1062	444	62	17	875	833	-		<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-		<0.5	ug/l	TM30/PM14
Dissolved Calcium #	31.3	56.6	21.2	26.3	124.9	100.8	29.0	18.3	-		<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	-		<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	<2	<2	<2	<2	<2	<2	<2	<2	-		<2	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7	<7	<7	<7	-		<7	ug/l	TM30/PM14
Total Dissolved Iron #	1340	351	129	174	<20	<20	<20	56	-		<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5	<5	<5	<5	-		<5	ug/l	TM30/PM14
Dissolved Lithium	16	95	47	15	11	6	24	21	-		<5	ug/l	TM30/PM14
Dissolved Magnesium #	6.7	29.6	5.6	5.0	13.1	8.2	7.0	6.2	-		<0.1	mg/l	TM30/PM14
Dissolved Manganese #	327	3	38	264	50	5	180	7	-		<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1	<1	<1	<1	-		<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	<2	<2	3	<2	<2	<2	-		<2	ug/l	TM30/PM14
Dissolved Potassium #	2.8	5.8	3.5	2.7	3.9	2.1	3.2	3.6	-		<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3	<3	<3	<3	<3	<3	<3	<3	-		<3	ug/l	TM30/PM14
Dissolved Silver	<5	<5	<5	<5	<5	<5	<5	<5	-		<5	ug/l	TM30/PM14
Dissolved Sodium #	154.3	638.7 <sup>AA</sup>	344.9 <sup>AA</sup>	140.7	71.4	16.1	280.0 <sup>AA</sup>	265.4 <sup>AA</sup>	-		<0.1	mg/l	TM30/PM14
Dissolved Strontium	537	4036 <sup>AA</sup>	762	415	324	176	478	361	-		<5	ug/l	TM30/PM14
Dissolved Vanadium #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	-		<1.5	ug/l	TM30/PM14
Dissolved Zinc #	<3	<3	<3	<3	<3	<3	6	<3	-		<3	ug/l	TM30/PM14
Total Chromium	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	-		<1.5	ug/l	TM30/PM14
Total Iron	1353	1269	106	409	134	170	137	177	-		<20	ug/l	TM30/PM14
Total Manganese	309	8	39	258	42	4	186	35	-		<2	ug/l	TM30/PM14
EPH >C8-C10	<10	<10	<10	<10	<10	<10	<10	<10	-		<10	ug/l	TM5/PM30
EPH >C10-C16	<10	<10	<10	<10	<10	<10	<10	<10	-		<10	ug/l	TM5/PM30
EPH >C16-C24	<10	<10	<10	<10	<10	<10	<10	<10	-		<10	ug/l	TM5/PM30
EPH >C24-C40	<10	<10	<10	<10	<10	<10	<10	<10	-		<10	ug/l	TM5/PM30
EPH >C8-C40	<10	<10	<10	<10	<10	<10	<10	<10	-		<10	ug/l	TM5/PM30
GRO (>C4-C8) #	<10	<10	<10	<10	<10	<10	<10	<10	-		<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10	<10	<10	<10	<10	<10	<10	-		<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10	<10	<10	<10	<10	<10	<10	-		<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5	<5	<5	<5	<5	<5	-		<5	ug/l	TM31/PM12
Benzene #	<5	<5	<5	<5	<5	<5	<5	<5	-		<5	ug/l	TM31/PM12
Toluene #	<5	<5	<5	<5	<5	<5	<5	<5	-		<5	ug/l	TM31/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	<5	<5	<5	-		<5	ug/l	TM31/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	-		<5	ug/l	TM31/PM12
o-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	-		<5	ug/l	TM31/PM12

Client Name: Envireau Ltd  
 Reference: KMA  
 Location: Various  
 Contact: Phil Ham  
 JE Job No.: 17/7422

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle  
 H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-10	11-19	20-29	30-39	40-49	50-59	60-69	70-79	80		Please see attached notes for all abbreviations and acronyms		
Sample ID	G2/23	G1/23	G3/23	G5/23	S3/23	S2/23	G4/23	G6/23	G1/23				
Depth													
COC No / misc													
Containers	V H HN P BOD G	V HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	H				
Sample Date	24/04/2017 13:45	24/04/2017 13:00	24/04/2017 14:30	24/04/2017 16:00	24/04/2017 16:15	24/04/2017 12:00	24/04/2017 15:15	24/04/2017 15:30	24/04/2017				
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Ground Water	Surface Water	Ground Water				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	25/04/2017	25/04/2017	25/04/2017	25/04/2017	25/04/2017	25/04/2017	25/04/2017	25/04/2017	25/04/2017				
											LOD/LOR	Units	Method No.
Bromide	0.06	0.28	0.19	0.05	0.06	<0.05	0.10	0.05	-		<0.05	mg/l	TM27/PM0
Fluoride	<0.3	1.0	0.6	<0.3	<0.3	<0.3	<0.3	<0.3	-		<0.3	mg/l	TM173/PM0
Sulphate as SO <sub>4</sub> #	30.1	801.1	153.8	21.1	59.8	47.0	85.8	80.1	-		<0.5	mg/l	TM38/PM0
Chloride #	28.6	97.2	49.4	22.8	126.9	30.6	25.8	27.3	-		<0.3	mg/l	TM38/PM0
Nitrate as NO <sub>3</sub> #	<0.2	<0.2	<0.2	<0.2	0.3	28.4	2.7	<0.2	-		<0.2	mg/l	TM38/PM0
Nitrite as NO <sub>2</sub> #	<0.02	<0.02	<0.02	<0.02	<0.02	0.15	<0.02	<0.02	-		<0.02	mg/l	TM38/PM0
Ortho Phosphate as P #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-		<0.03	mg/l	TM38/PM0
Monoethylene glycol	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-		<0.001	mg/l	TM24/PM30
Ammoniacal Nitrogen as N #	0.71	-	1.22	0.68	0.08	0.11	0.08	0.07	2.32		<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH <sub>4</sub> #	0.92	-	1.57	0.88	0.10	0.14	0.10	0.09	2.99		<0.03	mg/l	TM38/PM0
Dissolved Methane #	19	635	3519**	12	<1	11	12	13	-		<1	ug/l	TM25/PM0
Dissolved Ethane #	<1	<1	20	<1	<1	<1	<1	<1	-		<1	ug/l	TM25/PM0
Dissolved Carbon Dioxide	64972	156807**	106027**	65873	55715	30910	75749	41772	-		<1	ug/l	TM25/PM0
Dissolved Butane	<2	<2	<2	<2	<2	<2	<2	<2	-		<2	ug/l	TM25/PM0
Dissolved Propane	<2	<2	<2	<2	<2	<2	<2	<2	-		<2	ug/l	TM25/PM0
Acetic Acid	<10	<10	<10	<10	<10	<10	<10	<10	-		<10	mg/l	TM127/PM0
Total Alkalinity as CaCO <sub>3</sub> #	424	633	612	397	289	217	469	447	-		<1	mg/l	TM75/PM0
Bicarbonate Alkalinity as CaCO <sub>3</sub>	424	633	612	397	289	217	469	374	-		<1	mg/l	TM75/PM0
Acrylamide	<50	<50	<50	<50	<50	<50	<50	<50	-		<50	ug/l	TM103/PM0
Anionic Surfactants	1.0	1.0	0.7	0.6	0.7	0.5	0.2	0.5	-		<0.2	mg/l	TM33/PM0
BOD (Settled) #	<1	<1	5	<1	<1	<1	2	<1	-		<1	mg/l	TM58/PM0
COD (Settled) #	<7	<7	7	<7	28	<7	15	19	-		<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	820	2673	1396	716	907	534	957	922	-		<2	uS/cm	TM76/PM0
Formaldehyde	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-		<0.5	mg/l	TM51/PM0
Non Ionic Surfactants*	<5	<5	<5	<5	<5	<5	<5	<5	-		<5	ug/l	Subcontracted
pH #	6.20	7.26	7.64	7.60	7.97	7.85	7.73	8.40	-		<0.01	pH units	TM73/PM0
Redox	167.95	171.40	170.06	170.80	174.94	182.16	202.63	165.16	-			mV	TM72/PM0
Salinity	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-		<0.1	%	TM64/PM0
Sodium Persulphate	<60	<60	<60	<60	<60	<60	<60	<60	-		<60	mg/l	TM100/PM0
Total Dissolved Solids #	438	1870	869	430	477	352	571	531	-		<35	mg/l	TM20/PM0
Total Suspended Solids #	<10	31	<10	<10	16	22	12	<10	-		<10	mg/l	TM37/PM0

Please include all sections of this report if it is reproduced

**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.



## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/7422

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution

JE Job No: 17/7422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				

JE Job No: 17/7422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM37	Modified USEPA 160.2. Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				

JE Job No: 17/7422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				
Subcontracted	Subcontracted analysis, sent to an ISO 17025 accredited laboratory where possible.						



# Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

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DE72 3NB

Tel: +44 (0) 1244 833780  
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<b>Attention :</b>	Phil Ham
<b>Date :</b>	5th September, 2017
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 17/7422 Batch 2
<b>Location :</b>	Various
<b>Date samples received :</b>	26th April, 2017
<b>Status :</b>	Final report
<b>Issue :</b>	1

Seven samples were received for analysis on 26th April, 2017 of which seven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Paul Boden BSc  
Project Manager**

**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham  
**JE Job No.:** 17/7422

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	81-90	91-100	101-110	111-120,151	121-130	131-140	141-150				Please see attached notes for all abbreviations and acronyms		
Sample ID	BHB/23	BHC/23	BHA/23	BHE/23	BHD/23	B/23	BHBD/23						
Depth													
COC No / misc													
Containers	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G M	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G						
Sample Date	25/04/2017 10:45	25/04/2017 12:15	25/04/2017 13:15	25/04/2017 16:00	25/04/2017 14:30	25/04/2017 16:15	25/04/2017 11:00						
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Ground Water						
Batch Number	2	2	2	2	2	2	2						
Date of Receipt	26/04/2017	26/04/2017	26/04/2017	26/04/2017	26/04/2017	26/04/2017	26/04/2017				LOD/LOR	Units	Method No.
Dissolved Aluminium #	<20	<20	<20	146	<20	<20	<20				<20	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	<2	<2	<2	<2	<2				<2	ug/l	TM30/PM14
Dissolved Arsenic #	9.6	6.5	6.7	5.3	6.0	<2.5	9.0				<2.5	ug/l	TM30/PM14
Dissolved Barium #	90	24	70	51	12	<3	88				<3	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				<0.5	ug/l	TM30/PM14
Dissolved Boron	75	143	101	257	1745	<12	81				<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				<0.5	ug/l	TM30/PM14
Dissolved Calcium #	329.1 <sup>AA</sup>	418.0 <sup>AA</sup>	424.7 <sup>AA</sup>	0.7	29.3	<0.2	343.0 <sup>AA</sup>				<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5				<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	<2	3	<2	<2	<2	<2	<2				<2	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7	<7	<7				<7	ug/l	TM30/PM14
Total Dissolved Iron #	795	1312	2992	<20	732	<20	807				<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM30/PM14
Dissolved Lithium	62	87	52	153	46	<5	63				<5	ug/l	TM30/PM14
Dissolved Magnesium #	6.8	15.4	25.0	0.7	5.0	<0.1	6.8				<0.1	mg/l	TM30/PM14
Dissolved Manganese #	125	120	129	<2	13	<2	130				<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1	<1	<1				<1	ug/l	TM30/PM14
Dissolved Nickel #	3	4	6	<2	<2	<2	3				<2	ug/l	TM30/PM14
Dissolved Potassium #	2.5	3.3	2.6	11.1	3.0	<0.1	2.5				<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3	<3	<3	<3	<3	<3	<3				<3	ug/l	TM30/PM14
Dissolved Silver	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM30/PM14
Dissolved Sodium #	33.5	37.2	26.8	764.1 <sup>AA</sup>	464.3 <sup>AA</sup>	<0.1	33.6				<0.1	mg/l	TM30/PM14
Dissolved Strontium	488	724	714	131	729	<5	503				<5	ug/l	TM30/PM14
Dissolved Vanadium #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5				<1.5	ug/l	TM30/PM14
Dissolved Zinc #	<3	<3	<3	<3	<3	<3	<3				<3	ug/l	TM30/PM14
Total Chromium	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5				<1.5	ug/l	TM30/PM14
Total Iron	809	1039	2769	3794	736	<20	1010				<20	ug/l	TM30/PM14
Total Manganese	127	117	126	44	12	<2	128				<2	ug/l	TM30/PM14
EPH >C8-C10	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM5/PM30
EPH >C10-C16	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM5/PM30
EPH >C16-C24	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM5/PM30
EPH >C24-C40	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM5/PM30
EPH >C8-C40	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM5/PM30
GRO (>C4-C8) #	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM31/PM12
Benzene #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM31/PM12
Toluene #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM31/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM31/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM31/PM12
o-Xylene #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM31/PM12

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**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham  
**JE Job No.:** 17/7422

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
 H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	81-90	91-100	101-110	111-120,151	121-130	131-140	141-150				Please see attached notes for all abbreviations and acronyms		
Sample ID	BHB/23	BHC/23	BHA/23	BHE/23	BHD/23	B/23	BHBD/23						
Depth													
COC No / misc													
Containers	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G M	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G						
Sample Date	25/04/2017 10:45	25/04/2017 12:15	25/04/2017 13:15	25/04/2017 16:00	25/04/2017 14:30	25/04/2017 16:15	25/04/2017 11:00						
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Ground Water						
Batch Number	2	2	2	2	2	2	2						
Date of Receipt	26/04/2017	26/04/2017	26/04/2017	26/04/2017	26/04/2017	26/04/2017	26/04/2017						
											LOD/LOR	Units	Method No.
Bromide	0.15	0.07	0.07	0.34	0.07	<0.05	0.24				<0.05	mg/l	TM27/PM0
Fluoride	<0.3	<0.3	0.5	3.2	0.4	<0.3	<0.3				<0.3	mg/l	TM173/PM0
Sulphate as SO <sub>4</sub> #	259.7	552.8	595.5	1.4	241.9	<0.5	257.9				<0.5	mg/l	TM38/PM0
Chloride #	109.6	59.7	34.4	669.2	45.0	<0.3	117.3				<0.3	mg/l	TM38/PM0
Nitrate as NO <sub>3</sub> #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2				<0.2	mg/l	TM38/PM0
Nitrite as NO <sub>2</sub> #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02				<0.02	mg/l	TM38/PM0
Ortho Phosphate as P #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03				<0.03	mg/l	TM38/PM0
Monoethylene glycol	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	mg/l	TM24/PM30
Ammoniacal Nitrogen as N #	0.06	0.13	0.29	0.95	1.42	<0.03	0.07				<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH <sub>4</sub> #	0.08	0.17	0.37	1.22	1.83	<0.03	0.09				<0.03	mg/l	TM38/PM0
Dissolved Methane #	<1	9	9	64695**	121	13	10				<1	ug/l	TM25/PM0
Dissolved Ethane #	<1	<1	<1	9	<1	<1	<1				<1	ug/l	TM25/PM0
Dissolved Carbon Dioxide	302567**	402070**	346381**	5883	98163	<1	378372				<1	ug/l	TM25/PM0
Dissolved Butane	<2	<2	<2	<2	<2	<2	<2				<2	ug/l	TM25/PM0
Dissolved Propane	<2	<2	<2	<2	<2	<2	<2				<2	ug/l	TM25/PM0
Acetic Acid	<10	<10	<10	<10	<10	<10	<10				<10	mg/l	TM127/PM0
Total Alkalinity as CaCO <sub>3</sub> #	426	411	399	541	655	50	427				<1	mg/l	TM75/PM0
Bicarbonate Alkalinity as CaCO <sub>3</sub>	426	411	399	230	655	50	427				<1	mg/l	TM75/PM0
Acrylamide	<50	<50	<50	<50	<50	<50	<50				<50	ug/l	TM103/PM0
Anionic Surfactants	0.2	0.2	<0.2	0.3	<0.2	<0.2	<0.2				<0.2	mg/l	TM33/PM0
BOD (Settled) #	4	5	4	<1	<1	<1	4				<1	mg/l	TM58/PM0
COD (Settled) #	13	<7	16	22	<7	<7	23				<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	1361	1599	1524	2755	1577	18	1346				<2	uS/cm	TM76/PM0
Formaldehyde	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				<0.5	mg/l	TM51/PM0
Non Ionic Surfactants*	<5	26	27	<5	<5	<5	<5				<5	ug/l	Subcontracted
pH #	7.27	7.71	7.18	9.67	8.23	5.86	7.36				<0.01	pH units	TM73/PM0
Redox	250.59	229.80	201.86	85.88	170.79	326.81	249.82				mV		TM72/PM0
Salinity	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1				<0.1	%	TM64/PM0
Sodium Persulphate	<60	<60	<60	<60	<60	<60	<60				<60	mg/l	TM100/PM0
Total Dissolved Solids #	1098	1248	1263	1646	1120	<35	1115				<35	mg/l	TM20/PM0
Total Suspended Solids #	16	20	12	28	<10	<10	25				<10	mg/l	TM37/PM0

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**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/7422

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C $\pm$ 5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution

JE Job No: 17/7422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				

JE Job No: 17/7422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM37	Modified USEPA 160.2. Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				

JE Job No: 17/7422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				
Subcontracted	Subcontracted analysis, sent to an ISO 17025 accredited laboratory where possible.						

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Durham, 15<sup>th</sup> May, 2017.

Dear Joe,

Here are the results of the analysis of the groundwater samples you supplied. All results are expressed as per mille relative to VPDB. All results are expressed as mean and 95% confidence interval. We analysed 14 samples and we also included both local tap water and also included our zero air standard. The method we used was based on Roberts and Shiller (*Analytica Chimica Acta*, 2015, 856, 68-73). We detected methane and excess CO<sub>2</sub> in all samples and all samples were run in duplicate. I have added my interpretation based on the range observed. We had identified two samples as potentially having very high concentrations of dissolved CH<sub>4</sub> and so these samples were analysed at a range of water to zero air ratios. Normal analysis used 30 ml of water sample and 30 ml of zero air but this was varied down to 10 ml of water sample and 50 ml of zero air for those samples where there was very high dissolved CH<sub>4</sub> concentrations.

Table 1. <sup>13</sup>CH<sub>4</sub> isotope analysis. Samples mark (\*) show concentrations of CH<sub>4</sub> above that expected for equilibration with air.

Sample code	Sample date	Mean (‰)	95% confidence interval	Primo facie interpretation
Laboratory tap water	April	-52.3	±4	<i>Equilibrated with air</i>
S3/23	April	-49.0	+4	<i>Equilibrated with air</i>
BHB/23	April	-51.3	±4	<i>Equilibrated with air</i>
BHC/23	April	-53.3	±4	<i>Equilibrated with air</i>
BHA/23	April	-50.1*	±4	<i>Equilibrated with air</i>
BHE/23	April	-69.9*	±4	<i>Biogenic</i>
BHD/23	April	-52.4	±4	<i>Equilibrated with air</i>
BHBD/23	April	-49.8	±4	<i>Equilibrated with air</i>
S2/23	April	-49.2	±4	<i>Equilibrated with air</i>
G4/23	April	-46.2	±4	<i>Equilibrated with air</i>
G5/23	April	-50.5*	±4	<i>Equilibrated with air</i>
G6/23	April	-49.5	±4	<i>Equilibrated with air</i>
G1/23	April	-47.2	±4	<i>Equilibrated with air</i>
G3/23	April	-68.4*	±4	<i>Biogenic</i>
G2/23	April	-48.3*	±4	<i>Equilibrated with air</i>

Table 2.  $^{13}\text{CO}_2$  isotope analysis.

Sample code	Sample date	Mean (‰)	95% confidence interval
Laboratory tap water	April	-27.6	±1.5
S3/23	April	-25.8	±1.5
BHB/23	April	-24.0	±1.5
BHC/23	April	-23.5	±1.5
BHA/23	April	-26.6	±1.5
BHE/23	April	-9.0	±1.5
BHD/23	April	-25.8	±1.5
BHBD/23	April	-24.2	±1.5
S2/23	April	-24.0	±1.5
G4/23	April	-25.6	±1.5
G5/23	April	-27.2	±1.5
G6/23	April	-27.5	±1.5
G1/23	April	-22.5	±1.5
G3/23	April	-26.3	±1.5
G2/23	April	-25.8	±1.5

Yours sincerely

Fred Worrall, MA PhD, Professor of Environmental Chemistry



## Water Analysis Test Certificates

Round 24



# Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

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Derby  
DE72 3NB

Tel: +44 (0) 1244 833780  
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**Attention :** Phil Ham  
**Date :** 13th July, 2017  
**Your reference :** KMA  
**Our reference :** Test Report 17/8767 Batch 1  
**Location :** Various  
**Date samples received :** 18th May, 2017  
**Status :** Final report  
**Issue :** 1

Seven samples were received for analysis on 18th May, 2017 of which seven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Simon Gomery BSc**  
**Project Manager**

Client Name: Envireau Ltd  
 Reference: KMA  
 Location: Various  
 Contact: Phil Ham  
 JE Job No.: 17/8767

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle  
 H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-11	12-22	23-33	34-44	45-55	56-66	67-77				Please see attached notes for all abbreviations and acronyms		
Sample ID	G2/24	G1/24	G3/24	G4/24	G6/24	S2/24	B/24						
Depth													
COC No / misc													
Containers	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G						
Sample Date	17/05/2017 10:50	17/05/2017 10:00	17/05/2017 14:00	17/05/2017 11:30	17/05/2017 15:00	17/05/2017 09:30	17/05/2017 16:00						
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water						
Batch Number	1	1	1	1	1	1	1						
Date of Receipt	18/05/2017	18/05/2017	18/05/2017	18/05/2017	18/05/2017	18/05/2017	18/05/2017				LOD/LOR	Units	Method No.
Dissolved Aluminium #	<20	<20	<20	<20	<20	<20	<20				<20	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	<2	<2	5	<2	<2				<2	ug/l	TM30/PM14
Dissolved Arsenic #	3.1	<2.5	<2.5	<2.5	3.6	<2.5	<2.5				<2.5	ug/l	TM30/PM14
Dissolved Barium #	69	12	25	31	22	68	<3				<3	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				<0.5	ug/l	TM30/PM14
Dissolved Boron	466	2339	1128	877	831	15	<12				<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				<0.5	ug/l	TM30/PM14
Dissolved Calcium #	34.7	58.5	23.6	27.9	16.4	93.8	<0.2				<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5				<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	<2	<2	<2	<2	<2	<2	<2				<2	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7	<7	<7				<7	ug/l	TM30/PM14
Total Dissolved Iron #	1512	260	138	87	86	24	<20				<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM30/PM14
Dissolved Lithium	17	87	47	23	19	8	<5				<5	ug/l	TM30/PM14
Dissolved Magnesium #	7.9	31.5	6.6	6.9	6.0	7.8	<0.1				<0.1	mg/l	TM30/PM14
Dissolved Manganese #	332	3	38	224	27	6	<2				<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1	<1	<1				<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	<2	<2	<2	<2	<2				<2	ug/l	TM30/PM14
Dissolved Potassium #	3.3	5.9	3.8	2.9	2.9	2.4	<0.1				<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3	<3	<3	<3	<3	<3	<3				<3	ug/l	TM30/PM14
Dissolved Silver	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM30/PM14
Dissolved Sodium #	171.4	652.0 <sup>AA</sup>	359.2 <sup>AA</sup>	227.0 <sup>AA</sup>	226.1 <sup>AA</sup>	15.6	<0.1				<0.1	mg/l	TM30/PM14
Dissolved Strontium	578	4032 <sup>AB</sup>	838	479	352	171	<5				<5	ug/l	TM30/PM14
Dissolved Vanadium #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5				<1.5	ug/l	TM30/PM14
Dissolved Zinc #	<3	<3	<3	<3	<3	<3	<3				<3	ug/l	TM30/PM14
Total Chromium	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5				<1.5	ug/l	TM30/PM14
Total Iron	1281	939	159	145	172	122	<20				<20	ug/l	TM30/PM14
Total Manganese	325	6	38	220	57	5	<2				<2	ug/l	TM30/PM14
EPH >C8-C10	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM5/PM30
EPH >C10-C16	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM5/PM30
EPH >C16-C24	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM5/PM30
EPH >C24-C40	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM5/PM30
EPH >C8-C40	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM5/PM30
GRO (>C4-C8) #	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10	<10	<10	<10	<10	<10				<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM31/PM12
Benzene #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM31/PM12
Toluene #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM31/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM31/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM31/PM12
o-Xylene #	<5	<5	<5	<5	<5	<5	<5				<5	ug/l	TM31/PM12

Please include all sections of this report if it is reproduced



**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/8767

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution

JE Job No: 17/8767

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				



JE Job No: 17/8767

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM37	Modified USEPA 160.2. Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				

JE Job No: 17/8767

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				
Subcontracted	Subcontracted analysis, sent to an ISO 17025 accredited laboratory where possible.						



# Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point  
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Deeside  
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Cedars Farm Barn  
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DE72 3NB

Tel: +44 (0) 1244 833780  
Fax: +44 (0) 1244 833781



**Attention :** Phil Ham  
**Date :** 13th July, 2017  
**Your reference :** KMA  
**Our reference :** Test Report 17/8767 Batch 2  
**Location :** Various  
**Date samples received :** 19th May, 2017  
**Status :** Final report  
**Issue :** 1

Three samples were received for analysis on 19th May, 2017 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Simon Gomery BSc**  
**Project Manager**

**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham  
**JE Job No.:** 17/8767

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	78-88	89-99	100-110									
Sample ID	G5/24	S3/24	BHB/24									
Depth												
COC No / misc												
Containers	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G									
Sample Date	17/05/2017 15:30	17/05/2017 15:45	17/05/2017 13:00									
Sample Type	Ground Water	Ground Water	Ground Water									
Batch Number	2	2	2									
Date of Receipt	19/05/2017	19/05/2017	19/05/2017									
										LOD/LOR	Units	Method No.
Dissolved Aluminium #	<20	<20	<20							<20	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	<2							<2	ug/l	TM30/PM14
Dissolved Arsenic #	<2.5	<2.5	<2.5							<2.5	ug/l	TM30/PM14
Dissolved Barium #	111	81	88							<3	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5							<0.5	ug/l	TM30/PM14
Dissolved Boron	440	72	79							<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5							<0.5	ug/l	TM30/PM14
Dissolved Calcium #	27.4	110.0	370.8 <sub>AA</sub>							<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5							<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	<2	<2	<2							<2	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7							<7	ug/l	TM30/PM14
Total Dissolved Iron #	294	87	1536							<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5							<5	ug/l	TM30/PM14
Dissolved Lithium	14	10	63							<5	ug/l	TM30/PM14
Dissolved Magnesium #	5.8	13.2	7.2							<0.1	mg/l	TM30/PM14
Dissolved Manganese #	293	178	163							<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1							<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	3	<2							<2	ug/l	TM30/PM14
Dissolved Potassium #	2.9	8.1	2.8							<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3	<3	<3							<3	ug/l	TM30/PM14
Dissolved Silver	<5	<5	<5							<5	ug/l	TM30/PM14
Dissolved Sodium #	166.1	59.5	34.1							<0.1	mg/l	TM30/PM14
Dissolved Strontium	403	273	463							<5	ug/l	TM30/PM14
Dissolved Vanadium #	<1.5	<1.5	<1.5							<1.5	ug/l	TM30/PM14
Dissolved Zinc #	<3	<3	8							<3	ug/l	TM30/PM14
Total Chromium	<1.5	<1.5	<1.5							<1.5	ug/l	TM30/PM14
Total Iron	230	737	1306							<20	ug/l	TM30/PM14
Total Manganese	296	103	161							<2	ug/l	TM30/PM14
EPH >C8-C10	<10	<10	<10							<10	ug/l	TM5/PM30
EPH >C10-C16	<10	<10	<10							<10	ug/l	TM5/PM30
EPH >C16-C24	<10	<10	<10							<10	ug/l	TM5/PM30
EPH >C24-C40	<10	<10	<10							<10	ug/l	TM5/PM30
EPH >C8-C40	<10	<10	<10							<10	ug/l	TM5/PM30
GRO (>C4-C8) #	<10	<10	<10							<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10	<10							<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10	<10							<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5							<5	ug/l	TM31/PM12
Benzene #	<5	<5	<5							<5	ug/l	TM31/PM12
Toluene #	<5	<5	<5							<5	ug/l	TM31/PM12
Ethylbenzene #	<5	<5	<5							<5	ug/l	TM31/PM12
m/p-Xylene #	<5	<5	<5							<5	ug/l	TM31/PM12
o-Xylene #	<5	<5	<5							<5	ug/l	TM31/PM12

Please see attached notes for all abbreviations and acronyms

**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham  
**JE Job No.:** 17/8767

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
 H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	78-88	89-99	100-110								Please see attached notes for all abbreviations and acronyms		
Sample ID	G5/24	S3/24	BHB/24										
Depth													
COC No / misc													
Containers	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G										
Sample Date	17/05/2017 15:30	17/05/2017 15:45	17/05/2017 13:00										
Sample Type	Ground Water	Ground Water	Ground Water										
Batch Number	2	2	2										
Date of Receipt	19/05/2017	19/05/2017	19/05/2017								LOD/LOR	Units	Method No.
Bromide	0.06	0.10	0.24								<0.05	mg/l	TM27/PM0
Fluoride	<0.3	<0.3	<0.3								<0.3	mg/l	TM173/PM0
Sulphate as SO <sub>4</sub> #	20.7	29.0	270.1								<0.5	mg/l	TM38/PM0
Chloride #	21.5	84.4	101.4								<0.3	mg/l	TM38/PM0
Nitrate as NO <sub>3</sub> #	0.4	0.4	<0.2								<0.2	mg/l	TM38/PM0
Nitrite as NO <sub>2</sub> #	<0.02	<0.02	<0.02								<0.02	mg/l	TM38/PM0
Ortho Phosphate as P #	<0.03	<0.03	0.05								<0.03	mg/l	TM38/PM0
Monoethylene glycol	<0.001	<0.001	<0.001								<0.001	mg/l	TM24/PM30
Ammoniacal Nitrogen as N #	0.67	0.07	0.08								<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH <sub>4</sub> #	0.86	0.09	0.10								<0.03	mg/l	TM38/PM0
Dissolved Methane #	11	8	6								<1	ug/l	TM25/PM0
Dissolved Ethane #	<1	<1	<1								<1	ug/l	TM25/PM0
Dissolved Carbon Dioxide	65085	40296	304466**								<1	ug/l	TM25/PM0
Dissolved Butane	<2	<2	<2								<2	ug/l	TM25/PM0
Dissolved Propane	<2	<2	<2								<2	ug/l	TM25/PM0
Acetic Acid	<10	<10	<10								<10	mg/l	TM127/PM0
Total Alkalinity as CaCO <sub>3</sub> #	398	316	348								<1	mg/l	TM75/PM0
Bicarbonate Alkalinity as CaCO <sub>3</sub>	398	316	348								<1	mg/l	TM75/PM0
Acrylamide	<50	<50	<50								<50	ug/l	TM103/PM0
Anionic Surfactants	0.7	0.9	0.4								<0.2	mg/l	TM33/PM0
BOD (Settled) #	<1	2	<1								<1	mg/l	TM58/PM0
COD (Settled) #	<7	<7	<7								<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	785	778	1403								<2	uS/cm	TM76/PM0
Formaldehyde	<0.5	<0.5	<0.5								<0.5	mg/l	TM51/PM0
Non Ionic Surfactants*	<5	<5	<5								<5	ug/l	Subcontracted
pH #	7.75	7.79	7.63								<0.01	pH units	TM73/PM0
Redox	54.70	180.73	240.04									mV	TM72/PM0
Salinity	<0.1	<0.1	<0.1								<0.1	%	TM64/PM0
Sodium Persulphate	<60	<60	<60								<60	mg/l	TM100/PM0
Total Dissolved Solids #	492	447	1052								<35	mg/l	TM20/PM0
Total Suspended Solids #	13	24	19								<10	mg/l	TM37/PM0

**Matrix : Liquid**

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/8767

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution



JE Job No: 17/8767

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				

JE Job No: 17/8767

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM37	Modified USEPA 160.2. Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				

JE Job No: 17/8767

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				
Subcontracted	Subcontracted analysis, sent to an ISO 17025 accredited laboratory where possible.						



# Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

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DE72 3NB

Tel: +44 (0) 1244 833780  
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<b>Attention :</b>	Phil Ham
<b>Date :</b>	5th September, 2017
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 17/8827 Batch 1
<b>Location :</b>	Variuos
<b>Date samples received :</b>	19th May, 2017
<b>Status :</b>	Final report
<b>Issue :</b>	1

Six samples were received for analysis on 19th May, 2017 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Paul Boden BSc  
Project Manager**

Client Name: Envireau Ltd  
 Reference: KMA  
 Location: Variuos  
 Contact: Phil Ham  
 JE Job No.: 17/8827

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle  
 H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-11	12-22	23-33	34-44	45-55	56					Please see attached notes for all abbreviations and acronyms		
Sample ID	BHC/24	BHA/24	BHE/24	BHED/24	BHD/24	BHE/24.							
Depth													
COC No / misc													
Containers	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	M							
Sample Date	18/05/2017 09:45	18/05/2017 10:45	18/05/2017 13:45	18/05/2017 14:00	18/05/2017 12:30	18/05/2017 13:45							
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water							
Batch Number	1	1	1	1	1	1							
Date of Receipt	19/05/2017	19/05/2017	19/05/2017	19/05/2017	19/05/2017	19/05/2017					LOD/LOR	Units	Method No.
Dissolved Aluminium	<20	<20	150	151	<20	-					<20	ug/l	TM30/PM14
Dissolved Antimony	<2	<2	<2	<2	<2	-					<2	ug/l	TM30/PM14
Dissolved Arsenic	<2.5	<2.5	<2.5	<2.5	<2.5	-					<2.5	ug/l	TM30/PM14
Dissolved Barium	29	69	54	54	13	-					<3	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	-					<0.5	ug/l	TM30/PM14
Dissolved Boron	134	97	256	251	1778	-					<12	ug/l	TM30/PM14
Dissolved Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	-					<0.5	ug/l	TM30/PM14
Dissolved Calcium	452.6 <sup>AB</sup>	339.8 <sup>AA</sup>	0.7	0.7	26.2	-					<0.2	mg/l	TM30/PM14
Total Dissolved Chromium	<1.5	<1.5	<1.5	<1.5	<1.5	-					<1.5	ug/l	TM30/PM14
Dissolved Cobalt	4	<2	<2	<2	<2	-					<2	ug/l	TM30/PM14
Dissolved Copper	<7	<7	<7	<7	<7	-					<7	ug/l	TM30/PM14
Total Dissolved Iron	547	2314	<20	<20	564	-					<20	ug/l	TM30/PM14
Dissolved Lead	<5	<5	<5	<5	<5	-					<5	ug/l	TM30/PM14
Dissolved Lithium	69	44	137	138	41	-					<5	ug/l	TM30/PM14
Dissolved Magnesium	15.8	23.2	0.6	0.6	4.6	-					<0.1	mg/l	TM30/PM14
Dissolved Manganese	128	127	<2	<2	13	-					<2	ug/l	TM30/PM14
Dissolved Mercury	<1	<1	<1	<1	<1	-					<1	ug/l	TM30/PM14
Dissolved Nickel	10	6	<2	<2	<2	-					<2	ug/l	TM30/PM14
Dissolved Potassium	3.6	2.6	10.6	11.0	3.1	-					<0.1	mg/l	TM30/PM14
Dissolved Selenium	<3	<3	<3	<3	<3	-					<3	ug/l	TM30/PM14
Dissolved Silver	<5	<5	<5	<5	<5	-					<5	ug/l	TM30/PM14
Dissolved Sodium	45.9	26.5	675.4 <sup>AB</sup>	696.8 <sup>AB</sup>	484.5 <sup>AA</sup>	-					<0.1	mg/l	TM30/PM14
Dissolved Strontium	718	660	124	124	659	-					<5	ug/l	TM30/PM14
Dissolved Vanadium	<1.5	<1.5	<1.5	<1.5	<1.5	-					<1.5	ug/l	TM30/PM14
Dissolved Zinc	<3	<3	<3	<3	<3	-					<3	ug/l	TM30/PM14
Total Chromium	<1.5	<1.5	<1.5	<1.5	<1.5	-					<1.5	ug/l	TM30/PM14
Total Iron	697	1816	3666	4244	472	-					<20	ug/l	TM30/PM14
Total Manganese	125	124	43	50	6	-					<2	ug/l	TM30/PM14
EPH >C8-C10	<10	<10	<10	<10	<10	-					<10	ug/l	TM5/PM30
EPH >C10-C16	<10	<10	<10	<10	<10	-					<10	ug/l	TM5/PM30
EPH >C16-C24	<10	<10	<10	<10	<10	-					<10	ug/l	TM5/PM30
EPH >C24-C40	<10	<10	<10	<10	<10	-					<10	ug/l	TM5/PM30
EPH >C8-C40	<10	<10	<10	<10	<10	-					<10	ug/l	TM5/PM30
GRO (>C4-C8)	<10	<10	<10	<10	<10	-					<10	ug/l	TM36/PM12
GRO (>C8-C12)	<10	<10	<10	<10	<10	-					<10	ug/l	TM36/PM12
GRO (>C4-C12)	<10	<10	<10	<10	<10	-					<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5	<5	<5	-					<5	ug/l	TM31/PM12
Benzene #	<5	<5	<5	<5	<5	-					<5	ug/l	TM31/PM12
Toluene #	<5	<5	<5	<5	<5	-					<5	ug/l	TM31/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	-					<5	ug/l	TM31/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	-					<5	ug/l	TM31/PM12
o-Xylene #	<5	<5	<5	<5	<5	-					<5	ug/l	TM31/PM12

**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Variuos  
**Contact:** Phil Ham  
**JE Job No.:** 17/8827

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-11	12-22	23-33	34-44	45-55	56					Please see attached notes for all abbreviations and acronyms		
Sample ID	BHC/24	BHA/24	BHE/24	BHED/24	BHD/24	BHE/24.							
Depth													
COC No / misc													
Containers	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	M							
Sample Date	18/05/2017 09:45	18/05/2017 10:45	18/05/2017 13:45	18/05/2017 14:00	18/05/2017 12:30	18/05/2017 13:45							
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water							
Batch Number	1	1	1	1	1	1							
Date of Receipt	19/05/2017	19/05/2017	19/05/2017	19/05/2017	19/05/2017	19/05/2017					LOD/LOR	Units	Method No.
Bromide	0.07	0.09	0.41	0.31	0.07	-					<0.05	mg/l	TM27/PM0
Fluoride	<0.3	0.5	3.3	3.3	0.5	-					<0.3	mg/l	TM173/PM0
Sulphate as SO4	574.8	554.7	6.2	1.9	252.9	-					<0.5	mg/l	TM38/PM0
Chloride	58.7	33.4	649.0	656.5	43.4	-					<0.3	mg/l	TM38/PM0
Nitrate as NO3	0.3	<0.2	<0.2	<0.2	<0.2	-					<0.2	mg/l	TM38/PM0
Nitrite as NO2	<0.02	<0.02	<0.02	<0.02	<0.02	-					<0.02	mg/l	TM38/PM0
Ortho Phosphate as P	0.04	<0.03	0.04	0.05	0.05	-					<0.03	mg/l	TM38/PM0
Monoethylene glycol	<0.001	<0.001	<0.001	<0.001	<0.001	-					<0.001	mg/l	TM24/PM30
Ammoniacal Nitrogen as N	0.12	0.27	0.92	0.92	1.37	-					<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4	0.16	0.35	1.18	1.18	1.76	-					<0.03	mg/l	TM38/PM0
Dissolved Methane	<1	11	42988 <sup>++</sup>	44695 <sup>++</sup>	92	29941 <sup>++</sup>					<1	ug/l	TM25/PM0
Dissolved Ethane	<1	<1	<1	<1	<1	-					<1	ug/l	TM25/PM0
Dissolved Carbon Dioxide	296332 <sup>++</sup>	223112 <sup>++</sup>	5293	6115	82537	-					<1	ug/l	TM25/PM0
Dissolved Butane	<2	<2	<2	<2	<2	-					<2	ug/l	TM25/PM0
Dissolved Propane	<2	<2	<2	<2	<2	-					<2	ug/l	TM25/PM0
Acetic Acid	<10	<10	<10	<10	<10	-					<10	mg/l	TM127/PM0
Total Alkalinity as CaCO3	447	410	553	556	648	-					<1	mg/l	TM75/PM0
Bicarbonate Alkalinity as CaCO3	447	410	249	243	648	-					<1	mg/l	TM75/PM0
Acrylamide	<50	<50	<50	<50	<50	-					<50	ug/l	TM103/PM0
Anionic Surfactants	<0.2	0.3	1.4	1.0	0.4	-					<0.2	mg/l	TM33/PM0
BOD (Settled)	<1	<1	5	4	<1	-					<1	mg/l	TM58/PM0
COD (Settled)	<7	16	20	28	7	-					<7	mg/l	TM57/PM0
Electrical Conductivity @25C	1715	1595	2824	2862	1625	-					<2	uS/cm	TM76/PM0
Formaldehyde	<0.5	<0.5	<0.5	1.3	<0.5	-					<0.5	mg/l	TM51/PM0
Non Ionic Surfactants*	<5	<5	<5	<5	<5	-					<5	ug/l	Subcontracted
pH	6.89	7.07	9.51	9.56	8.11	-					<0.01	pH units	TM73/PM0
Redox	259.45	224.55	142.89	162.69	225.93	-					mV		TM72/PM0
Salinity	0.1	<0.1	0.2	0.2	0.1	-					<0.1	%	TM64/PM0
Sodium Persulphate	<60	<60	<60	<60	<60	-					<60	mg/l	TM100/PM0
Total Dissolved Solids	1269	1222	1590	1593	1082	-					<35	mg/l	TM20/PM0
Total Suspended Solids	26	17	21	22	<10	-					<10	mg/l	TM37/PM0

**Matrix : Liquid**

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/8827

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.



**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution

JE Job No: 17/8827

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.				
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.				

JE Job No: 17/8827

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.				
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.				
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				

JE Job No: 17/8827

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				
Subcontracted	Subcontracted analysis, sent to an ISO 17025 accredited laboratory where possible.						

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Durham, 30<sup>th</sup> May, 2017.

Dear Joe,

Here are the results of the analysis of the groundwater samples you supplied. All results are expressed as per mille relative to VPDB. All results are expressed as mean and 95% confidence interval. We analysed 14 samples and we also included both local tap water and also included our zero air standard. The method we used was based on Roberts and Shiller (*Analytica Chimica Acta*, 2015, 856, 68-73). We detected methane and excess CO<sub>2</sub> in all samples and all samples were run in duplicate. I have added my interpretation based on the range observed. We had identified two samples as potentially having very high concentrations of dissolved CH<sub>4</sub> and so these samples were analysed at a range of water to zero air ratios. Normal analysis used 30 ml of water sample and 30 ml of zero air but this was varied down to 10 ml of water sample and 50 ml of zero air for those samples where there was very high dissolved CH<sub>4</sub> concentrations.

Table 1. <sup>13</sup>CH<sub>4</sub> isotope analysis. Samples mark (\*) show concentrations of CH<sub>4</sub> above that expected for equilibration with air.

Sample code	Sample date	Mean (‰)	95% confidence interval	Primo facie interpretation
Laboratory tap water	May	-44.1	±4	<i>Equilibrated with air</i>
S3/24	May	-64.0*	±4	<i>Biogenic</i>
BHB/24	May	-75.0*	±4	<i>Biogenic</i>
BHC/24	May	-49.9	±4	<i>Equilibrated with air</i>
BHA/24	May	-67.4*	±4	<i>Biogenic</i>
BHE/24	May	-79.0*	±4	<i>Biogenic</i>
BHD/24	May	-38.9*	±4	<i>Thermogenic</i>
G4/24	May	-64.1*	±4	<i>Biogenic</i>
BHED/24	May	-82.4*	±4	<i>Biogenic</i>
G1/24	May	-78.8*	±4	<i>Biogenic</i>
S2/24	May	-53.3	±4	<i>Equilibrated with air</i>
G5/24	May	-52.4	±4	<i>Equilibrated with air</i>
G6/24	May	-49.6	±4	<i>Equilibrated with air</i>
G3/24	May	-66.3*	±4	<i>Biogenic</i>
G2/24	May	-53.7	±4	<i>Equilibrated with air</i>

Table 2.  $^{13}\text{CO}_2$  isotope analysis.

Sample code	Sample date	Mean (‰)	95% confidence interval
Laboratory tap water	May	-10.6	±1.5
S3/24	May	-27.6	±1.5
BHB/24	May	-11.4	±1.5
BHC/24	May	-21.9	±1.5
BHA/24	May	-22.5	±1.5
BHE/24	May	-11.2	±1.5
BHD/24	May	-26.8	±1.5
G4/24	May	-24.9	±1.5
BHED/24	May	-11.0	±1.5
G1/24	May	-13.9	±1.5
S2/24	May	-24.7	±1.5
G5/24	May	-25.4	±1.5
G6/24	May	-25.2	±1.5
G3/24	May	-25.0	±1.5
G2/24	May	-26.3	±1.5

Yours sincerely

Fred Worrall, MA PhD, Professor of Environmental Chemistry

## Water Analysis Test Certificates

Round 25



# Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

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<b>Attention :</b>	Phil Ham
<b>Date :</b>	13th July, 2017
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 17/10356 Batch 1 Schedule A 17/10356 Batch 1 Schedule B 17/10356 Batch 1 Schedule C
<b>Location :</b>	Various
<b>Date samples received :</b>	15th June, 2017
<b>Status :</b>	Final report
<b>Issue :</b>	1

Nine samples were received for analysis on 15th June, 2017 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Simon Gomery BSc**  
**Project Manager**



Client Name: Envireau Ltd  
 Reference: KMA  
 Location: Various  
 Contact: Phil Ham  
 JE Job No.: 17/10356

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle  
 H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90		Please see attached notes for all abbreviations and acronyms		
Sample ID	G2/25	G1/25	G3/25	G5/25	B/25	G4D/25	S2/25	G4/25	G6/25				
Depth													
COC No / misc													
Containers	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G				
Sample Date	14/06/2017 12:00	14/06/2017 11:15	14/06/2017 13:45	14/06/2017 14:30	14/06/2017 14:00	14/06/2017 12:45	14/06/2017 10:30	14/06/2017 12:30	14/06/2017 13:15				
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	15/06/2017	15/06/2017	15/06/2017	15/06/2017	15/06/2017	15/06/2017	15/06/2017	15/06/2017	15/06/2017		LOD/LOR	Units	Method No.
Dissolved Aluminium #	<20	<20	<20	<20	<20	<20	<20	<20	<20		<20	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM30/PM14
Dissolved Arsenic #	3.0	<2.5	<2.5	3.9	3.0	<2.5	<2.5	<2.5	<2.5		<2.5	ug/l	TM30/PM14
Dissolved Barium #	71	11	23	102	<3	32	68	31	22		<3	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM30/PM14
Dissolved Boron	476	2329	1118	455	<12	879	15	883	743		<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM30/PM14
Dissolved Calcium #	31.9	61.9	21.6	26.7	<0.2	27.8	86.4	27.6	16.8		<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7	<7	<7	<7	<7		<7	ug/l	TM30/PM14
Total Dissolved Iron #	1669	352	129	258	<20	<20	85	<20	175		<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM30/PM14
Dissolved Lithium	14	85	41	15	<5	20	<5	21	17		<5	ug/l	TM30/PM14
Dissolved Magnesium #	7.7	35.1	6.3	5.6	<0.1	6.8	7.0	6.8	5.3		<0.1	mg/l	TM30/PM14
Dissolved Manganese #	324	<2	34	263	<2	223	11	225	23		<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM30/PM14
Dissolved Potassium #	2.9	5.9	3.5	2.6	<0.1	2.9	1.9	2.8	2.5		<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM30/PM14
Dissolved Silver	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM30/PM14
Dissolved Sodium #	167.6	643.7 <sup>AC</sup>	388.7 <sup>AA</sup>	154.8	<0.1	255.0 <sup>AA</sup>	15.3	254.3 <sup>AA</sup>	193.8		<0.1	mg/l	TM30/PM14
Dissolved Strontium	547	4672 <sup>AB</sup>	758	412	<5	435	143	437	304		<5	ug/l	TM30/PM14
Dissolved Vanadium #	<1.5	<1.5	<1.5	<1.5	<1.5	2.6	<1.5	<1.5	<1.5		<1.5	ug/l	TM30/PM14
Dissolved Zinc #	<3	<3	<3	<3	<3	7	<3	9	<3		<3	ug/l	TM30/PM14
Total Chromium	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	ug/l	TM30/PM14
Total Iron	1578	779	63	371	<20	121	576	223	297		<20	ug/l	TM30/PM14
Total Manganese	243	5	30	259	<2	163	19	164	54		<2	ug/l	TM30/PM14
EPH >C8-C10	<10	<10	<10	<10	<10	<10	140	60	110		<10	ug/l	TM5/PM30
EPH >C10-C16	<10	<10	<10	<10	<10	<10	<10	<10	60		<10	ug/l	TM5/PM30
EPH >C16-C24	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
EPH >C24-C40	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
EPH >C8-C40	<10	<10	<10	<10	<10	<10	140	60	170		<10	ug/l	TM5/PM30
GRO (>C4-C10)	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM36/PM12
GRO (>C4-C8) #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM36/PM12
GRO (>C8-C12) #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM36/PM12
GRO (>C4-C12) #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM31/PM12
Benzene #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM31/PM12
Toluene #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM31/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM31/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM31/PM12

**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham  
**JE Job No.:** 17/10356

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
 H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90		Please see attached notes for all abbreviations and acronyms		
Sample ID	G2/25	G1/25	G3/25	G5/25	B/25	G4D/25	S2/25	G4/25	G6/25				
Depth													
COC No / misc													
Containers	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G				
Sample Date	14/06/2017 12:00	14/06/2017 11:15	14/06/2017 13:45	14/06/2017 14:30	14/06/2017 14:00	14/06/2017 12:45	14/06/2017 10:30	14/06/2017 12:30	14/06/2017 13:15				
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	15/06/2017	15/06/2017	15/06/2017	15/06/2017	15/06/2017	15/06/2017	15/06/2017	15/06/2017	15/06/2017				
											LOD/LOR	Units	Method No.
o-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM31/PM12
Bromide	<0.05	0.21	0.17	0.07	<0.05	0.08	<0.05	0.08	0.11		<0.05	mg/l	TM27/PM0
Fluoride	<0.3	1.1	0.6	<0.3	<0.3	0.3	<0.3	0.3	0.3		<0.3	mg/l	TM173/PM0
Sulphate as SO <sub>4</sub> #	26.4	839.5	150.4	20.0	<0.5	82.0	39.3	81.8	58.8		<0.5	mg/l	TM38/PM0
Chloride #	28.3	97.8	47.6	22.2	<0.3	25.4	28.3	25.1	19.5		<0.3	mg/l	TM38/PM0
Nitrate as NO <sub>3</sub> #	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	26.0	0.8	<0.2		<0.2	mg/l	TM38/PM0
Nitrite as NO <sub>2</sub> #	0.36	<0.02	<0.02	<0.02	<0.02	0.08	0.24	0.10	<0.02		<0.02	mg/l	TM38/PM0
Ortho Phosphate as P #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	mg/l	TM38/PM0
Monoethylene glycol	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	mg/l	TM24/PM30
Ammoniacal Nitrogen as N #	0.73	2.35	1.23	0.68	<0.03	0.63	0.09	0.63	0.03		<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH <sub>4</sub> #	0.94	3.02	1.58	0.88	<0.03	0.81	0.11	0.81	0.04		<0.03	mg/l	TM38/PM0
Dissolved Methane #	25	785 <sup>++</sup>	2939 <sup>++</sup>	13	<1	10	9	9	49		<1	ug/l	TM25/PM0
Dissolved Ethane #	<1	<1	16	<1	<1	<1	<1	<1	<1		<1	ug/l	TM25/PM0
Dissolved Carbon Dioxide	85257	124760 <sup>++</sup>	102619 <sup>++</sup>	78258	<1	80301	30311	85342	56633		<1	ug/l	TM25/PM0
Dissolved Butane	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM25/PM0
Dissolved Propane	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM25/PM0
Acetic Acid	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	mg/l	TM127/PM0
Total Alkalinity as CaCO <sub>3</sub> #	422	634	630	397	26	476	190	473	437		<1	mg/l	TM75/PM0
Bicarbonate Alkalinity as CaCO <sub>3</sub>	361	573	630	397	26	410	149	410	374		<1	mg/l	TM75/PM0
Acrylamide	<50	<50	<50	<50	<50	<50	<50	<50	<50		<50	ug/l	TM103/PM0
Anionic Surfactants	0.7	1.1	1.3	0.7	1.1	1.2	0.7	1.0	1.1		<0.2	mg/l	TM33/PM0
BOD (Settled) #	<1	1	3	<1	<1	1	<1	1	1		<1	mg/l	TM58/PM0
COD (Settled) #	<7	7	9	<7	<7	<7	10	<7	38		<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	808	2719	1436	747	20	1108	534	1001	891		<2	uS/cm	TM76/PM0
Formaldehyde	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	mg/l	TM51/PM0
Non Ionic Surfactants*	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	Subcontracted
pH #	8.47	8.38	8.13	7.90	5.66	8.48	8.31	8.49	8.52		<0.01	pH units	TM73/PM0
Redox	199.75	224.92	217.94	231.49	291.00	280.15	274.28	271.52	265.63			mV	TM72/PM0
Salinity	<0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	%	TM64/PM0
Sodium Persulphate	<60	<60	<60	<60	<60	<60	<60	<60	<60		<60	mg/l	TM100/PM0
Total Dissolved Solids #	548	1985	974	496	<35	676	366	697	610		<35	mg/l	TM20/PM0
Total Suspended Solids #	<10	21	<10	<10	<10	<10	16	11	<10		<10	mg/l	TM37/PM0

Please include all sections of this report if it is reproduced

**Matrix : Liquid**

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/10356

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution
AC	x20 Dilution

JE Job No: 17/10356

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				

JE Job No: 17/10356

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

JE Job No: 17/10356

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				
Subcontracted	Subcontracted analysis, sent to an ISO 17025 accredited laboratory where possible.						





# Exova Jones Environmental

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<b>Attention :</b>	Phil Ham
<b>Date :</b>	5th September, 2017
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 17/10422 Batch 1
<b>Location :</b>	Various
<b>Date samples received :</b>	16th June, 2017
<b>Status :</b>	Final report
<b>Issue :</b>	1

Six samples were received for analysis on 16th June, 2017 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Paul Boden BSc  
Project Manager**

Client Name: Envireau Ltd  
 Reference: KMA  
 Location: Various  
 Contact: Phil Ham  
 JE Job No.: 17/10422

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle  
 H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-10	11-20	21-30	31-40	41	42-51					Please see attached notes for all abbreviations and acronyms		
Sample ID	BHB/25	BHC/25	BHA/25	BHE/25	BHE/25	BHD/25							
Depth													
COC No / misc													
Containers	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	V H HN P BOD G	M	V H HN P BOD G							
Sample Date	15/06/2017 11:00	15/06/2017 12:15	15/06/2017 13:30	15/06/2017 16:15	15/06/2017 16:15	15/06/2017 15:00							
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water							
Batch Number	1	1	1	1	1	1							
Date of Receipt	16/06/2017	16/06/2017	16/06/2017	16/06/2017	16/06/2017	16/06/2017					LOD/LOR	Units	Method No.
Dissolved Aluminium #	<20	<20	<20	129	-	<20					<20	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	<2	<2	-	<2					<2	ug/l	TM30/PM14
Dissolved Arsenic #	<2.5	<2.5	<2.5	<2.5	-	<2.5					<2.5	ug/l	TM30/PM14
Dissolved Barium #	85	23	70	46	-	9					<3	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	-	<0.5					<0.5	ug/l	TM30/PM14
Dissolved Boron	83	144	105	246	-	1665					<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	-	<0.5					<0.5	ug/l	TM30/PM14
Dissolved Calcium #	333.7 <sup>AA</sup>	412.9 <sup>AB</sup>	345.6 <sup>AA</sup>	0.7	-	25.5					<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	-	<1.5					<1.5	ug/l	TM30/PM14
Dissolved Cobalt #	<2	3	<2	<2	-	<2					<2	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	-	<7					<7	ug/l	TM30/PM14
Total Dissolved Iron #	1578	868	2345	<20	-	205					<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	-	<5					<5	ug/l	TM30/PM14
Dissolved Lithium	67	86	50	147	-	42					<5	ug/l	TM30/PM14
Dissolved Magnesium #	6.7	15.0	21.3	0.7	-	4.6					<0.1	mg/l	TM30/PM14
Dissolved Manganese #	154	123	99	<2	-	10					<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	-	<1					<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	5	2	<2	-	<2					<2	ug/l	TM30/PM14
Dissolved Potassium #	2.7	3.3	2.6	11.1	-	3.0					<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3	<3	<3	<3	-	<3					<3	ug/l	TM30/PM14
Dissolved Silver	<5	<5	<5	<5	-	<5					<5	ug/l	TM30/PM14
Dissolved Sodium #	33.3	37.6	25.5	692.4 <sup>AB</sup>	-	458.7 <sup>AA</sup>					<0.1	mg/l	TM30/PM14
Dissolved Strontium	511	745	647	130	-	682					<5	ug/l	TM30/PM14
Dissolved Vanadium #	<1.5	<1.5	<1.5	<1.5	-	<1.5					<1.5	ug/l	TM30/PM14
Dissolved Zinc #	10	36	7	3	-	<3					<3	ug/l	TM30/PM14
Total Chromium	<1.5	<1.5	<1.5	<1.5	-	<1.5					<1.5	ug/l	TM30/PM14
Total Iron	975	845	2531	353	-	615					<20	ug/l	TM30/PM14
Total Manganese	161	127	102	<2	-	8					<2	ug/l	TM30/PM14
EPH >C8-C10	<10	<10	<10	<10	-	<10					<10	ug/l	TM5/PM30
EPH >C10-C16	<10	<10	<10	<10	-	<10					<10	ug/l	TM5/PM30
EPH >C16-C24	<10	<10	<10	<10	-	<10					<10	ug/l	TM5/PM30
EPH >C24-C40	<10	<10	<10	<10	-	<10					<10	ug/l	TM5/PM30
EPH >C8-C40	<10	<10	<10	<10	-	<10					<10	ug/l	TM5/PM30
GRO (>C4-C10)	<10	<10	<10	<10	-	<10					<10	ug/l	TM36/PM12
MTBE #	<5	<5	<5	<5	-	<5					<5	ug/l	TM31/PM12
Benzene #	<5	<5	<5	<5	-	<5					<5	ug/l	TM31/PM12
Toluene #	<5	<5	<5	<5	-	<5					<5	ug/l	TM31/PM12
Ethylbenzene #	<5	<5	<5	<5	-	<5					<5	ug/l	TM31/PM12
m/p-Xylene #	<5	<5	<5	<5	-	<5					<5	ug/l	TM31/PM12
o-Xylene #	<5	<5	<5	<5	-	<5					<5	ug/l	TM31/PM12
Bromide	0.18	0.06	0.07	0.28	-	0.06					<0.05	mg/l	TM27/PM0

Please include all sections of this report if it is reproduced

Client Name: Envireau Ltd  
 Reference: KMA  
 Location: Various  
 Contact: Phil Ham  
 JE Job No.: 17/10422

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle  
 H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

J E Sample No.	1-10	11-20	21-30	31-40	41	42-51					Please see attached notes for all abbreviations and acronyms		
Sample ID	BHB/25	BHC/25	BHA/25	BHE/25	BHE/25	BHD/25							
Depth													
COC No / misc													
Containers	V H H N P BOD G	V H H N P BOD G	V H H N P BOD G	V H H N P BOD G	M	V H H N P BOD G							
Sample Date	15/06/2017 11:00	15/06/2017 12:15	15/06/2017 13:30	15/06/2017 16:15	15/06/2017 16:15	15/06/2017 15:00							
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water							
Batch Number	1	1	1	1	1	1							
Date of Receipt	16/06/2017	16/06/2017	16/06/2017	16/06/2017	16/06/2017	16/06/2017					LOD/LOR	Units	Method No.
Fluoride	<0.3	<0.3	0.5	3.1	-	0.4					<0.3	mg/l	TM173/PM0
Sulphate as SO <sub>4</sub> #	258.4	548.8	455.3	1.3	-	249.7					<0.5	mg/l	TM38/PM0
Chloride #	111.7	59.1	37.3	682.7	-	43.8					<0.3	mg/l	TM38/PM0
Nitrate as NO <sub>3</sub> #	<0.2	<0.2	<0.2	<0.2	-	<0.2					<0.2	mg/l	TM38/PM0
Nitrite as NO <sub>2</sub> #	<0.02	<0.02	<0.02	<0.02	-	<0.02					<0.02	mg/l	TM38/PM0
Ortho Phosphate as P #	<0.03	<0.03	<0.03	<0.03	-	<0.03					<0.03	mg/l	TM38/PM0
Monoethylene glycol	<0.001	<0.001	<0.001	<0.001	-	<0.001					<0.001	mg/l	TM24/PM30
Ammoniacal Nitrogen as N #	0.08	0.12	0.27	0.94	-	1.37					<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH <sub>4</sub> #	0.10	0.16	0.35	1.21	-	1.76					<0.03	mg/l	TM38/PM0
Dissolved Methane #	<1	6	<1	36171 <sup>++</sup>	28685 <sup>++</sup>	86					<1	ug/l	TM25/PM0
Dissolved Ethane #	<1	<1	<1	<1	-	<1					<1	ug/l	TM25/PM0
Dissolved Carbon Dioxide	206519 <sup>++</sup>	206672 <sup>++</sup>	168946 <sup>++</sup>	7363	-	95995					<1	ug/l	TM25/PM0
Dissolved Butane	<2	<2	<2	<2	-	<2					<2	ug/l	TM25/PM0
Dissolved Propane	<2	<2	<2	<2	-	<2					<2	ug/l	TM25/PM0
Acetic Acid	<10	<10	<10	<10	-	<10					<10	mg/l	TM127/PM0
Total Alkalinity as CaCO <sub>3</sub> #	419	435	419	522	-	650					<1	mg/l	TM75/PM0
Bicarbonate Alkalinity as CaCO <sub>3</sub>	419	435	419	209	-	650					<1	mg/l	TM75/PM0
Acrylamide	<50	<50	<50	<50	-	<50					<50	ug/l	TM103/PM0
Anionic Surfactants	1.1	0.4	1.1	1.0	-	1.3					<0.2	mg/l	TM33/PM0
BOD (Settled) #	<1	<1	<1	5	-	1					<1	mg/l	TM58/PM0
COD (Settled) #	15	16	24	53	-	73					<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	1399	1599	1425	2815	-	1598					<2	uS/cm	TM76/PM0
Formaldehyde	<0.5	<0.5	<0.5	<0.5	-	<0.5					<0.5	mg/l	TM51/PM0
Non Ionic Surfactants*	<5	<5	144	<5	-	<5					<5	ug/l	Subcontracted
pH #	7.20	7.16	7.21	9.77	-	8.18					<0.01	pH units	TM73/PM0
Redox	138.06	154.24	138.80	167.65	-	46.59						mV	TM72/PM0
Salinity	<0.1	0.1	<0.1	0.2	-	0.1					<0.1	%	TM64/PM0
Sodium Persulphate	<60	<60	<60	<60	-	<60					<60	mg/l	TM100/PM0
Total Dissolved Solids #	1143	1378	1161	1675	-	1051					<35	mg/l	TM20/PM0
Total Suspended Solids #	10	<10	<10	<10	-	<10					<10	mg/l	TM37/PM0
Total Cations	18.72	23.56	20.17	30.49	-	21.68					<0.00	mmolc/l	TM30/PM14
Total Anions	16.91	21.79	18.91	29.72	-	19.43					<0.00	mmolc/l	TM0/PM0
% Cation Excess	5.08	3.90	3.22	1.28	-	5.47						%	TM0/PM0

**Matrix : Liquid**

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/10422

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution

JE Job No: 17/10422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM24	Determination of Glycols by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM31	Modified USEPA 8015B. Determination of Methylterbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			

JE Job No: 17/10422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			



JE Job No: 17/10422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM100	Ferrous ammonium sulphate is oxidised by any persulphate present in the samples, any residual ferrous iron is then titrated with potassium permanganate.	PM0	No preparation is required.				
TM103	Determination of specific Amines with Reversed Phase Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM127	Determination of specific Volatile Fatty Acids with Liquid Chromatography and Mass Spectroscopy detection.	PM0	No preparation is required.				
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				
Subcontracted	Subcontracted analysis, sent to an ISO 17025 accredited laboratory where possible.						



# Exova Jones Environmental

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<b>Attention :</b>	Phil Ham
<b>Date :</b>	18th July, 2017
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 17/10356 Batch 1 Schedule D
<b>Location :</b>	Various
<b>Date samples received :</b>	15th June, 2017
<b>Status :</b>	Final report
<b>Issue :</b>	1

Nine samples were received for analysis on 15th June, 2017 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Simon Gomery BSc**  
**Project Manager**

Please see attached notes for all abbreviations and acronyms

**Matrix : Liquid**

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/10356

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 17/10356

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				



## Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

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<b>Attention :</b>	Phil Ham
<b>Date :</b>	05th September, 2017
<b>Your reference :</b>	KMA
<b>Our reference :</b>	Test Report 17/10422 Batch 1 Schedule C
<b>Location :</b>	Various
<b>Date samples received :</b>	16th June, 2017
<b>Status :</b>	Final report
<b>Issue :</b>	2

Six samples were received for analysis on 16th June, 2017 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Simon Gomery BSc**  
**Project Manager**





**Client Name:** Envireau Ltd  
**Reference:** KMA  
**Location:** Various  
**Contact:** Phil Ham

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/10422

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Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

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A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 17/10422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				

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Durham, 24<sup>th</sup> June, 2017.

Dear Joe,

Here are the results of the analysis of the groundwater samples you supplied. All results are expressed as per mille relative to VPDB. All results are expressed as mean and 95% confidence interval. We analysed 13 samples and we also included both local tap water and also included our zero air standard. The method we used was based on Roberts and Shiller (*Analytica Chimica Acta*, 2015, 856, 68-73). We detected methane and excess CO<sub>2</sub> in all samples and all samples were run in duplicate. I have added my interpretation based on the range observed. We had identified samples with (\*) where there was a larger concentration of dissolved CH<sub>4</sub> than as measured in laboratory tap water. Normal analysis used 30 ml of water sample and 30 ml of zero air but this was varied down to 10 ml of water sample and 50 ml of zero air for those samples where there was very high dissolved CH<sub>4</sub> concentrations (i.e. BHE/25). In line with the attached statistical analysis I have modified the reporting of the error on the dissolved CH<sub>4</sub> concentrations.

Table 1. <sup>13</sup>CH<sub>4</sub> isotope analysis. Samples mark (\*) show concentrations of CH<sub>4</sub> above that expected for equilibration with air.

Sample code	Sample date	Mean (‰)	Standard error	Primo facie interpretation
Laboratory tap water	June	-48.8	±4	Equilibrated with air
BHB/25	June	-47.1*	±4	Equilibrated with air
BHC/25	June	-48.7*	±4	Equilibrated with air
BHA/25	June	-48.7*	±4	Equilibrated with air
BHE/25	June	-83.4*	±4	Biogenic
BHD/25	June	-43.1*	±4	Equilibrated with air
S2/25	June	-49.5*	±4	Equilibrated with air
G4/25	June	-48.2*	±4	Equilibrated with air
G1/25	June	-46.0*	±4	Equilibrated with air
G4D/25	June	-47.1*	±4	Equilibrated with air
G5/25	June	-46.1*	±4	Equilibrated with air
G6/25	June	-46.0*	±4	Equilibrated with air
G3/25	June	-49.8*	±4	Equilibrated with air
G2/25	June	-48.8*	±4	Equilibrated with air

Table 2.  $^{13}\text{CO}_2$  isotope analysis.

Sample code	Sample date	Mean (‰)	95% confidence interval
Laboratory tap water	June	-11.6	±1.5
BHB/25	June	-23.0	±1.5
BHC/25	June	-21.4	±1.5
BHA/25	June	-22.9	±1.5
BHE/25	June	-7.85	±1.5
BHD/25	June	-26.9	±1.5
S2/25	June	-23.8	±1.5
G4/25	June	-25.7	±1.5
G1/25	June	-22.6	±1.5
G4D/25	June	-22.6	±1.5
G5/25	June	-26.1	±1.5
G6/25	June	-22.1	±1.5
G3/25	June	-25.3	±1.5
G2/25	June	-25.3	±1.5

Yours sincerely

Fred Worrall, MA PhD, Professor of Environmental Chemistry

## **APPENDIX F**

### Headspace Methane Reports



## Headspace Methane Results

Round 23

**PROJECT ID:** GGS1282  
**SITE:** KMA  
**SPECIALIST:** H. Rutter  
**EQUIPMENT:** GasData GFM435 (SN: 11028) & TDL-500 (SN: 154011)

BH ID	Site	Date	Time	Barometric Pressure	Line Test	Flow Rate ( ltr/hr )			Steady CH <sub>4</sub> ( % v/v )	Peak CH <sub>4</sub> ( % v/v )	Steady CO <sub>2</sub> ( % v/v )	Peak CO <sub>2</sub> ( % v/v )	Minimum O <sub>2</sub> ( % v/v )	Maximum O <sub>2</sub> ( % v/v )	CO ( ppmv )	H <sub>2</sub> S ( ppmv )	Steady CH <sub>4</sub> ( ppmv )	Peak CH <sub>4</sub> ( ppmv )	Comments
					OK?	Initial	Duration	Steady											
BH A	KMA	24/04/17	12:20	1006	Y	<0.1	-	<0.1	<0.1	<0.1	4.7	4.7	2.7	2.8	<1	<1	24.5	-	
BH B	KMA	24/04/17	12:00	1007	Y	<0.1	-	<0.1	<0.1	<0.1	10.1	10.1	0.6	0.6	<1	<1	44.4	-	
BH C	KMA	24/04/17	12:15	1006	Y	<0.1	-	<0.1	<0.1	<0.1	0.5	0.5	21.0	20.8	<1	<1	2.0	-	
BH D	KMA	24/04/17	12:10	1006	Y	<0.1	-	<0.1	<0.1	<0.1	0.2	0.2	20.2	20.3	<1	<1	2.8	342.0	Peak of 342 ppm when tap initially opened
BH E	KMA	24/04/17	12:05	1006	Y	<0.1	-	<0.1	<0.1	<0.1	0.1	0.1	20.4	20.4	<1	<1	103.0	664.0	Drop to steady 103 ppm after 2 mins - no bung

BH A	KMA	25/04/17	09:50	1004	Y	<0.1	-	<0.1	<0.1	<0.1	2.5	3.5	10.8	10.9	<1	<1	14.6	22.8	No continuous monitoring during water sampling
BH B	KMA	25/04/17	09:30	1006	Y	<0.1	-	<0.1	<0.1	<0.1	10.5	10.5	0.3	0.3	<1	<1	46.8	-	Min 58.9 ppm, max 60.4 ppm with tubing dangled within borehole whilst water sampling
BH C	KMA	25/04/17	09:45	1005	Y	<0.1	-	<0.1	<0.1	<0.1	0.4	0.5	20.1	20.1	<1	<1	2.1	-	No continuous monitoring during water sampling
BH D	KMA	25/04/17	09:40	1005	Y	<0.1	-	<0.1	<0.1	<0.1	0.1	0.1	20.5	20.5	<1	<1	2.0	-	Continuous background levels during water sampling
BH E	KMA	25/04/17	09:35	1006	Y	<0.1	-	<0.1	<0.1	<0.1	0.1	0.1	20.5	20.5	<1	<1	50.0	120.0	Drop to steady 50 ppm after 2 mins (no bung). Varied between max 128 ppm & min 10.2 ppm whilst water sampling. After 35 mins 63.7 ppm

KEY: 0.0 = Below instrument limit of detection, NM = Not Measured, N/A = Not Applicable, %v/v = Percentage volume by volume, ppmv = parts per million by volume, mb = milibar, ltr/hr = litres per hour, mbgl = metres below ground level



Experts in Continuous Monitoring

**PROJECT ID:** GGS1282

**SITE:** KMA

**SPECIALIST:** H. Rutter

**EQUIPMENT:** GasData GFM435 (SN: 11028) & TDL-500 (SN: 154011)

Site	Date	Barometric Pressure ( mb )	Site Notes
S2 - Costa Beck	24/04/17	1007	Continuous background levels during water sampling
S3 - Auckland Beck	24/04/17	1007	Continuous background levels during water sampling
G1 - Elm Tree Farm	24/04/17	1007	Max 2896 ppm CH4 detected at hose nozzle. H2S smell from hose
G2 - West Farm	24/04/17	1007	Continuous background levels during water sampling
G3 - The Villa	24/04/17	1008	15.7 ppm max detected from water in bucket
G4 - Coultas Farm	24/04/17	1006	Continuous background levels during water sampling
G5 - Habton Whin	24/04/17	1006	Continuous background levels during water sampling
G6 - The Ellers	24/04/17	1006	Continuous background levels during water sampling

## Headspace Methane Results

Round 24



**PROJECT ID:** GGS1282

**SITE:** KMA

**SPECIALIST:** H. Rutter

**EQUIPMENT:** GasData GFM435 (SN: 11028) & TDL-500 (SN: 154011)

BH ID	Site	Date	Time	Barometric Pressure ( mb )	Line Test	Flow Rate ( ltr/hr )			Steady CH <sub>4</sub> ( % v/v )	Peak CH <sub>4</sub> ( % v/v )	Steady CO <sub>2</sub> ( % v/v )	Peak CO <sub>2</sub> ( % v/v )	Minimum O <sub>2</sub> ( % v/v )	Maximum O <sub>2</sub> ( % v/v )	CO ( ppmv )	H <sub>2</sub> S ( ppmv )	Steady CH <sub>4</sub> ( ppmv )	Peak CH <sub>4</sub> ( ppmv )	Comments
					OK?	Initial	Duration	Steady											
BH A	KMA	17/05/17	12:05	1013	Y	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	20.7	20.7	<1	<1	3.2	-	
BH B	KMA	17/05/17	12:00	1014	Y	<0.1	-	<0.1	<0.1	<0.1	1.5	1.5	18.7	18.7	<1	<1	5.1	-	
BH C	KMA	17/05/17	12:10	1013	Y	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	20.5	20.5	<1	<1	1.9	-	
BH D	KMA	17/05/17	12:15	1013	Y	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	20.5	20.5	<1	<1	2.1	-	
BH E	KMA	17/05/17	12:20	1013	Y	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	20.5	20.5	<1	<1	584.0	2484.0	Drop to steady 584 ppm after 2 mins - no bung
BH A	KMA	18/05/17	08:35	1009	Y	<0.1	-	<0.1	<0.1	<0.1	2.8	3.2	17.8	17.9	<1	<1	8.8	14.3	17.1 initial, 3.5 ppm steady after 30 secs
BH B	KMA	18/05/17	08:40	1009	Y	<0.1	-	<0.1	<0.1	<0.1	6.9	6.9	13.9	14.0	<1	<1	22.7	-	
BH C	KMA	18/05/17	08:30	1009	Y	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	20.5	20.6	<1	<1	3.5	17.1	17.1 initial, 3.5 ppm steady after 30 secs
BH D	KMA	18/05/17	08:50	1008	Y	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	20.5	20.5	<1	<1	32.8	-	
BH E	KMA	18/05/17	08:45	1008	Y	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	20.1	20.1	<1	<1	2861.0	5000.0	Peak at 0.5% v/v with steady readings at about 0.2% v/v

KEY: <0.1 = Below instrument limit of detection, NM = Not Measured, N/A = Not Applicable, %v/v = Percentage volume by volume, ppmv = parts per million by volume, mb = millibar, ltr/hr = litres per hour, mbgl = metres below ground level



Experts in Continuous Monitoring

**PROJECT ID:** GGS1282

**SITE:** KMA

**SPECIALIST:** H. Rutter

**EQUIPMENT:** GasData GFM435 (SN: 11028) & TDL-500 (SN: 154011)

Site	Date	Barometric Pressure ( mb )	Site Notes
S2 - Costa Beck	17/05/17	1013	Continuous background levels during water sampling
S3 - Auckland Beck	17/05/17	1013	Continuous background levels during water sampling
G1 - Elm Tree Farm	17/05/17	1014	Max 63.1 ppm within sampling bottle. 5.7 ppm within room. H2S smell from hose
G2 - West Farm	17/05/17	1014	Continuous background levels during water sampling
G3 - The Villa	17/05/17	1013	261 ppm within sampling bottle
G4 - Coultas Farm	17/05/17	1014	Continuous background levels during water sampling
G5 - Habton Whin	17/05/17	1013	Continuous background levels during water sampling
G6 - The Ellers	17/05/17	1014	Continuous background levels during water sampling

## Headspace Methane Results

Round 25



**PROJECT ID:** GGS1282

**SITE:** KMA

**SPECIALIST:** H. Rutter

**EQUIPMENT:** GA5000 (SN: G503519) & TDL-500 (SN: 154011)

BH ID	Site	Date	Time	Barometric Pressure ( mb )	Line Test	Flow Rate ( ltr/hr )			Steady CH <sub>4</sub> ( % v/v )	Peak CH <sub>4</sub> ( % v/v )	Steady CO <sub>2</sub> ( % v/v )	Peak CO <sub>2</sub> ( % v/v )	Minimum O <sub>2</sub> ( % v/v )	Maximum O <sub>2</sub> ( % v/v )	CO ( ppmv )	H <sub>2</sub> S ( ppmv )	Steady CH <sub>4</sub> ( ppmv )	Peak CH <sub>4</sub> ( ppmv )	Comments
					OK?	Initial	Duration	Steady											
BH A	KMA	15/06/17	10:44	1005	Y	<0.1	-	<0.1	<0.1	<0.1	6.4	6.4	4.4	4.4	<1	1	1.8	-	
BH B	KMA	15/06/17	10:30	1005	Y	<0.1	-	<0.1	<0.1	<0.1	7.1	7.1	1.2	1.2	<1	<1	32.4	35.4	
BH C	KMA	15/06/17	10:37	1005	Y	<0.1	-	<0.1	<0.1	<0.1	2.9	2.9	12.2	12.2	<1	1	19.8	42.8	
BH D	KMA	15/06/17	10:54	1005	Y	<0.1	-	<0.1	<0.1	<0.1	20.2	20.2	20.2	20.2	<1	<1	1.8	19.1	
BH E	KMA	15/06/17	10:49	1005	Y	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	20.5	20.5	<1	1	338.0	10000.0	

KEY: <0.1 = Below instrument limit of detection, NM = Not Measured, N/A = Not Applicable, %v/v = Percentage volume by volume, ppmv = parts per million by volume, mb = millibar, ltr/hr = litres per hour, mbgl = metres below ground level





Experts in Continuous Monitoring

**PROJECT ID:** GGS1282

**SITE:** KMA

**SPECIALIST:** H. Rutter

**EQUIPMENT:** TDL-500 (SN: 154011)

Site	Date	Barometric Pressure ( mb )	Site Notes
S2 - Costa Beck	14/06/17	1016	Continuous background levels during water sampling
S3 - Auckland Beck	14/06/17	1016	Continuous background levels during water sampling
G1 - Elm Tree Farm	14/06/17	1014	Max 30.1 ppm within sampling bottle. 4.7 ppm within room. H2S smell from hose
G2 - West Farm	14/06/17	1015	Continuous background levels during water sampling
G3 - The Villa	14/06/17	1016	20.9 ppm within sampling bottle
G4 - Coultas Farm	14/06/17	1014	Continuous background levels during water sampling
G5 - Habton Whin	14/06/17	1016	Continuous background levels during water sampling
G6 - The Ellers	14/06/17	1014	Continuous background levels during water sampling



*Third Energy UK Gas Ltd*

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## OPERATING PROCEDURE OP-EN-07

### Surface Water and Groundwater Sampling

Issued	Issue Number	Description / Comments	Date	Reviewed By	Authorised By
	01	Created as working document	15/02/2017	P. Ham	J. Dewar
Reviewed					

## Introduction

This document presents the procedure for the collection, analysis and reporting of surface water and groundwater samples, as required to support Third Energy's operations in North Yorkshire.

The procedure for water sampling is summarised in the following process diagram and described in the sections that follow.



## **Planning**

### **Access Arrangements:**

Access arrangements are agreed prior to sampling.

### **Sample & Analysis Specification:**

The specification for water sampling and analysis is defined prior to sampling. This is based on the requirements set out in the relevant environmental permits but may also include additional requirements as defined by Third Energy.

### **Laboratory Co-ordination:**

The sample & analysis specification is discussed with the laboratory to confirm that the specification can be delivered and any special arrangements for sample collection and storage, e.g. filtration, preservation. The laboratory will then issue the required sample containers and confirm the requirements for delivery. Sample containers are labelled prior to sampling.

### **Health & Safety Arrangements:**

A risk assessment and method statement (RAMS) is prepared, submitted and agreed prior to sampling.

### **Equipment Preparation & Calibration:**

The equipment required for water sampling is presented as a checklist in Appendix A. The checklist is used in the preparation for sampling. All equipment is cleaned and, where possible, calibrated in the office prior to sampling.

All equipment is regularly maintained and calibrated in accordance with the manufacturer's guidance.

### **Personnel & Qualifications:**

Suitably qualified and experienced personnel are used to carry out sampling.

## **Sampling**

### **Standards:**

Sampling is carried out with reference to BS ISO 5667 (Water Quality Sampling).

### **Field Documentation & Measurements:**

Site location plans showing the location of sampling points and a copy of sampling protocols, and used in the field.

All observations made during sampling are recorded in field notebooks and individual survey sheets for each of the sample locations. These are reviewed after sampling and filed electronically.

### **Field Measurements:**

A list of the field measurements taken during sampling is provided in Appendix B.

### **Methods:**

#### **Hygiene and working area:**

Hygiene is essential to minimise the potential for sample contamination. Equipment is cleaned in the office using sanitising wipes or fluids prior to sampling and cleaned between each sampling location. Nitrile gloves are worn by personnel carrying out sampling and changed as required and between each sampling location as a minimum.

Working areas are established on flat areas (wherever practicably possible) and clean plastic sheeting used to prepare a clean area where sampling equipment can be set up and stored during sampling.

#### **Obtaining surface water samples:**

Surface water samples are collected using a telescopic sampling pole, as follows:

- 1) The beaker at the head of the sampling pole is detached and cleaned using sanitising wipes or fluids. The beaker is then rinsed with distilled water and reattached to the pole.
- 2) The sample pole is extended to the required length and used to retrieve a water sample. Where possible, samples are collected away from the bank. In the case of rivers/streams, samples are collected where water can be observed to flow; ideally midstream. Water samples are not collected when there is insufficient depth of water to submerge the beaker.
- 3) Sufficient sample is obtained to fill the required sample containers, following the method in Section 4.4.4. A sample of water is used for field chemistry analysis using an In-Situ Smartroll multi parameter device, and field measurements recorded.
- 4) Any excess water is discharged downstream on the sampling point.

#### **Obtaining groundwater samples:**

A number of methods are used to obtain groundwater samples.

#### ***Wellsite Monitoring Boreholes***

Low volume pneumatic bladder pumps are installed in purpose constructed monitoring boreholes that are present at a number of Third Energy's wellsites. The pumps are suspended from specially designed well plugs that form a seal at the top of the borehole casing and incorporate a gas sampling valve that connects to portable gas detection equipment.

Water samples are obtained from the wellsite boreholes as follows:

- 1) The steel well head plate is unbolted and removed.
- 2) Gas concentrations are measured and recorded (where required).

## Surface Water and Groundwater Sampling

- 3) The well plug is removed from the borehole, allowing access to an airline and water discharge line connected to the bladder pump inside the borehole. Groundwater levels are measured using a hand held dip meter and recorded, together with the date and time the dip measurement is taken. The probe of the dip tape is cleaned prior to dipping each borehole, using sanitising wipes or fluids.
- 4) The compressor to operate the bladder pump is set up and connected to the battery power supply. The compressor is connected to the airline of the bladder pump using the fittings supplied. This requires the removal of the moisture cap that is fitted to the top of the airline inside the borehole. The moisture cap is stored away during sampling.
- 5) The plastic discharge line from the bladder pump is then connected to a flow through cell and then to a bucket used to collect the discharged water. A dedicated water discharge line is used at surface to avoid cross-contamination when sampling. Water collecting in the bucket is emptied into the drainage system at the wellsite.
- 6) The Smartroll multiparameter device is then installed in the flow through cell and connected to an Android device to measure and record field chemistry data. The Smartroll is calibrated in the office prior to use and, where necessary can also be calibrated in the field between sampling locations.
- 7) The compressor is switched on and water is then purged from the borehole at a rate less than ~1 litre/minute. The pressure settings on the compressor can be adjusted to achieve the required flow rate.
- 8) Water chemistry is monitored and recorded through Vu-situ software, which includes a 'stability test' to determine the stability of the water passing through the through cell. Once all the parameters stabilise, purging continues for a minimum of three logging intervals before water samples are collected. This generally takes in the region of 30 - 45 minutes per borehole.
- 9) Water sample containers are then filled following the method in Section 4.4.4.
- 10) On completion of the sampling, the compressor is switched off. Once the pressure in the airline reduces to zero, the equipment can be disconnected and packed away/moved to the next borehole. The moisture cap is replaced on the airline of the bladder pump and the well plug reinstalled in the borehole. The steel well head plate can then be bolted back in place.

### *Offsite Boreholes*

The construction of the offsite boreholes is variable. The following sampling methods are therefore employed:

- Where boreholes contain pumps or are artesian, water samples are collected using existing pumping equipment and sample taps within the distribution network. Sample taps are cleaned using sanitising wipes or fluids (where practicably possible) and water purged for at least five minutes before water samples are collected.
- Where boreholes do not contain pumps, water samples are collected using disposable single valve bailers lowered into the borehole on Kevlar rope or (in the case of some very shallow supplies) a telescopic sampling pole.

## Surface Water and Groundwater Sampling

In both cases, sufficient sample is obtained to fill the required sample containers, following the method in Section 4.4.4. A sample of water is used for field chemistry analysis using an In-Situ Smartroll multi parameter device, and field measurements recorded. Excess water is discharged to discharged to surface.

### Filling sample containers:

Sample containers are filled as follows:

- 1) Sample containers are placed in a drip tray, on a flat platform.
- 2) Taking each container in turn, the cap is unscrewed and the container slowly filled with sample water. Containers that do not contain preservatives or are filled with filtered water are rinsed with sample water first. Care is taken to ensure that any pipework or fittings do not come into contact with the container during the rinsing or filling process.
- 3) The rate of filling is controlled to less than ~1 litre per minute to is controlled to minimise aeration and losing any sample preservatives. Sample containers should be filled to the brim, leaving no airspace.
- 4) A small amount of water is placed inside the cap of the container, which is then screwed back in place. Plastic bottles are squeezed gently as the cap is screwed tight to ensure there is no airspace.
- 5) Some water samples require filtering prior to filling containers. In this case, water samples are collected in a clean plastic jug and containers filled with water that is passed through a syringe fitted with a 0.45µm filter. The jug is cleaned using sanitising wipes and rinsed with distilled water between sampling locations.
- 6) Small glass vials (used for volatiles) are filled at a reduced rate (~0.5l/minute) and should be stored upside down to minimise the loss of volatiles from the water.

### Quality control sampling:

At least one full duplicate and one blank is collected for analysis.

### Cleaning equipment:

Equipment is sanitised and rinsed with distilled water prior to and on completion of sampling at each location.

## **Analysis & Reporting**

### **Sample Packaging & Delivery:**

The outside of each sample container is cleaned with paper towels. The details on each sample label are checked to ensure they have the correct details including Sample ID, location, date and time.

Samples are packaged in a cool box with appropriate protection to prevent damage and then couriered to the laboratory within 24 hours of sample collection. A chain of custody is completed and included within the consignment.

### **Laboratory Analysis:**

Analysis of water samples is carried out in a UKAS accredited laboratory, where available.

### **Quality Assurance & Control:**

Sample analysis results are reviewed for consistency and compared to blank and duplicate samples. Anomalies are checked with the laboratory to determine if re-analysis of samples is required.

### **Reporting Arrangements:**

Sample analysis results are tabulated, graphed and reported as required.



## Appendix A

### Equipment Checklist

Geotech Bladder pump fittings	
Geotech Compressor	
12Volt mobile battery pack	
Water level dip meter	
Smartroll water quality meter	
Calibration fluids	
Android device	
Flow through cell	
Telescopic sampling stick	
Plastic buckets	
Drip trays	
Plastic Jugs	
Sample bottles	
Syringes and filters	
Tool kit (handheld tools)	
Cleaning products, e.g. sanitising wipes & fluids	
Nitrile gloves	
Plastic sheeting	
PPE	

## Appendix B

### Field Measurements

Date/Time	
Weather Conditions	
General observations, e.g. condition of borehole	
Water levels	
Water chemistry parameters	
Water appearance	



## *Third Energy UK Gas Ltd*

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### OPERATING PROCEDURE OP-EN-08

#### Surface Water Management Procedure

Issued	Issue Number	Description / Comments	Date	Reviewed By	Authorised By
	01	Created as working document	20/09/2017	S.Smart	J.Dewar
Reviewed					

## 1 INTRODUCTION

The purpose of this document is to outline the surface water management arrangements to be implemented at the Kirby Misperton A (KMA) wellsite during well operations and production operations.

This Surface Water Management Plan is applicable to the KMA wellsite and all production and well operations permitted therein, in accordance with planning consent. It is applicable to Third Energy UK Gas Ltd, its contractors and subcontractors.

## 2 SITE LOCATION

Kirby Misperton A Wellsite  
Off Habton Road  
Kirby Misperton  
North Yorkshire  
YO17 6XS  
England

National Grid Ref: SE 771789

Site Area: 1.465 ha

The KMA wellsite consists of two independent sites, constructed immediately adjacent to each other and share the same access. The Kirby Misperton 1 wellsite was constructed in the mid 1984 to accommodate the drilling of a petroleum exploratory borehole, KM1. The Kirby Misperton 1 wellsite was extended in 2013 to accommodate the drilling of the KM8 petroleum production borehole. Collectively, the well-sites are referred to as Kirby Misperton A wellsite (KMA).

### **3 OBJECTIVE OF THE SURFACE WATER MANAGEMENT PROCEDURE**

The primary objective of this Surface Water Management Procedure is to prevent significant impacts from all liquids and dissolved solids, whose emission to water or land could cause pollution of local amenities, affect human health and the environment. This objective will be achieved through:

- Identification of potential pollution generating sources and activities;
- Implementation of pollution mitigation measures;
- Implementation of a pollution monitoring scheme;
- Procedures for the analysis and reporting of pollution incidents; and
- Training of operational personnel on pollution prevention techniques and their roles and responsibilities.

#### **3.1 Sources of Potential Liquid Pollutants**

The following sources of liquids whose emission to water or land could cause pollution have been identified within the production and well operations to be conducted at the KMA wellsite:

- Produced water;
- Fuel used for power generation;
- Oils, lubricants and grease used for maintenance of equipment; and
- Site sewerage (temporary or permanent) and foul water.

#### **3.2 Distribution of the Surface Water Management Procedure**

Third Energy will communicate the Surface Water Management Procedure to the KMA wellsite. The Surface Water Management Procedure may be issued as an electronic version or paper copy. The procedure will be made available for review by regulatory bodies.

The Surface Water Management Procedure will be communicated to site personnel and a copy will be made available on site to all personnel during operations.

#### **3.3 Alterations to the Surface Water Management Procedure**

Any required changes or deviations from this Surface Water Management Procedure are to be referred to Third Energy in the first instance. No changes to, or deviations from, this Surface Water Management Procedure are to be implemented until the required changes or deviations have been reviewed and approved by Third Energy.

## **4 REDUCING CONTACT WITH POLLUTING MATERIALS**

### **4.1 Use of Alternative Products**

The use of liquid products, whose emission to water or land could cause pollution will be substituted where possible, for alternative products which are deemed safe and effective.

If products cannot be substituted, these products will be identified prior to mobilisation and arrangements will be established to ensure that where practicable, products are contained to prevent accidental release during transportation, storage, handling, use and disposal.

To ensure that the risk of liquid products, whose emission to water or land could cause pollution is minimised, quantities of products stored onsite are to be kept to a minimum where possible.

### **4.2 Identification of Potential Liquid Emitting Products and Equipment**

An inventory of products and equipment whose emission of liquid products to water or land could cause pollution, including description and quantities will be undertaken by Third Energy and an inventory of chemicals shall be held onsite. Where well operations are to take place service providers are required to provide an inventory of chemicals to Third Energy.

During well operations the Wellsite Supervisor will collate service provider inventories and produce a consolidated inventory ensuring that it is updated on receipt/disposal of products and equipment. A copy of the consolidated inventory is to be held within the KMA Wellsite Supervisor's office and be available for review by regulatory bodies.

### **4.3 Storage Arrangements**

Where possible, products whose emission to water or land could cause pollution shall be stored inside buildings/containers or secondary containment systems to reduce potential emissions.

Storage areas will be clearly marked and site personnel informed of specific storage requirements for individual areas when receiving site induction.

Where practicable, storage areas are to be protected from the effects of weather and ingress of water to prevent degradation of containers/sacks etc.

Third Energy is to conduct regular checks of storage areas and products for potential leaks or damage to containers/sacks etc. Records of checks are to be held either at the KMA wellsite or Knapton Generating Station (KGS) and be available for review by regulatory bodies.

### **4.4 Management of Storage Areas**

During well operations the Wellsite Supervisor is responsible for ensuring that storage areas are kept clean, tidy, monitored regularly for signs of leaks or damage to containers or collection of surface water. Containers/sacks identified as leaking or damaged, are to be segregated and provisions implemented for the containment, immediate use or offsite disposal by an Environment Agency licensed waste carrier to an Environment Agency licensed waste facility.

Storage areas are to be secure and protected to ensure that damage from collision and extremes of weather does not occur.

### **4.5 Waste Storage**

Waste products will be segregated and stored in a designated area onsite prior to offsite disposal by an Environment Agency licensed waste carrier to an Environment Agency licensed waste facility. Where practicable, enclosed skips will be used for storage of waste products. Where the use of enclosed skips is not practicable, these skips shall be covered to reduce the potential for ingress of precipitation.

Skips identified as damaged or with significantly reduced integrity are to be withdrawn from service and arrangements made for a replacement skip.

#### **4.6 Storage of Oils and Chemicals**

To reduce the likelihood of liquid emissions occurring, consideration is to be taken of the hazards associated with oils and chemicals, where they are stored and correct handling procedures.

All oils and chemicals introduced to the wellsite require a Control of Substances Hazardous to Health (COSHH) Assessment which addresses the health risks to those using the chemical in the way it is utilised in the particular operation. The COSHH Assessment is to be provided by the contractor responsible for the introduction of the oils/chemicals and a copy is to be held by the contractor and Third Energy. The main sources of input to the COSHH Assessment is the Material Safety Data Sheet (MSDS) provided under the Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (REACH), and the method statement or operational procedure applicable.

Oils and fuels are to be stored in accordance with the Oil Storage (England and Wales) Regulations 2001.

Oils and chemicals are to be stored in suitable, labelled containers in safe storage areas identified within the Surface Water Risk Assessment. Storage areas and containers are to be inspected daily by Third Energy to ensure they are in good condition and free from cracks and leaks. Materials are to be secured on site to reduce the risk of accidental damage, vandalism, theft or arson.

As spillages and leaks cannot be completely avoided, secondary containment, such as bunded wall/tanks or bunded pallets are to be used. This is good practice and will provide time to either correct or minimise the problem before help arrives.

Secondary containment is to provide a minimum of 110% of the tank/container capacity for example, a 1000 litre tank must have a secondary containment system that will hold a minimum of 1,100 litres.

Secondary containment that contains multiple fixed tanks, mobile bowsters or IBCs, must have a capacity that is equal to whichever is the greater of these 2 measurements:

- One quarter of the combined capacity of all the containers; or
- 110% of the capacity of the largest container.

#### **4.7 Equipment Storage**

Equipment will be stored in a designated area onsite identified by the Wellsite Supervisor. Where there is the potential for leaks/spillages to occur from equipment within the designated storage area, secondary containment, such as bunded pallets are to be used to ensure that the protection of the wellsite surface and local environment is maintained.



## 5 SURFACE RUN-OFF WATER

### 5.1 Wellsite Drainage

Both the Kirby Misperton 1 wellsite and the Kirby Misperton 1 extension (collectively known as KMA wellsite) have independent surface water drainage systems. Both sites have an impermeable membrane separating site activities from the underlying subsoils. Before operations commence, the extensions drain line isolation valve will be closed and locked off, and the interceptor (separator) valve on the KM1 original site will be closed and locked to remove the potential pathway for liquids into the drainage ditch to the west of the site.

The Kirby Misperton 1 wellsite is clay lined with a drainage channel constructed along the perimeter of the wellsite, which captures surface run-off water from the adjacent land and diverts it around the perimeter of the site to discharge points in Sugar Hill Drain. The discharge points are located on the western boundary of the KMA wellsite, one immediately adjacent to the wellsite access gates and the second adjacent to the interceptor, as indicated in drawing Figure 1 KMA Wellsite Drainage (Surface Water Management) within Appendix 1 of this procedure.

The Kirby Misperton 1 extension is lined using HDPE and has a perimeter containment system. The purpose of the impermeable membrane is to capture any surface run off liquids such as rainwater, but also captures any spillages incurred onsite and contains them within the site perimeter ditches, ensuring environmental harm is averted and any spillages can be rectified onsite.

The Kirby Misperton 1 extension perimeter containment system is currently connected to an interceptor, located within the Kirby Misperton 1 wellsite. During periods of activity, such as drilling or intervention activities, the flow line connecting the perimeter containment system within the interceptor is isolated and the surface run-off water collected for reuse within the operation or removed from site via road tanker to an Environment Agency approved waste water treatment works for subsequent treatment and recycling or disposal.

During normal production operations the interceptor will be open allowing the egress of clean surface water from the wellsite. As KM1 and KM1 extension have independent surface water drainage systems the KM1 drainage system can remain open whilst well operations are being undertaken on KM1 extension and vice versa, should Third Energy require this. The surface water drainage system must be locked off from the interceptor if well operations are taking place on its corresponding site to prevent the discharge of pollution.

### 5.2 Well Cellars

Well cellars have been constructed within the KMA wellsite form a containment area from which the wells were drilled, whilst also housing the wellheads. There is the potential for surface run-off water to collect within the well cellars and Third Energy is to ensure that the surface run-off water collected within the well cellars is not discharged to surface.

Surface run-off water collected within the well cellars is to be treated onsite through the three phase separator or removed offsite via a licenced waste carrier to an Environment Agency permitted licenced waste facility for treatment/disposal.

## **6 MONITORING RECORDING AND EMERGENCY RESPONSE**

### **6.1 Daily Environmental Monitoring and Recording**

Third Energy is to undertake daily environmental monitoring and a record is to be held onsite. Environmental monitoring is to include checks on the open containment ditch, wellsite equipment, secondary containment systems and hazardous materials for visible signs of leaks, damage or contamination. A monitoring check sheet has been provided within Appendix 2 of this document and shall be used as a record of compliance.

### **6.2 Emergency Response Procedures**

#### **6.2.1 Emergency Action Plan**

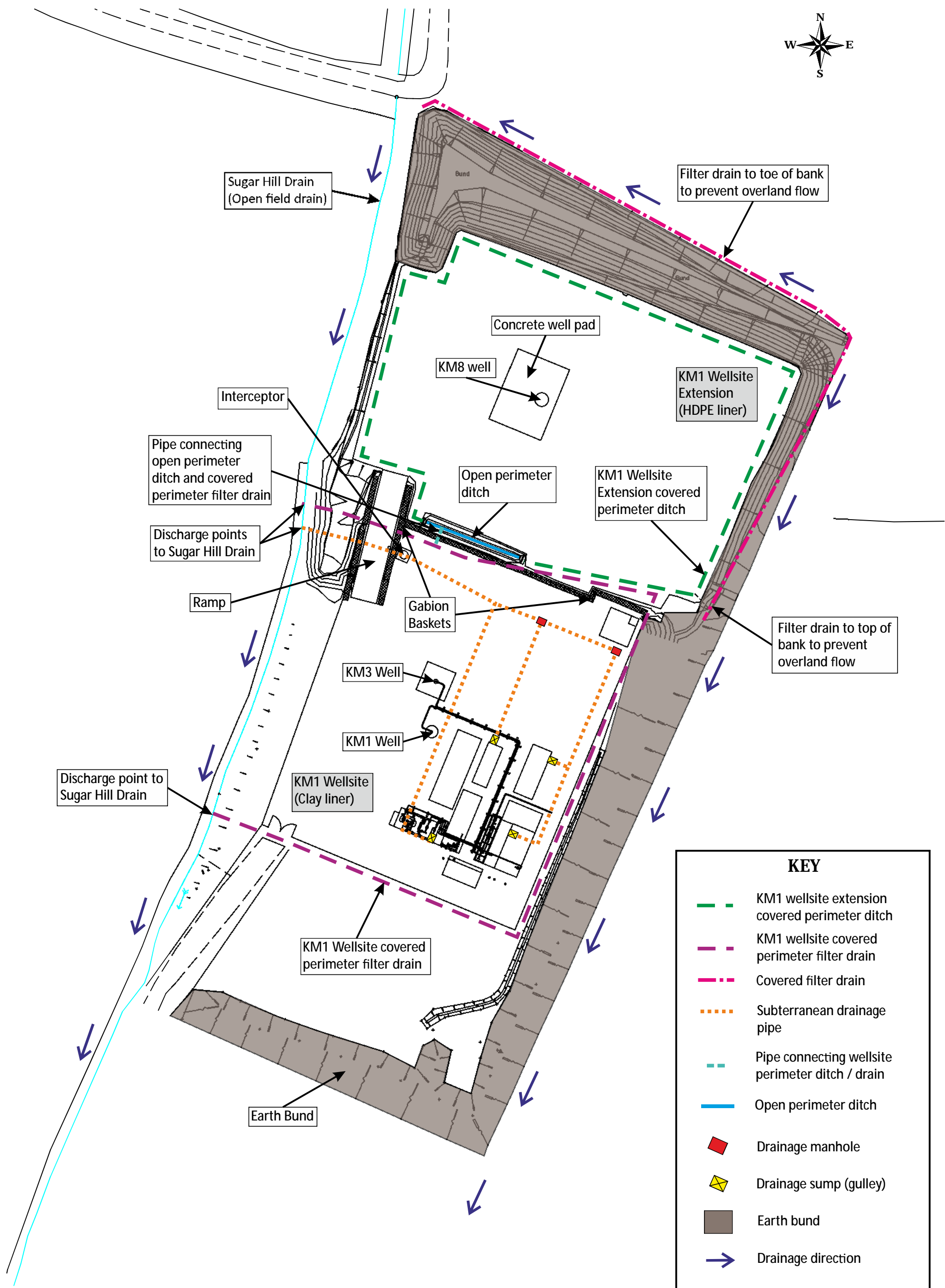
In the event of a spillage, the Wellsite Supervisor is to comply with the Third Energy emergency procedures ensuring, if safe to do so, immediate action is undertaken to isolate, contain and prevent the spillage from entering any drains or watercourses. The spillage is not to be hosed down or detergents used to remediate the spillage. If oils or chemicals soak into the ground, remediation is to be undertaken and the contaminated soil is to be removed, segregated and disposed of to a regulated facility as hazardous waste.

#### **6.2.2 Spillage Response Equipment**

Spillage response equipment will be available at the KMA wellsite. During site inductions, personnel will be shown the location of spillage equipment and how to use the equipment correctly and how to store and use materials safely. Spillage equipment is to be labelled and checked on a regular basis by Third Energy and unserviceable items quarantined and replaced.

## **APPENDIX 1 – KMA WELLSITE DRAINAGE**

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## **APPENDIX 2 – MONITORING CHECKLIST**

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Surface Water Management Checklist – KMA Wellsite						
No.	Interceptor:					
1.1	Locked off to prevent unauthorised discharge:	Yes		No		
Comment:						
No.	Perimeter Containment Ditch:					
2.1	Signs of visible damage / leaks:	Yes		No		
Comment:						
No.	Perimeter Containment Ditch:					
3.1	Water level recorded (% of ditch capacity):	0 <input type="checkbox"/>	25 <input type="checkbox"/>	50 <input type="checkbox"/>	75 <input type="checkbox"/>	100 <input type="checkbox"/>
Comment:						
No.	Perimeter Containment Ditch:					
4.1	Signs of visible oil / grease:	Yes		No		
Comment:						
No.	Perimeter Containment Ditch:					
5.1	Signs of visible contamination:	Yes		No		
Comment:						



No.	Perimeter Containment Ditch:					
3.1	Water transparency (% with 100% being clear):	0 <input type="checkbox"/>	25 <input type="checkbox"/>	50 <input type="checkbox"/>	75 <input type="checkbox"/>	100 <input type="checkbox"/>
Comment:						
No.	Perimeter Containment Ditch:					
7.1	Signs of wildlife (rats / mice / voles etc.):	Yes		No		
Comment:						
No.	Storage Tanks / Containers / Skips / hoses / unions / flanges:					
7.1	Signs of visible damage / leaks:	Yes		No		
Comment:						

Date: \_\_\_\_\_ Time: \_\_\_\_\_

 Third Energy Personnel: \_\_\_\_\_  
(Print Name)
(Signature)

## APPENDIX 3 – NOISE MONITORING PLAN

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## KM8 Well HF Development and Production

### Noise Management and Monitoring Plan

**Report ref.**

ARC6759/14327/Rev 2

**Issued to**

Third Energy Gas (UK) Limited

**Prepared by**

Andrew Corkill MSc, MIOA

Director

Version:	Remarks:	Date:
First Issue	For client comment	13 May 2015
Rev 1	For submission to NYCC	13 May 2015
Rev 2	For client comment following revisions required in Condition 33 of Decision Notice 27 May 2016	19 July 2016



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## 1. INTRODUCTION

Third Energy Gas (UK) Ltd has planning consent (Application NY/2015/0233/ENV; Decision No. C3/15/00971/CPO) to hydraulically stimulate and test the various geological formations previously identified during the 2013 KM8 drilling operation, followed by the production of gas from one or more of these formations into the existing production facilities, followed by wellsite restoration.

Spectrum Acoustic Consultants has been instructed to revise the Noise Management and Monitoring Plan<sup>1</sup> (NMMP) submitted with the planning application, in line with the requirement of Condition 33 of the planning permission.

This NMMP details the arrangements to be made for both monitoring noise and managing the actions required in the event that monitoring shows high noise levels arising. It also deals with actions required when complaints on noise are received.

The original plan was prepared in response to a formal request made in writing by Ryedale District Council<sup>2</sup> and also following a subsequent clarification meeting<sup>3</sup> with them.

### Condition 33 states:

*A revised Noise Management and Monitoring Plan (including details of exact locations and times for noise monitoring and starting from the commencement of operations hereby permitted) shall be submitted, incorporating revised trigger levels based around the proposed noise condition limits, and providing for either some on site attended measurements or remote access to audio files for on-site reporting of noise levels and actions proposed regarding breaches of trigger levels to the County Planning Authority. Such a Plan shall also incorporate provisions for events that noise monitoring indicates that noise levels have exceeded the maximum permitted noise levels. Such a plan shall be submitted for approval in writing by the County Planning Authority, prior to commencement of the development. Thereafter, monitoring shall be carried out in accordance with the approved Noise Management and Monitoring Plan and the results of the each noise monitoring exercise shall be submitted to the County Planning Authority within seven (7) days of the monitoring being carried out.*

*The noise levels at the nearest sensitive receptors shall be as stated in the table below:*

<b>Pre Stimulation Workover</b>		
<b>Noise Sensitive Receptor</b>	<b>Noise Limit Day 07:00-19:00 dB(A) <math>L_{Aeq,1hr}</math></b>	<b>Noise Limit Evening and Night 19:00-07:00 dB(A) <math>L_{Aeq,1hr}</math></b>
Alma House	41	35
Kirby O Carr	55	46
5 Shire Grove	47	36

<sup>1</sup> KM 8 Well HF Development and Production Noise Management and Monitoring Plan. Ref ARC6672/14327, 13 May 2015

<sup>2</sup> Scoping opinion from Mr Steve Richmond of Ryedale District Council, Health and Environment Manager, 25<sup>th</sup> February 2015

<sup>3</sup> Meeting 5<sup>th</sup> March 2015 with Mr Steve Richmond



<b>Hydraulic Fracture Stimulation/Well Test – Day Time</b>		
<b>Noise Sensitive Receptor</b>	<b>Noise Limit Day 07:00-19:00 dB(A) <math>L_{Aeq,1hr}</math></b>	<b>Noise Limit Evening and Night 19:00-07:00 dB(A) <math>L_{Aeq,1hr}</math></b>
Alma House	55	N/A
Kirby O Carr	60	N/A
5 Shire Grove	50	N/A
<b>Hydraulic Fracture Stimulation/Well Test – Evening/Night Time</b>		
<b>Noise Sensitive Receptor</b>	<b>Noise Limit Day 07:00-19:00 dB(A) <math>L_{Aeq,1hr}</math></b>	<b>Noise Limit Evening and Night 19:00-07:00 dB(A) <math>L_{Aeq,1hr}</math></b>
Alma House	N/A	35
Kirby O Carr	N/A	42
5 Shire Grove	N/A	35
<b>Production</b>		
<b>Noise Sensitive Receptor</b>	<b>Noise Limit Day 07:00-19:00 dB(A) <math>L_{Aeq,1hr}</math></b>	<b>Noise Limit Evening and Night 19:00-07:00 dB(A) <math>L_{Aeq,1hr}</math></b>
Alma House	45	35
Kirby O Carr	55	35
5 Shire Grove	50	35
<b>Restoration</b>		
<b>Noise Sensitive Receptor</b>	<b>Noise Limit Day 07:00-19:00 dB(A) <math>L_{Aeq,1hr}</math></b>	<b>Noise Limit Evening and Night 19:00-07:00 dB(A) <math>L_{Aeq,1hr}</math></b>
Alma House	55	N/A
Kirby O Carr	55	N/A
5 Shire Grove	55	N/A

## 2. PREDICTED NOISE LEVELS

The predicted noise levels and the times in which they occur are shown in table 1.

Development Phase	Predicted level, $L_{Aeq,1hr}$		
	Alma House	Kirby O Carr	5 Shire Grove
Pre-stimulation workover, with noise barrier, day and night	34	46	31
HF and well testing - HF activity, with noise barrier, day only	54	59	48
HF and well testing - General activity, with noise barrier, at night	35	42	28
Production	22	25	9
Restoration, noise barrier removed, day only	52 (16hr)	<52	<52

**Table 1:** Summary of Predicted Noise Levels



During pre-stimulation workover the noise levels with the noise barrier in place will, for the substantial majority of nearby receptors, typically be in the range  $L_{Aeq,1hr}$  31-34 dB. Kirby O Carr however is unavoidably in line with the opening in the noise barrier, and therefore noise levels are higher here at 46dB. It is however expected that final detailing of the noise barrier should be able to slightly reduce the noise to this single location by a further 1-2 dB. The priority is to monitor at Kirby O Carr, during the late evening or early night during this phase.

During the HF and well testing phase the daytime noise levels with the noise barrier will generally be in the range  $L_{Aeq,1hr}$  48-54 dB at all receptors. Again the levels at Kirby O Carr are slightly higher at 59 dB.

At night during the HF and well testing phase, minor activities and analysis continues, and predicted levels with the noise barrier are generally  $L_{Aeq,1hr}$  28-35 dB. At Kirby O Carr however, the level is 42 dB.

The longer term production phase noise levels range over  $L_{Aeq,1hr}$  9-25 dB. These levels are very low and insignificant in their effect on the community. Furthermore measurements made at the monitoring locations would be unable to detect levels this low.

During restoration the  $L_{Aeq,16hr}$  covering the daytime period, at the nearest property, Alma House, is 52 dB. At other receptors, the levels will be lower.

### 3. NOISE MONITORING LOCATIONS

Although predicted noise levels are generally well below levels that are significant, a precautionary approach is proposed to be adopted whereby substantial and detailed noise monitoring will be undertaken. Noise monitoring is proposed to be undertaken at two locations. These are:

- Kirby O Carr 320m south of KM8 well. The measurement position is in the front garden of the bungalow, and does not benefit from screening by the temporary noise barrier, as it is opposite the gap in the barrier required for access to and from the wellsite.
- 5 Shire Grove 820m NE of KM8 well. This is representative of a large number of properties within Kirby Misperton village, both closer and further away. It is a position where complaints have been received in the past. It is a 3 storey residential property with bedrooms at the third level.

The locations of these noise monitoring positions are shown in Appendix A along with photos of instrumentation in position during the baseline noise monitoring already undertaken.

It is considered that monitoring noise at these two locations will adequately capture the noise generated and affecting all three assessment positions. It is proposed that if the limits imposed at Kirby O Carr and 5 Shire Grove are achieved, then the limits at Alma House will also be achieved. Monitoring at the third location at which background noise monitoring was taken (Alma House) is not proposed as at this position, the temporary noise barrier will be especially effective in reducing noise to much lower levels than at the very much less screened Kirby O Carr. Both are single properties rather than representing a larger group of houses, such as 5 Shire Grove.





#### 4. NOISE MONITORING PROCEDURE

It is proposed that monitoring will be carried out during the phases and times shown in table 2. Unmanned monitoring is proposed for all but one phase of the development. The noise generated during normal production will not be able to be detected at the monitoring locations as the levels will be so low. For this phase it is proposed to obtain measurements at the site boundary and extrapolate these results to the noise monitoring positions. This will be undertaken using the established noise propagation model for the project.

Development Phase	Time when monitored
Pre-stimulation workover	Unmanned monitoring day and night
HF and well testing	Unmanned monitoring day and night
Normal production	Attended measurement on site and extrapolation in noise model, day only
Restoration	Unmanned monitoring day only

**Table 2:** Development phases and times to be monitored

Noise monitoring will be carried out simultaneously at two locations using unattended acoustic logging equipment. This will obtain and then transfer across the mobile telephone network, measurement data and very short acoustic recordings (subject to adequate mobile phone signal). Results will include  $L_{A10,1hr}$ ,  $L_{A90,1hr}$  and  $L_{Aeq,1hr}$  and also 1/3 octave band data.

At the nearest of the monitoring locations (Kirby O Carr), a further noise monitor and microphone will record continuous sound as a permanent record against which subsequent listening can enable the source of high noise to be formally confirmed. This continuous acoustic recording will generate files too large to be transferred across the mobile telephone network, so will be downloaded during weekly visits.

A wind monitoring station will be located at Kirby O Carr to establish an historic wind direction data record for the complete monitoring period.

Monitor results and short sound recordings will be downloaded remotely being transferred across the mobile telephone network and reviewed 4 times in the first fully operational 24 hour period of each of the critical first two phases (Pre Stimulation Workover and HF/Well testing). If the levels are compliant with planning consent limits, then these will be downloaded thereafter on a daily basis for the following 3 days, and then if at least 5dB within the planning limits and if levels become stable and levels are not expected to change, thereafter on a weekly basis. However during each of the 5 daytime HF events; levels will be downloaded remotely and reviewed mid-way and at the end of each 5 hour stimulation. During restoration, the results will be downloaded initially on a daily basis for the first 3 days and then thereafter on a weekly basis as for the first two phases.



## 5. REPORTING

### 5.1 FORMAL REPORTS OF NOISE MONITORING

As a formal record of noise monitoring for the project, formal reports will be issued on completion of each of the phases. These will give all the results from the noise monitors and noise measurements, including post-processing to extract the levels during the day, evening and night, discounting data where the wind velocities are in excess of 5m/s and also if appropriate considering results grouped by wind direction. In addition samples of short sound recording files will be available for listening.

### 5.2 INTERIM RESULTS AND ACTIONS

Reporting interim results as the monitoring commences, and implementing actions in the event that limits are breached, are key elements of the NMMP, and will provide stakeholders with the confidence that limits will be complied with in accordance with permit terms and conditions.

Where interim results show levels are above the planning consent limits, and the short sample recordings show the exceedances are associated with activity on the wellsite, rather than an offsite noise such as local idling road vehicle, garden or agricultural (including milking) machinery, aircraft etc., then Third Energy will be formally notified within 3 hours of data download, of both the time and the duration of a provisional exceedance, and requested to investigate.

Third Energy shall identify the reason for the exceedance and take action to reduce the levels immediately. Where action cannot be taken immediately, then the independent noise specialist shall visit the site within 24 hours of the provisional breach notification, review the continuous acoustic recording, undertake detailed on site measurements of noise to confirm the reason for the exceedance, and make recommendations for further mitigation measures. These measures shall be advanced immediately in order to limit occurrences of further breaches. A summary report will be issued, a copy of which will be forwarded electronically to NYCC, within 24 hours of the noise specialist's site visit.

Table 3 shows three Action Levels (1, 2 and 3) and the actions to take place when these levels are breached.

Action	Action Level		
	Level 1: Consented noise limit -5dB	Level 2: Consented noise limit	Level 3: Consented noise limit +5dB
Data downloaded and reported to Site Manager	✓	✓	✓
Short sound recording analysis reported to Site Manager	✓	✓	✓
Site manager to take action to reduce noise; then re-download		✓	✓
Noise specialist visit, within 24 hrs, after site manager notification.		✓	✓
Summary report to NYCC within 24 hours of noise visit.		✓	✓
Cease operation			✓

**Table 3:** Actions proposed to be carried out on breaching Action Levels 1, 2 and 3.

The actions proposed start (Level 1) at notifying the site manager of the noise monitor and short sound recording results. At a breach of the consented noise limit (Level 2), the site manager is required to take



action immediately and then if the subsequent downloaded data still exceeds Action Level 2, the noise specialist visits within 24 hours of the original notification, downloads the continuous sound recording meter, undertakes on site noise evaluation measurements and issues a summary report to be copied to NYCC within 24 hours. In the event that Level 3 is breached, operations causing this degree of breach will cease.

In considering the duration over which an Action Level might be breached, wind direction will be a significant influencing factor, with levels being highest under downwind propagation conditions, and being typically as much as 5-15dB lower under upwind conditions. The predicted levels are given for an average of wind conditions which will be 2dB lower than the highest values likely under downwind conditions. The receptor with predicted levels closest to the consented limits is Kirby O Carr to the south of the wellsite. Downwind propagation will only arise here infrequently when there is a NW, N or NE wind.

Tables 4 and 5 show the predicted levels against the Action Levels for the two monitoring locations.

Phase	Time	Predicted level, $L_{Aeq,1hr}$	Action Level, $L_{Aeq,1hr}$		
			Level 1 Consented noise limit -5dB	Level 2 (Consented noise limit)	Level 3 Consented noise limit +5dB
Pre-stimulation workover	Night	46	41	46	51
HF and well testing	Day	59	55	60	65
HF and well testing	Night	42	37	42	47
Normal production	Night	25	30	35	40
Restoration	Day only	<52	50	55	60

**Table 4:** Predicted and Action Levels 1, 2 and 3 for each phase of the development, at Kirby O Carr

Phase	Time	Predicted level, $L_{Aeq,1hr}$	Action Level, $L_{Aeq,1hr}$		
			Level 1 Consented noise limit -5dB	Level 2 (Consented noise limit)	Level 3 Consented noise limit +5dB
Pre-stimulation workover	Night	31	31	36	41
HF and well testing	Day	48	45	50	55
HF and well testing	Night	28	30	35	40
Normal production	Night	9	30	35	40
Restoration	Day only	<52	50	55	60

**Table 5:** Predicted and Action Levels 1, 2 and 3 for each phase of the development, at 5 Shire Grove

For comparison purposes, the predicted levels at Alma House are shown in table 6 to be significantly below the consent noise limits, in comparison with the levels at for example Kirby O Carr, where levels are very



close. Alma House is also less critical than 5 Shire Grove, the latter which is representative of a large number of properties in the village of Kirby Misperton.

Phase	Time	Predicted level, LAeq,1hr	Consented noise limit LAeq,1hr
Pre-stimulation workover	Night	31	35
HF and well testing	Day	48	55
HF and well testing	Night	28	35
Normal production	Night	9	35
Restoration	Day only	<52	55

**Table 6:** Predicted and Action Levels 1, 2 and 3 for each phase of the development, at Alma House

The site manager will be responsible for coordinating the various inspection and storing of logs and reports made, and issuing these as required to NYCC or other stakeholders.

## 6. COMPLAINTS

In the event of complaints being received, these should be formally logged by the site manager, along with the time of the complaint and details of the description of the noise, its duration, timing and characteristics, as described by the complainant. Having received an update of the latest noise monitoring results from the noise specialist, the site manager will be in a position to establish whether any Action Levels have been breached and implement the required actions set out within this Noise Management and Monitoring Plan.



## **A P P E N D I X   A**

### Noise Monitoring Locations

- NMP monitoring location map
- Photos showing noise and weather monitoring equipment





Noise and weather monitoring equipment to be used during the noise monitoring programme.




Noise monitoring equipment




Weather monitoring station

**Head Office**

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