



Kerr-McGee Oil & Gas Onshore L.P.  
1099 18<sup>th</sup> Street, Suite 1800  
Denver, Colorado 80202  
720-929-6000 Fax 720-929-7000

July 10, 2017

Mr. Greg Deranleau  
Environmental Manager  
Colorado Oil & Gas Conservation Commission  
1120 Lincoln Street, Suite 801  
Denver, CO 80203

**Re: Update Report IV: Remediation Project #10182**  
**Initial Form 27 Document #401280844**  
**Weld County, Colorado**

Dear Mr. Deranleau:

This is the fourth update to the initial Form 27 Site Investigation and Remediation Workplan (Document #401280844) approved by the Colorado Oil & Gas Conservation Commission (COGCC) on May 17, 2017. The following provides a summary of activities completed since the June 29, 2017 Update Report for the project area, which includes the area in and around the properties located at 6310 and 6312 Twilight Avenue, and along a limited area on the east side of Oak Meadows Blvd south of Twilight Avenue.

In order to confirm the effectiveness of the soil vapor extraction (SVE) systems' removal of gas from the subsurface across the project area, gas samples were collected for laboratory analysis from all 63 of the original vent wells (VW-01 – VW-63) on June 27 and 28, 2017. The locations of the vent wells are presented on Figure 1 (purple points). Laboratory analytical results indicate that no hydrocarbons were detected in any of the 63 vents wells. Copies of the laboratory analytical reports are presented in Appendix A.

Laboratory analytical results from the 63 vent well samples (and the previously reported 9 confirmation borehole samples), indicate that the two SVE systems have been effective in removing gas from both subsurface areas. Based on this data, we respectfully request approval from COGCC for the following:

- We would like to remove both SVE systems and the associated piping. The actual SVE wells will remain in place in the event they are needed again in the future. Additionally, if conditions change such that one or both of the SVE systems are necessary again, we will coordinate with COGCC and the surface owner(s) to re-deploy one or both systems, as appropriate.

- We will initiate monthly monitoring of a subset of the vent wells for a minimum period of one quarter (three additional monitoring events). Gas samples will be collected for laboratory analysis from the vent wells listed in the table below. The next monitoring event will begin approximately July 27, 2017. A report will be submitted to COGCC following the receipt of laboratory data from each monitoring event.

Western Area	Eastern Area
VW-06	VW-37
VW-08	VW-38
VW-17	VW-41
VW-21	VW-45*
VW-31	VW-58
	VW-59

\* Utilization of VW-45 is contingent upon approval of the resident.

- In lieu of bi-weekly reports, we would like to change the reporting schedule such that we will submit reports following each monthly monitoring event. If conditions change, such that additional reporting is necessary, we will work with COGCC to accommodate that need.

Please advise if these requested changes are acceptable to COGCC. Feel free to contact me at 720-929-6726 if you have any questions regarding this information.

Sincerely,

Kerr-McGee Oil & Gas Onshore LP



Paul D. Schneider, P.G.  
HSE Manager

Attachments





## APPENDIX A





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Dolan Integration Group

**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011456  
**Client:** Vista Geoscience  
**Sample Name(s):** VW010628171148

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011456  
 Client: Vista Geoscience  
 Sample Name: VW010628171148  
 Date Sampled: 06/28/17  
 Time Sampled: 11:48  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	782661	78.92	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	185789	18.73	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	23220	2.34	-	-25.7	-	
Carbon Monoxide (CO)	17	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 1706984

DTG 04451-011458

Rush!

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>, C<sub>3</sub>H<sub>8</sub>

RSK-175\* (for comparison)  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>, C<sub>3</sub>H<sub>8</sub>  
with dissolved Cl<sub>2</sub>, C<sub>2</sub> & C<sub>3</sub>

8°C Methane (Carbon)

80 Methane (Hydrogen)

8°C Ethane-Pentane  
(C<sub>2</sub> to C<sub>5</sub> if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW200628171158	6-28-17	11:58	X		X	X	X	+D13C CO2
	VW170628171222	6-28-17	12:22	X		X	X	X	+D13C CO2
	VW20628171204	6-28-17	12:04	X		X	X	X	+D13C CO2
	VW120628171131	6-28-17	11:31	X		X	X	X	+D13C CO2
	VW280628171152	6-28-17	11:52	X		X	X	X	+D13C CO2
	VW010628171148	6-28-17	11:48	X		X	X	X	+D13C CO2
	VW080628171123	6-28-17	11:23	X		X	X	X	+D13C CO2
	VW230628171116	6-28-17	11:16	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by	Vista GeoScience	6/28/17	14:22
Received by	DIG	06/28/17	14:25
Relinquished by			
Received by			

\*Gas composition vs RSK-175. Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

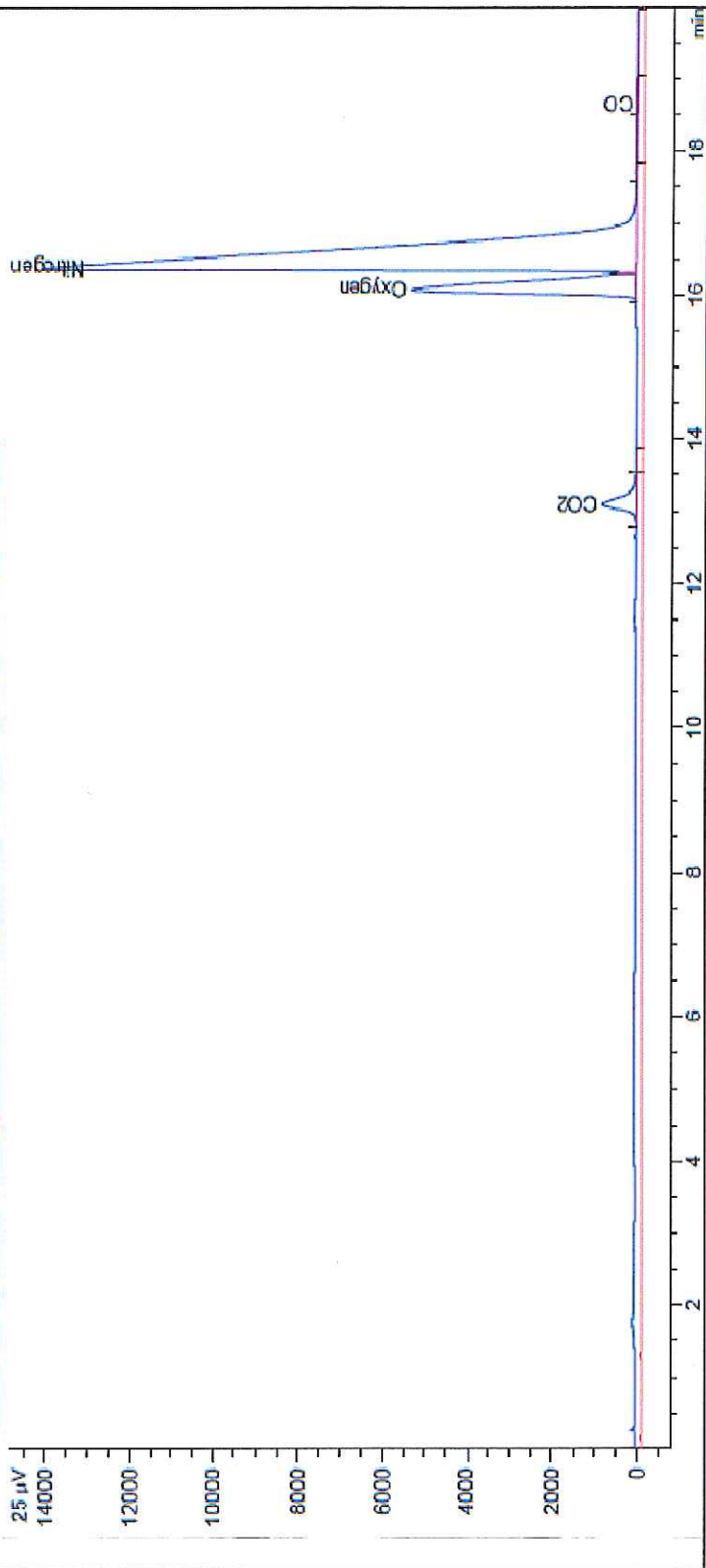
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030



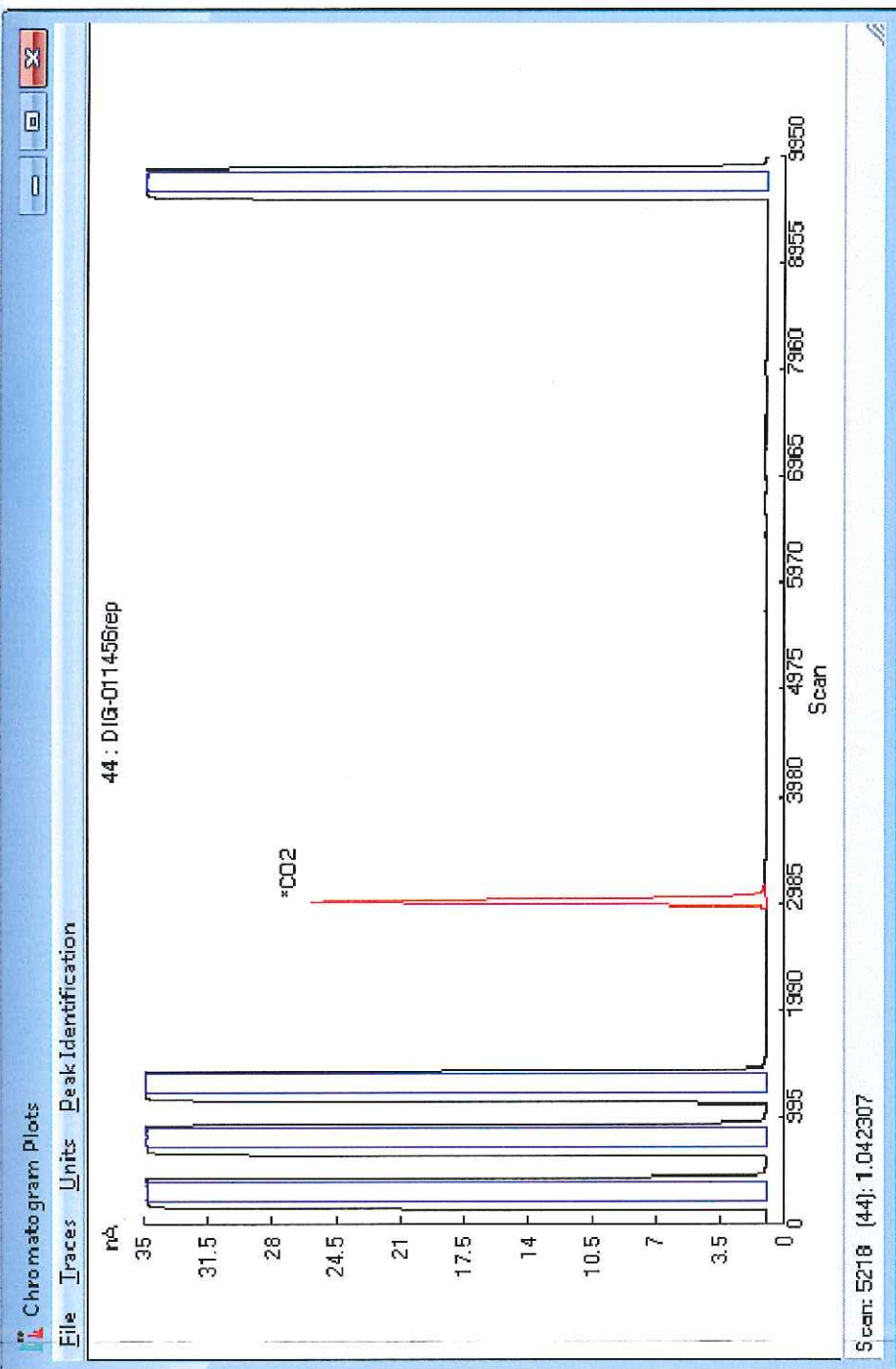


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982) 2017-06-29 05:52:05.DIG-011456.D)  
TCD2 B, Back Signal (20170626\_JOB982) 2017-06-29 05:52:05.DIG-011456.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011453  
**Client:** Vista Geoscience  
**Sample Name(s):** VW020628171204

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011453  
 Client: Vista Geoscience  
 Sample Name: VW020628171204  
 Date Sampled: 06/28/17  
 Time Sampled: 12:04  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	786289	79.22	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	191756	19.32	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	14511	1.46	-	-25.8	-	
Carbon Monoxide (CO)	19	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	#DIV/0!
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



**Geochemistry for Energy**  
1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 1706484  
NTG 04451-011458

Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub>	RSK-175* for composition with dissolved Cl, C <sub>2</sub> & C <sub>3</sub>	82°C Methane (Carbon)	80°C Methane (Hydrogen)	82°C Ethane-Pentane (C <sub>3</sub> & if present)	
	VW200628171158	6-28-17	11:58	X		X	X	X	
	VW170628171222	6-28-17	12:22	X		X	X	X	+D13C CO2
	VW20628171204	6-28-17	12:04	X		X	X	X	+D13C CO2
	VW120628171131	6-28-17	11:31	X		X	X	X	+D13C CO2
	VW280628171152	6-28-17	11:52	X		X	X	X	+D13C CO2
	VW010628171148	6-28-17	11:48	X		X	X	X	+D13C CO2
	VW080628171123	6-28-17	11:23	X		X	X	X	+D13C CO2
	VW230628171116	6-28-17	11:16	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista GeoScience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>06/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

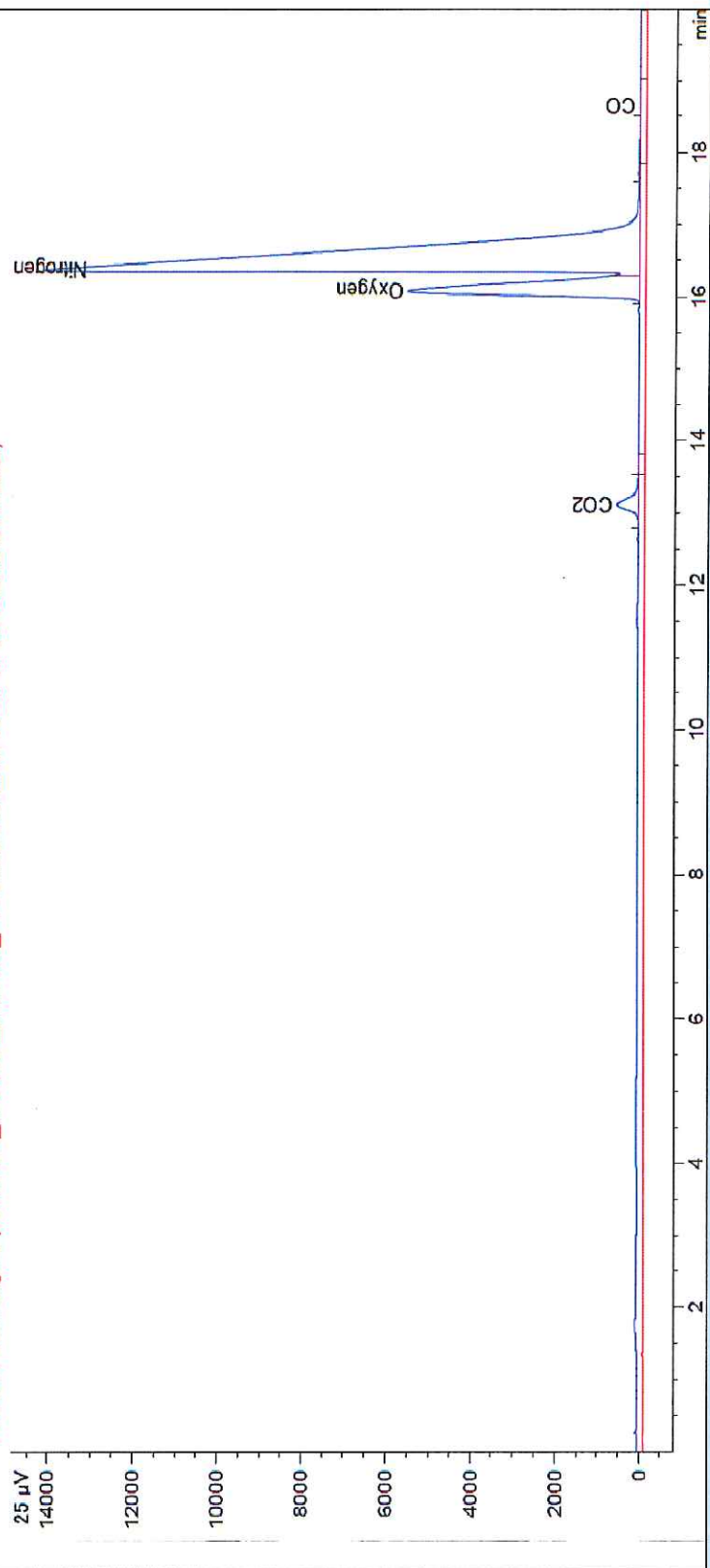




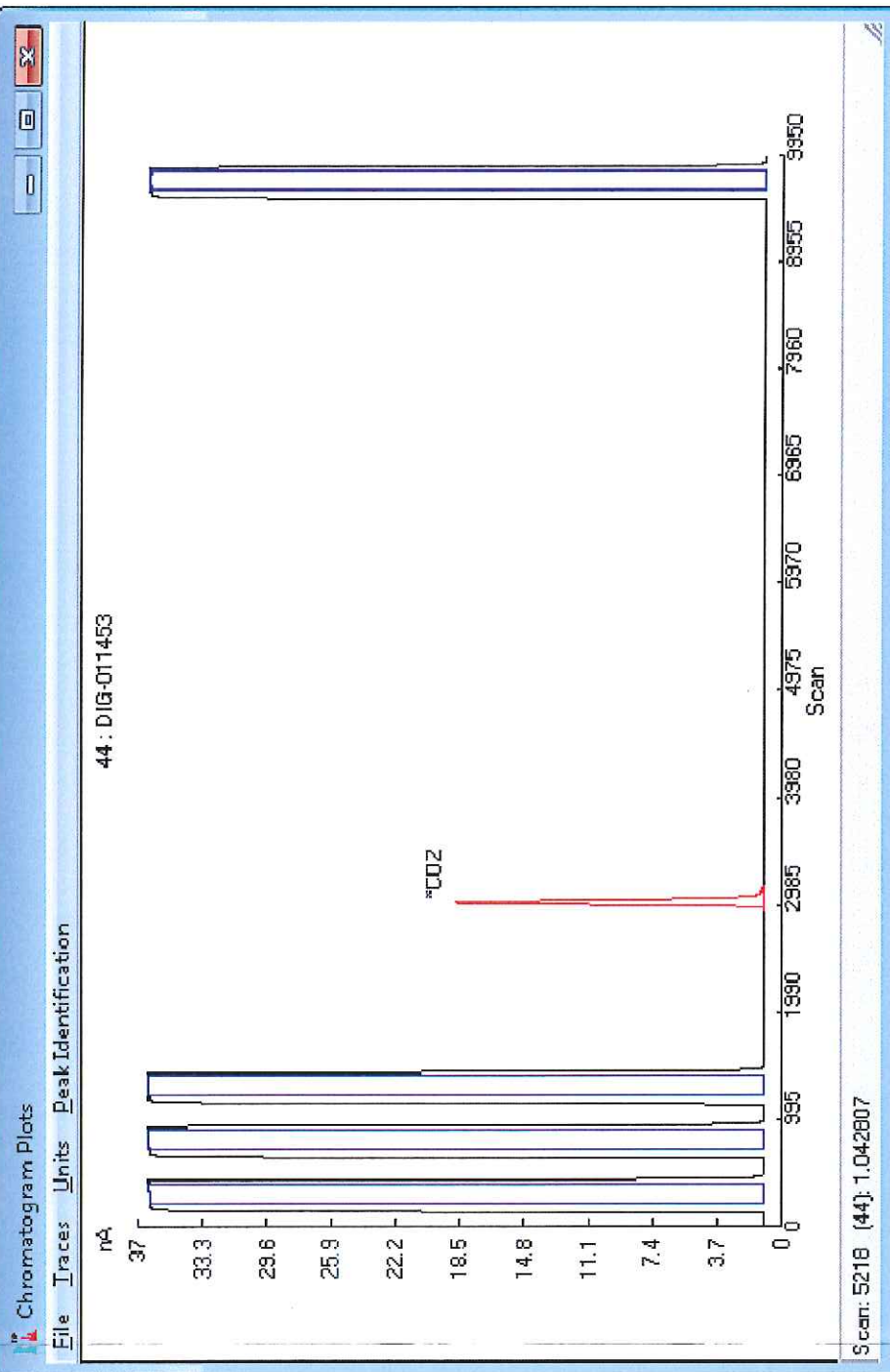


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-29 05-52-05\DIG-011453.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-29 05-52-05\DIG-011453.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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Dolan Integration Group

**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011458  
**Client:** Vista Geoscience  
**Sample Name(s):** VW030628171116

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011458  
 Client: Vista Geoscience  
 Sample Name: VW030628171116  
 Date Sampled: 06/28/17  
 Time Sampled: 11:16  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	784952	78.76	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	180684	18.13	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	30960	3.11	-	-23.2	-	
Carbon Monoxide ( $\text{CO}$ )	18	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



**dig**  
Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
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p: 303.531.2030

JOB 1706984

NTG 04451-011458

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Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> H <sub>8</sub>	RSK-175* (for composition) N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> H <sub>8</sub> with dissolved Cl <sub>2</sub> , C <sub>2</sub> H <sub>4</sub> & C <sub>3</sub> H <sub>6</sub>	8°C Methane (Carbon)	50°C Methane (Hydrogen)	50°C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	
	VW200628171158	6-28-17	11:58	X		X	X	X	+D13C CO2
	VW170628171222	6-28-17	12:22	X		X	X	X	+D13C CO2
	VW200628171204	6-28-17	12:04	X		X	X	X	+D13C CO2
	VW170628171131	6-28-17	11:31	X		X	X	X	+D13C CO2
	VW280628171152	6-28-17	11:52	X		X	X	X	+D13C CO2
	VW010628171148	6-28-17	11:48	X		X	X	X	+D13C CO2
	VW080628171123	6-28-17	11:23	X		X	X	X	+D13C CO2
	VW230628171116	6-28-17	11:16	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	Vista GeoScience	6/28/17	14:22
Received by <u>[Signature]</u>	DIG	06/28/17	14:25
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

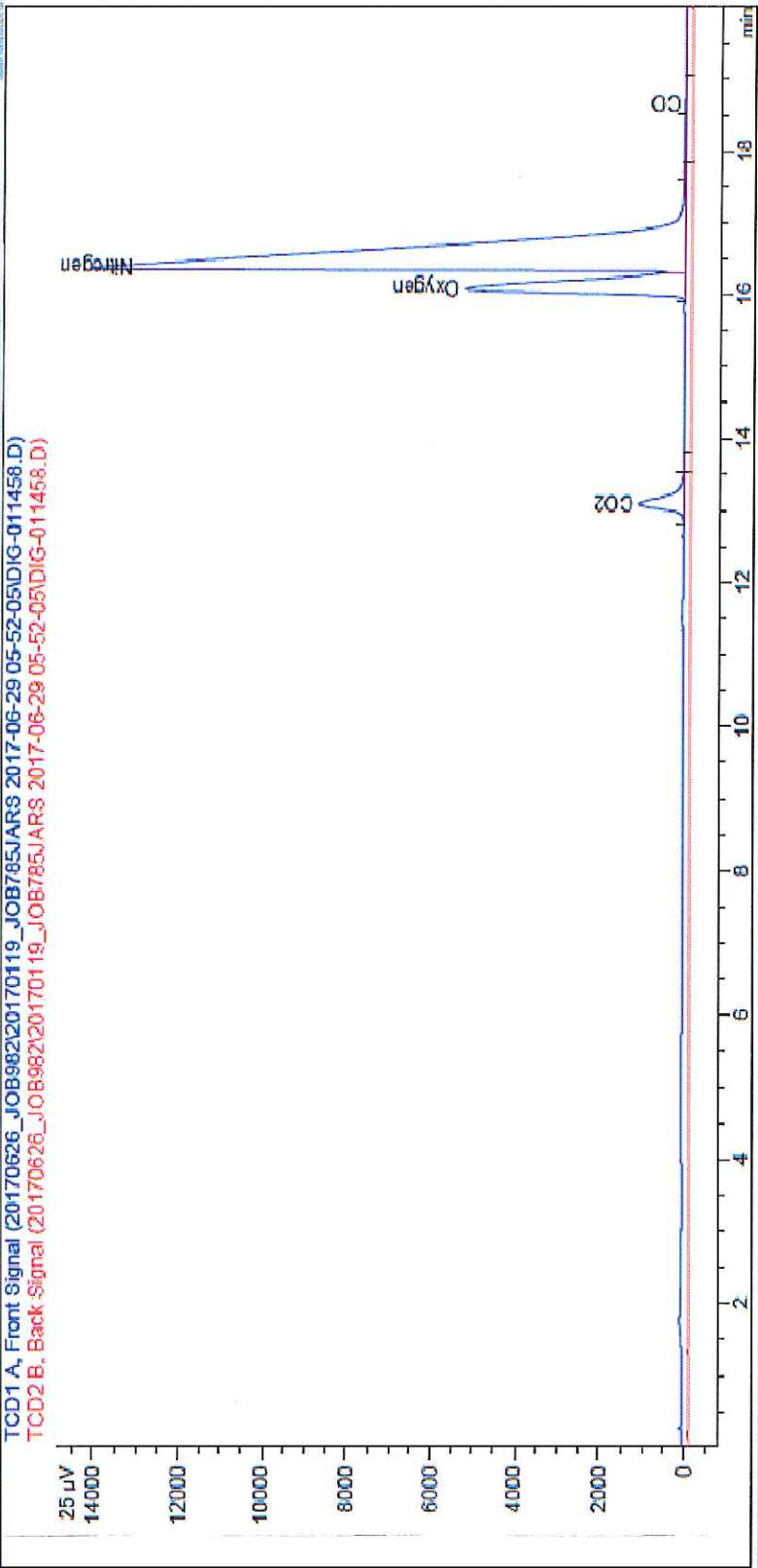
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030



# Gas Chromatography (GC) Chromatogram

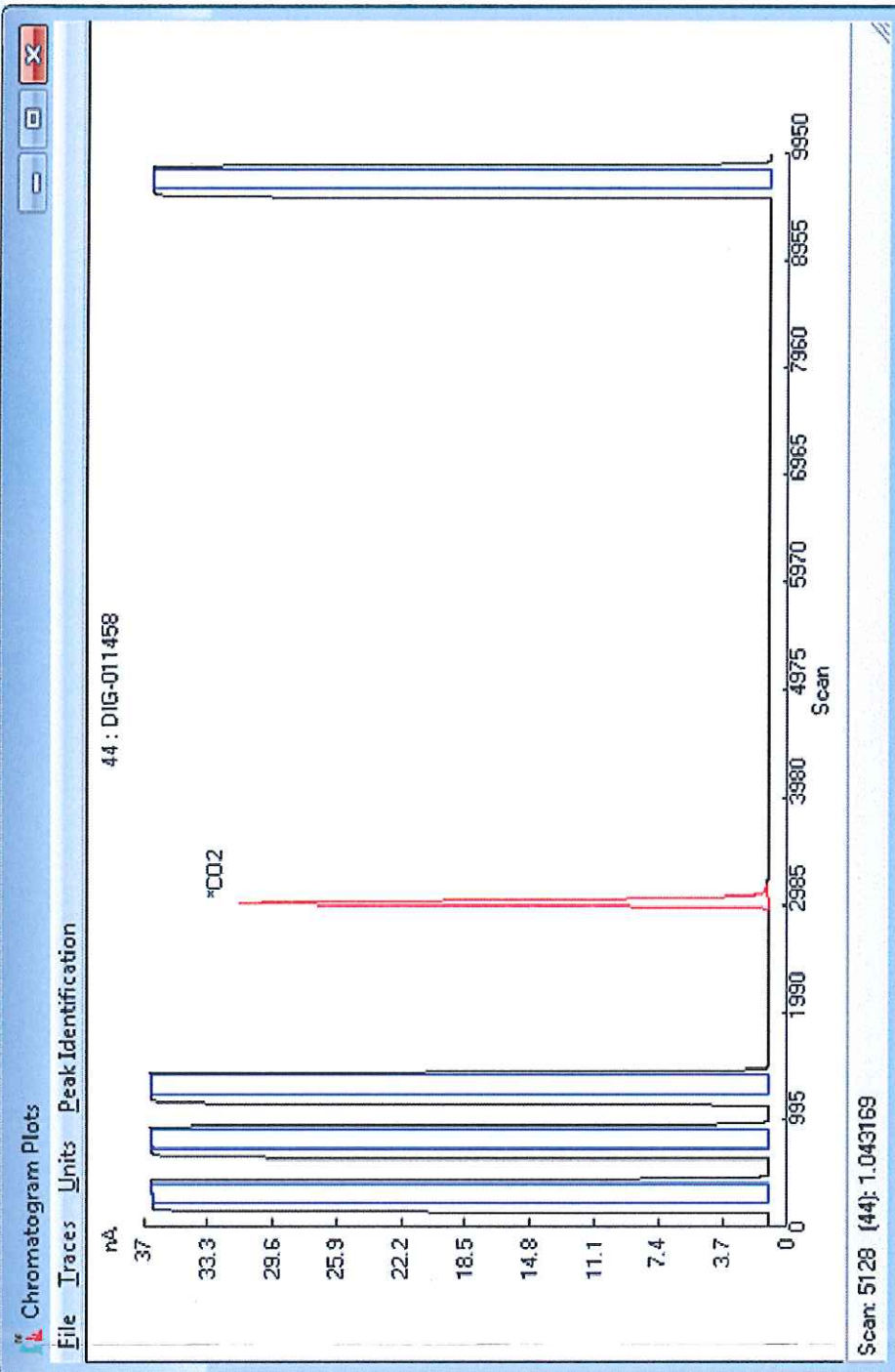


TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-29 05-52-05\DIG-011458.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-29 05-52-05\DIG-011458.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060984  
**Lab #:** DIG-011470  
**Client:** Vista Geoscience  
**Sample Name(s):** VW040628171239

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011470  
 Client: Vista Geoscience  
 Sample Name: VW040628171239  
 Date Sampled: 06/28/17  
 Time Sampled: 12:39  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	789388	77.16	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	199132	19.47	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	34471	3.37	-	-22.6	-	
Carbon Monoxide (CO)	18	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰

# Chain of Custody Form



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Dolan Integration Group

## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 17060984 **RUSH!**  
DILG - 011467-  
011474

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175 <sup>®</sup> (see composition) H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> with dissolved Cl <sup>-</sup> , Cl <sup>-</sup> & SO <sub>4</sub> <sup>2-</sup>	ppm Methane (Carbon)	ppm Methane (Hydrogen)	ppm Ethane-Pentane (C <sub>2</sub> to C <sub>5</sub> if present)	
	VW160628171231	6-28-17	12:31	X		X	X	X	+D13C CO2
	VW0628170145	6-28-17	09:45	X		X	X	X	+D13C CO2
	VW050628171037	6-28-17	10:37	X		X	X	X	+D13C CO2
	VW040628171239	6-28-17	12:39	X		X	X	X	+D13C CO2
	VW57062817944	6-28-17	9:44	X		X	X	X	+D13C CO2
	VW110628171142	6-28-17	11:42	X		X	X	X	+D13C CO2
	VW070628171008	6-28-17	10:08	X		X	X	X	+D13C CO2
	VW160628171233	6-28-17	12:33	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista GeoScience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

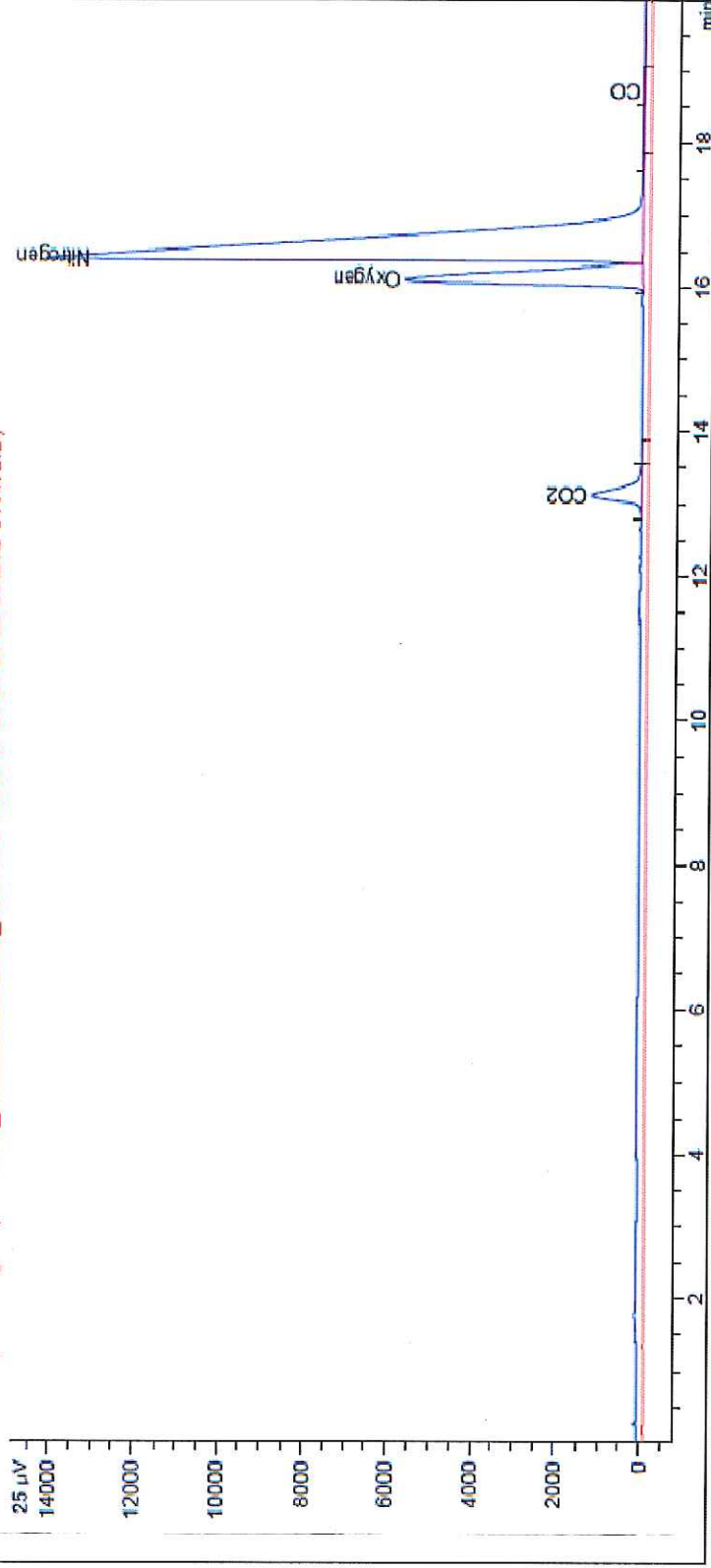
[illegible]



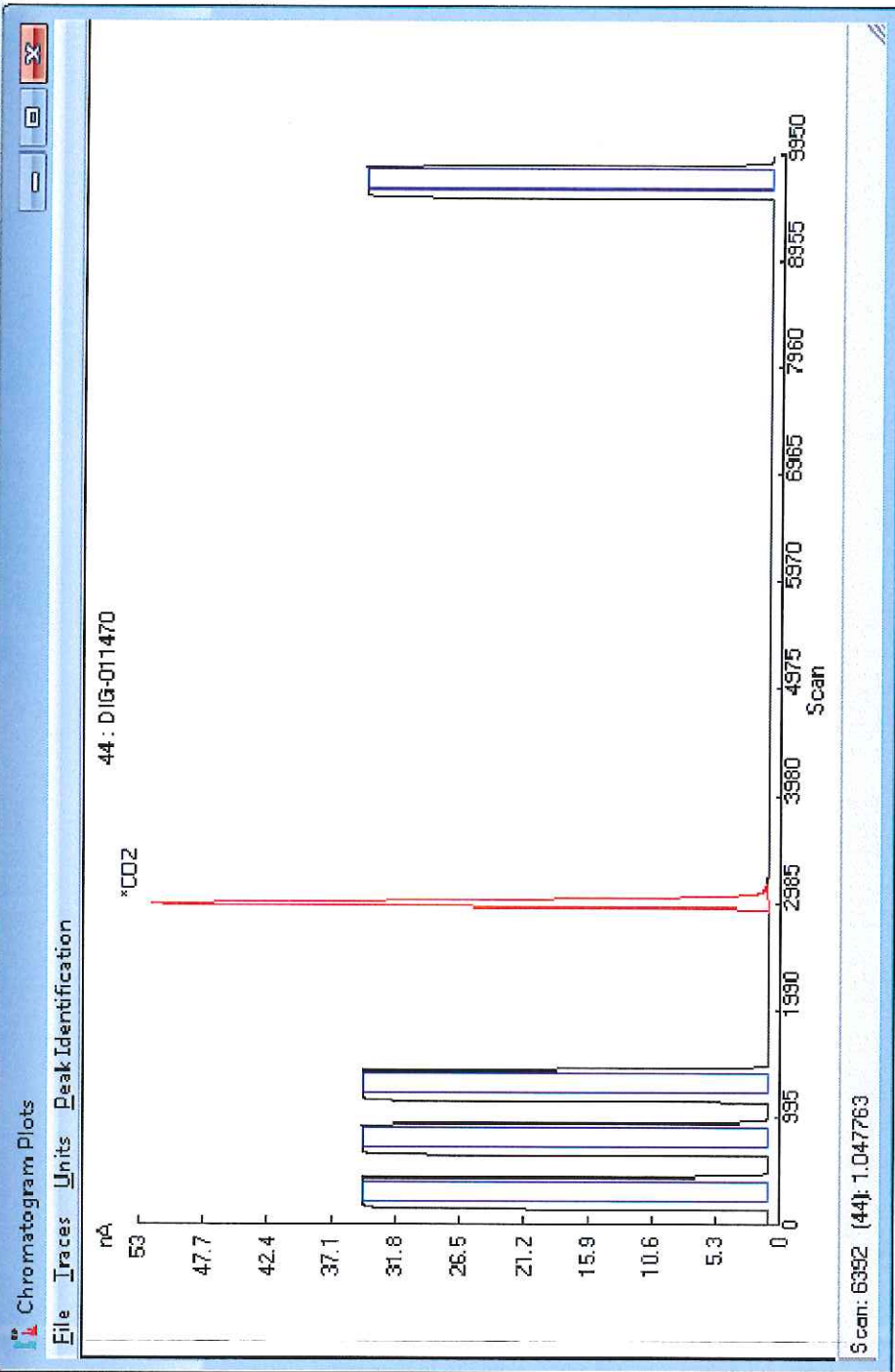
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982120170119\_JOB785JARS 2017-06-29 05:52-05DIG-011470.D)  
TCD2 B, Back Signal (20170626\_JOB982120170119\_JOB785JARS 2017-06-29 05:52-05DIG-011470.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060984  
**Lab #:** DIG-011469  
**Client:** Vista Geoscience  
**Sample Name(s):** VW050628171037

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011469  
 Client: Vista Geoscience  
 Sample Name: VW050628171037  
 Date Sampled: 06/28/17  
 Time Sampled: 10:37  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	789461	77.93	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	177037	17.48	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	46493	4.59	-	-27.6	-	
Carbon Monoxide ( $\text{CO}$ )	14	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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## Geochemistry for Energy

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Westminster, CO 80234  
p: 303.531.2030

JOB 17060984 **RUSH!**  
DLG - 0114167-  
011474

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

Analysis Requested			
Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175* Gas composition with dissolved Cl, Cl <sub>2</sub> & C <sub>2</sub> H <sub>6</sub>	δ <sup>13</sup> C Methane (Carbon)	δ <sup>13</sup> C Methane (Hydrogen)
		δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	

## Sample Description

Container #	Sample Identification	Date Sampled	Time	X	X	X	X	Comments
	VW160628171231	6-28-17	12:31	X		X	X	+D13C CO2
	VW0628170145	6-28-17	09:45	X		X	X	+D13C CO2
	VW050628171037	6-28-17	10:37	X		X	X	+D13C CO2
	VW040628171239	6-28-17	12:39	X		X	X	+D13C CO2
	VW150628171944	6-28-17	9:44	X		X	X	+D13C CO2
	VW110628171142	6-28-17	11:42	X		X	X	+D13C CO2
	VW070628171008	6-28-17	10:08	X		X	X	+D13C CO2
	VW160628171233	6-28-17	12:33	X		X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	Vista GeoScience	6/28/17	14:22
Received by <u>[Signature]</u>	DLG	6/28/17	14:25
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

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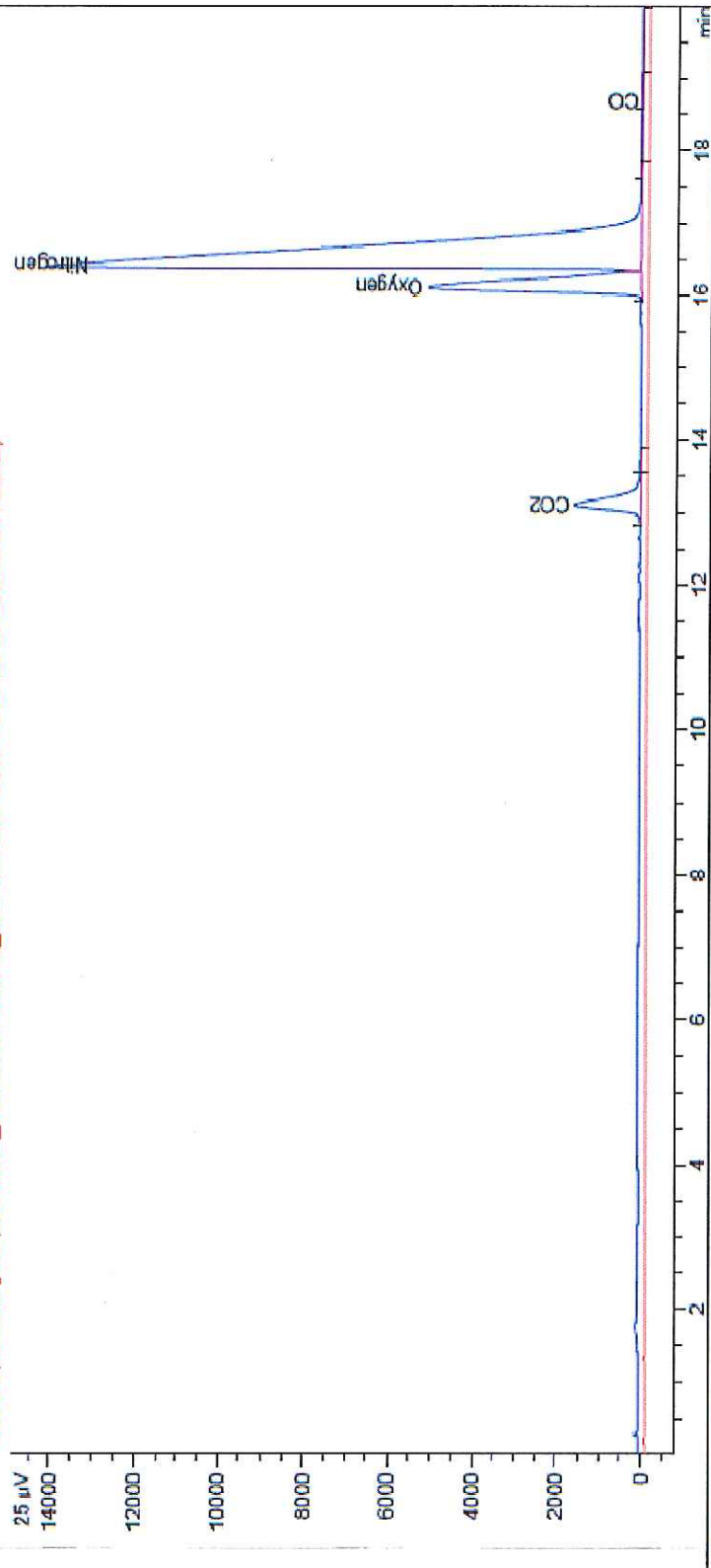




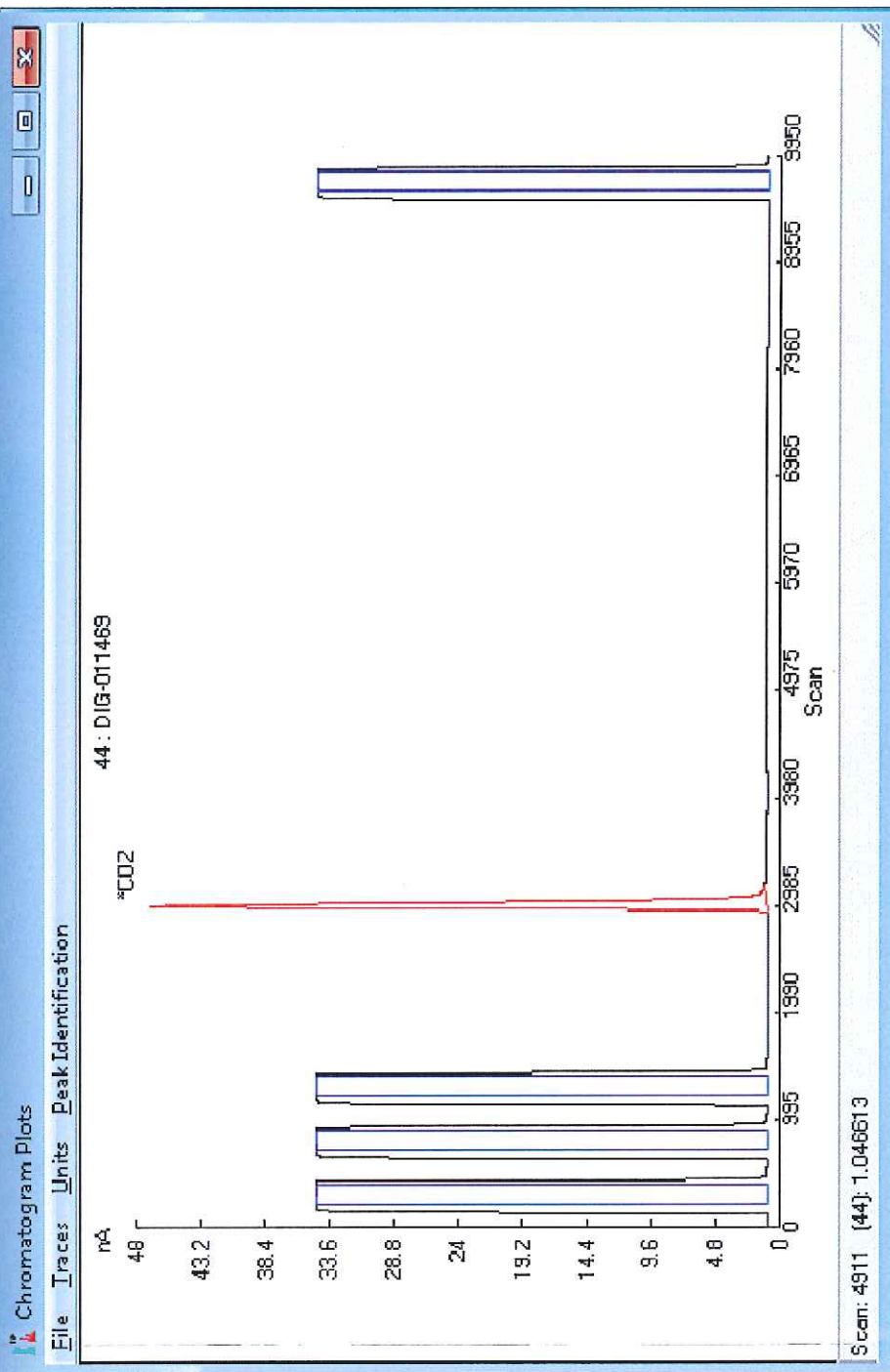


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982) 20170629 05:52:05 (DIG-011469.D)  
TCD2 B, Back Signal (20170626\_JOB982) 20170629 05:52:05 (DIG-011469.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060984  
**Lab #:** DIG-011462  
**Client:** Vista Geoscience  
**Sample Name(s):** VW050628171039

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011462  
 Client: Vista Geoscience  
 Sample Name: VW050628171039  
 Date Sampled: 06/28/17  
 Time Sampled: 10:39  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	785330	77.89	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	176121	17.47	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	46777	4.64	-	-27.4	-	
Carbon Monoxide ( $\text{CO}$ )	20	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



**dig**  
Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 1706A84  
DIG 011454-011466  
Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMT

## Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	✓W060628171044	6-28-17	10:44	X		X	X	X	+D13C CO2
	VW170628171108	6-28-17	1108	X		X	X	X	+D13C CO2
	VW100628171003	6-28-17	1003	X		X	X	X	+D13C CO2
	VW050628171039	6-28-17	10:39	X		X	X	X	+D13C CO2
	VW190628171059	6-28-17	10:59	X		X	X	X	+D13C CO2
	VW560628171027	6-28-17	1027	X		X	X	X	+D13C CO2
	VW630628171019	6-28-17	1019	X		X	X	X	+D13C CO2
	VW070628171052	6-28-17	1052	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	Vista Geoscience	6/28/17	14:22
Received by <u>[Signature]</u>	DIG	06/28/17	14:25
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

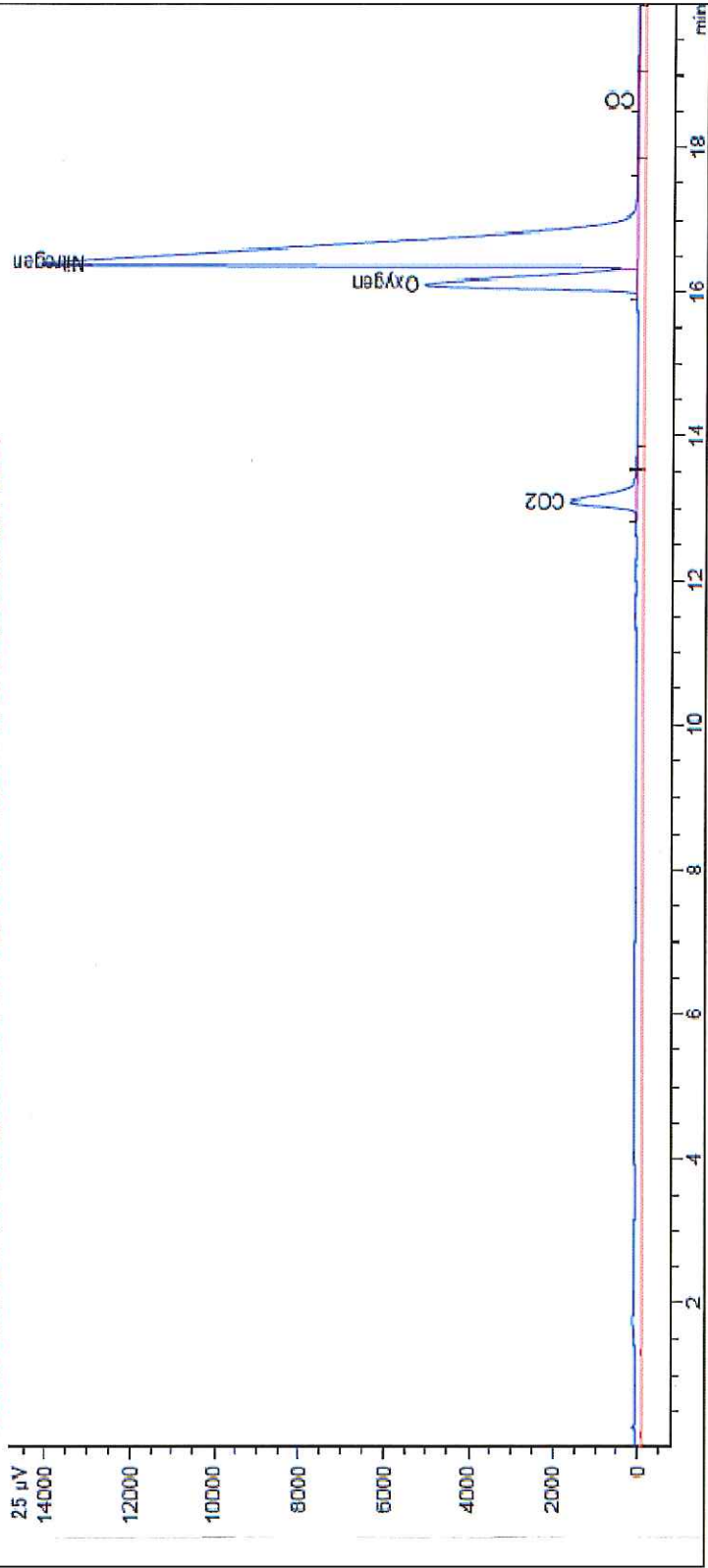
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030



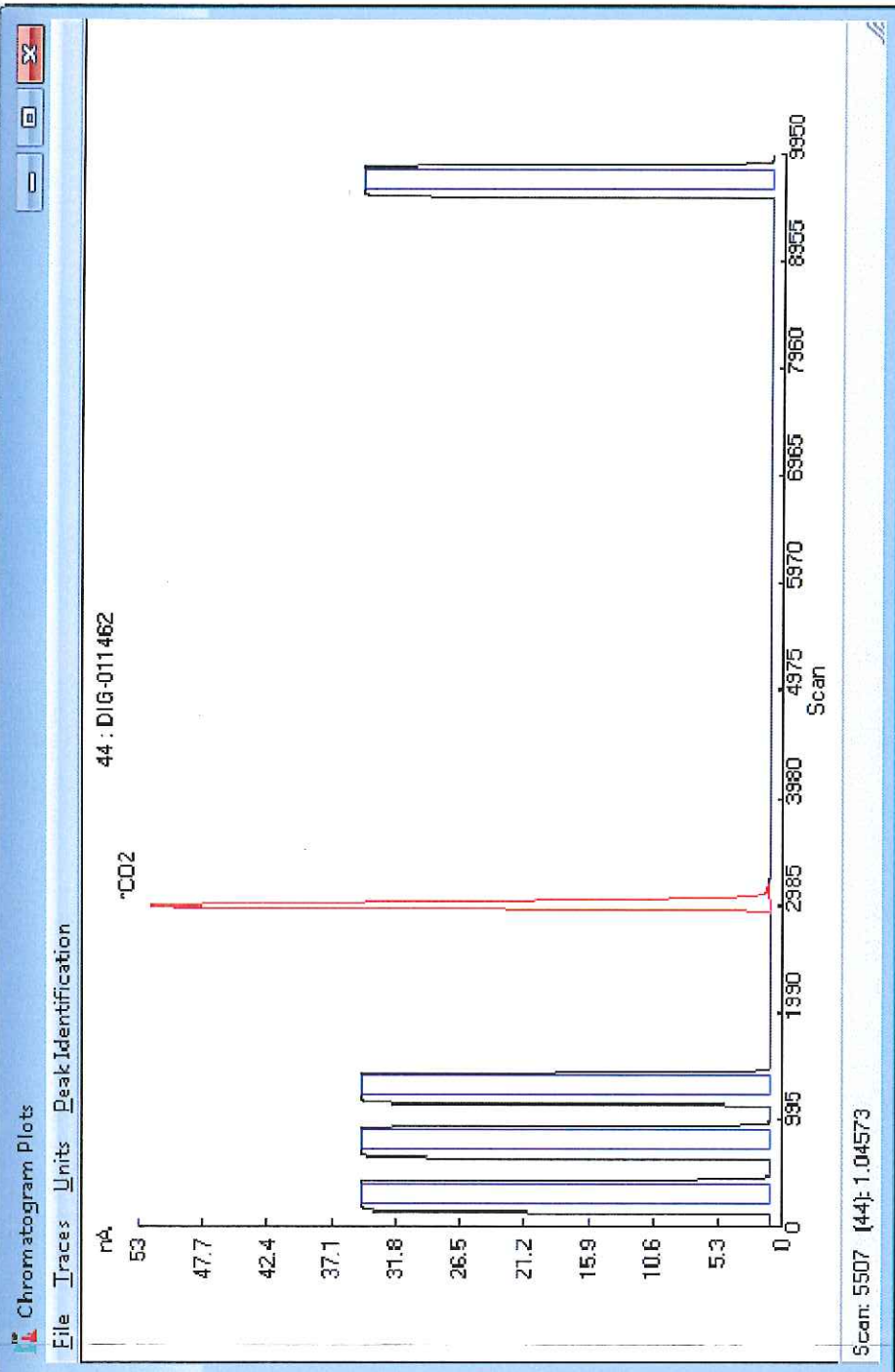
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785\ARS 2017-06-29 05-52-05\DIG-011462.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785\ARS 2017-06-29 05-52-05\DIG-011462.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060984  
**Lab #:** DIG-011459  
**Client:** Vista Geoscience  
**Sample Name(s):** VW060628171044

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011459  
 Client: Vista Geoscience  
 Sample Name: VW060628171044  
 Date Sampled: 06/28/17  
 Time Sampled: 10:44  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	781805	78.12	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	179483	17.93	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	39467	3.94	-	-26.8	-	
Carbon Monoxide ( $\text{CO}$ )	17	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 1706A84  
DIL 011454-011466  
Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Fireside  
Sampled By: JMT

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>1</sub> -C <sub>4</sub>	RSK-175* Gas composition with dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	8°C Methane (Carbon)	80°C Methane (Hydrogen)	8°C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> , if present)	
	VW060628171044	6-28-17	10:44	X		X	X	X	+D13C CO <sub>2</sub>
	VW170628171108	6-28-17	11:08	X		X	X	X	+D13C CO <sub>2</sub>
	VW100628171003	6-28-17	10:03	X		X	X	X	+D13C CO <sub>2</sub>
	VW05062817039	6-28-17	10:39	X		X	X	X	+D13C CO <sub>2</sub>
	VW190628171059	6-28-17	10:59	X		X	X	X	+D13C CO <sub>2</sub>
	VW560628171027	6-28-17	10:27	X		X	X	X	+D13C CO <sub>2</sub>
	VW630628171019	6-28-17	10:19	X		X	X	X	+D13C CO <sub>2</sub>
	VW070628171052	6-28-17	10:52	X		X	X	X	+D13C CO <sub>2</sub>

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geoscience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>06/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

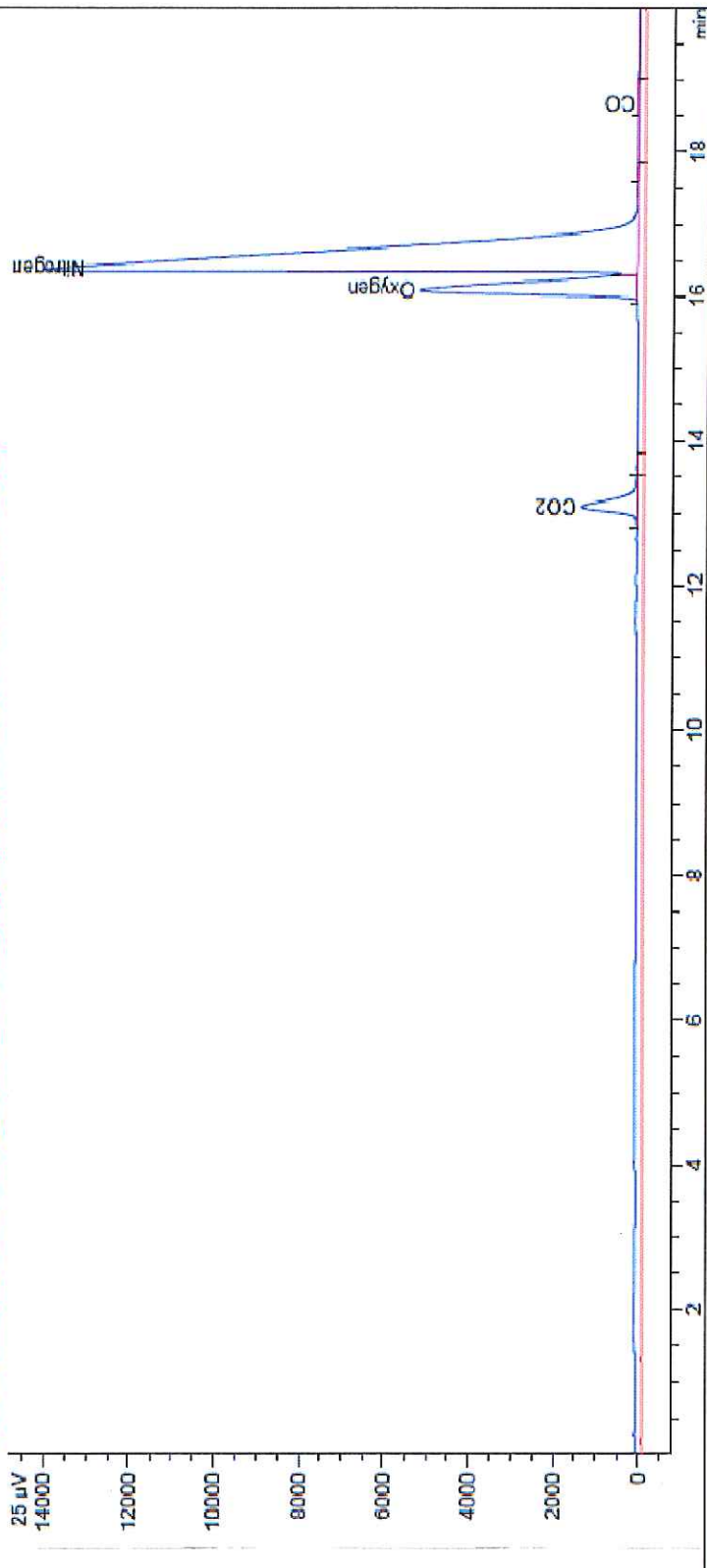




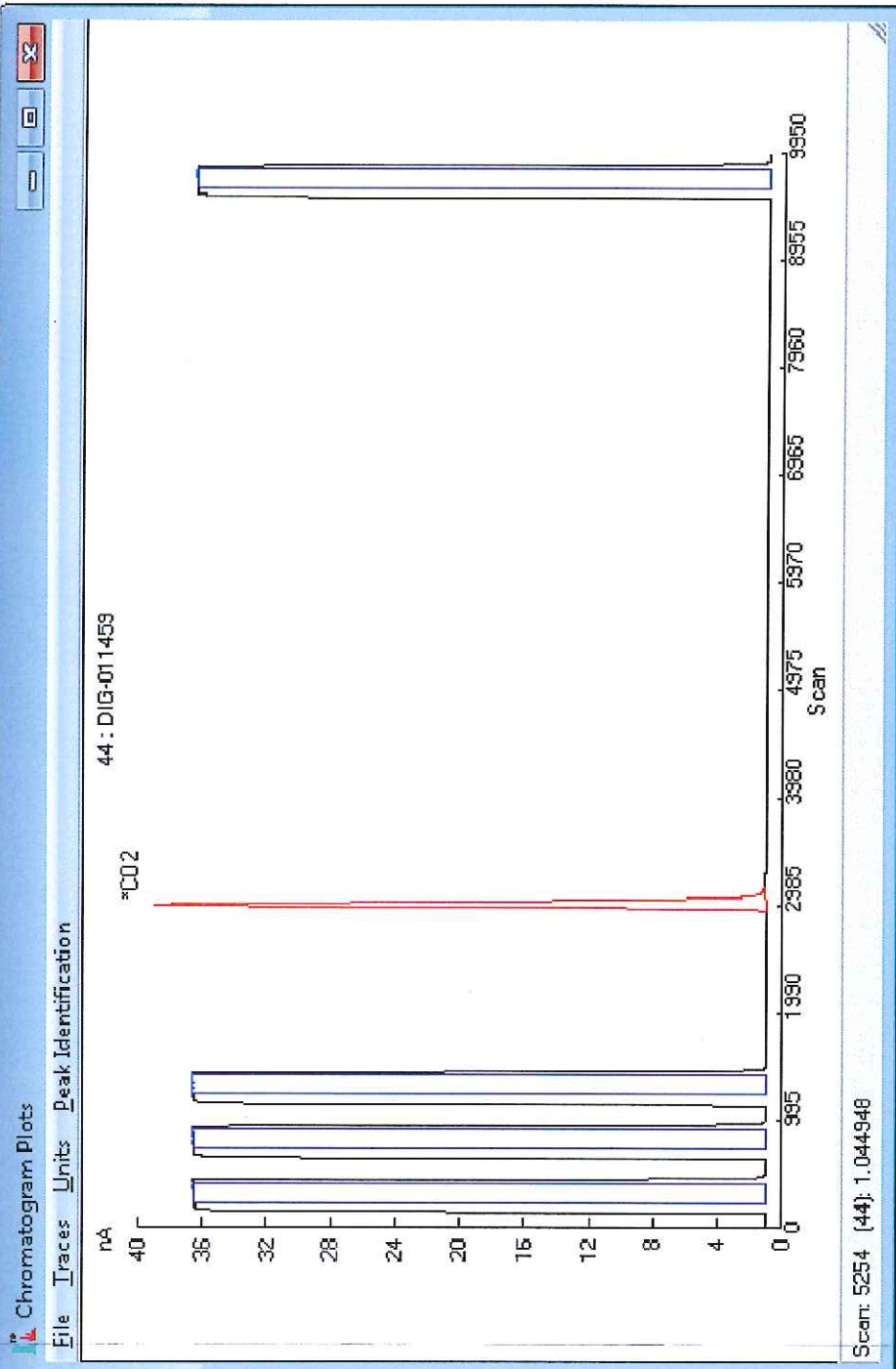


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982) 20170119\_JOB785JARS 2017-06-29 05:52:05 (DIG-011459.D)  
TCD2 B, Back Signal (20170626\_JOB982) 20170119\_JOB785JARS 2017-06-29 05:52:05 (DIG-011459.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011466  
**Client:** Vista Geoscience  
**Sample Name(s):** VW070628171052

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011466  
 Client: Vista Geoscience  
 Sample Name: VW070628171052  
 Date Sampled: 06/28/17  
 Time Sampled: 10:52  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	790822	78.46	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	174341	17.30	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	42808	4.25	-	-26.6	-	
Carbon Monoxide ( $\text{CO}$ )	14	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



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Westminster, CO 80234  
p: 303.531.2030

JOB 1706984  
DIG 011454-011466  
Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firesone  
Sampled By: JMT

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>-C<sub>6</sub>+

RSK-175\* Gas composition  
with dissolved Cl<sub>2</sub>, C<sub>2</sub>-C<sub>6</sub>+

8<sup>13</sup>C Methane (Carbon)  
C<sub>2</sub>, C<sub>2</sub> & C<sub>3</sub>

8D Methane (Hydrogen)

8<sup>13</sup>C Ethane-Pentane  
(C<sub>2</sub>-C<sub>5</sub> if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW060628171044	6-28-17	10:44	X		X	X	X	+D13C CO2
	VW170628171108	6-28-17	1108	X		X	X	X	+D13C CO2
	VW100628171003	6-28-17	1003	X		X	X	X	+D13C CO2
	VW050628171039	6-28-17	10:39	X		X	X	X	+D13C CO2
	VW190628171059	6-28-17	10:59	X		X	X	X	+D13C CO2
	VW60628171027	6-28-17	1027	X		X	X	X	+D13C CO2
	VW630628171019	6-28-17	1019	X		X	X	X	+D13C CO2
	VW070628171052	6-28-17	1052	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	Vista Geoscience	6/28/17	14:22
Received by <u>[Signature]</u>	DIG	06/28/17	14:25
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

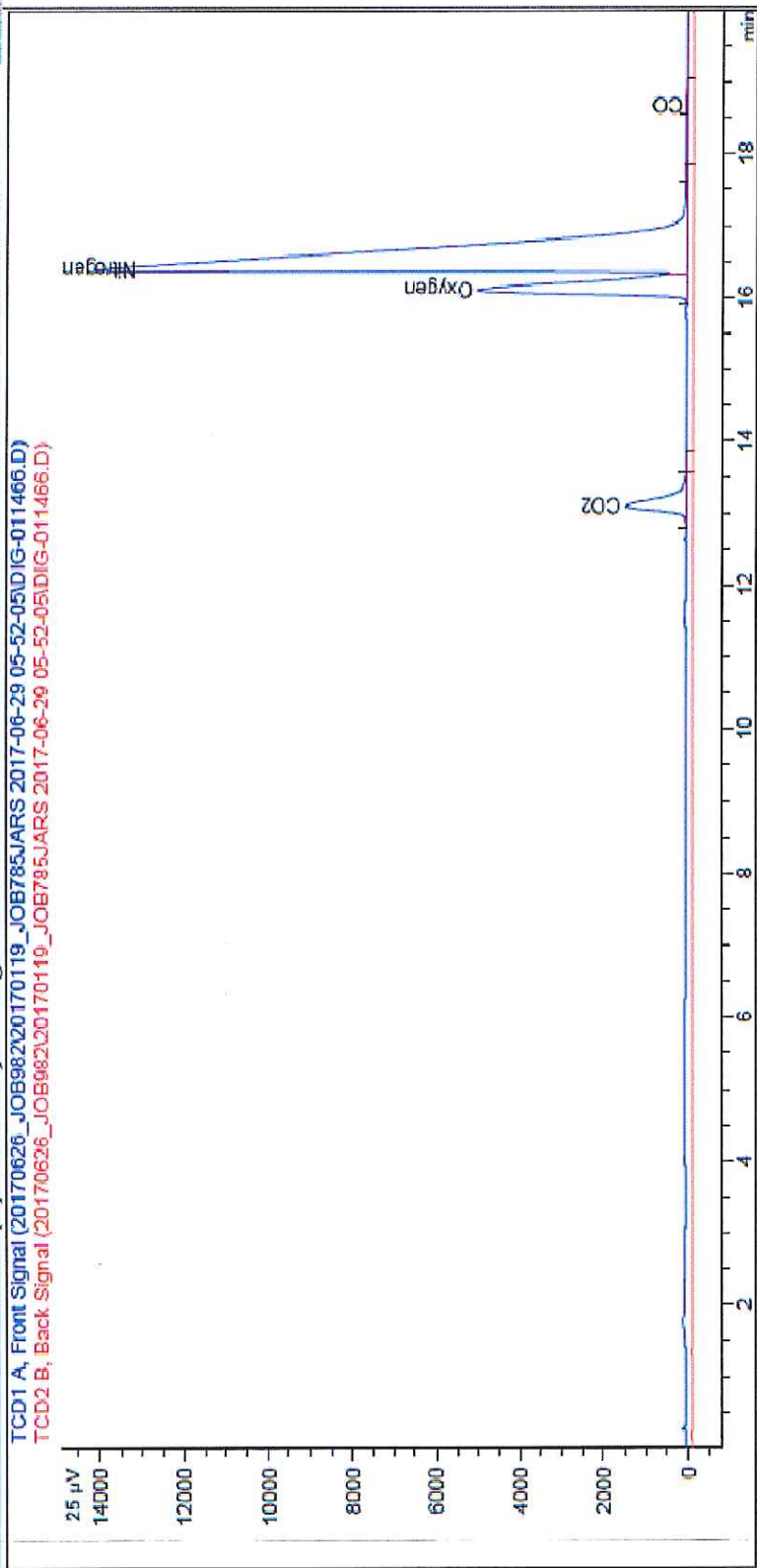




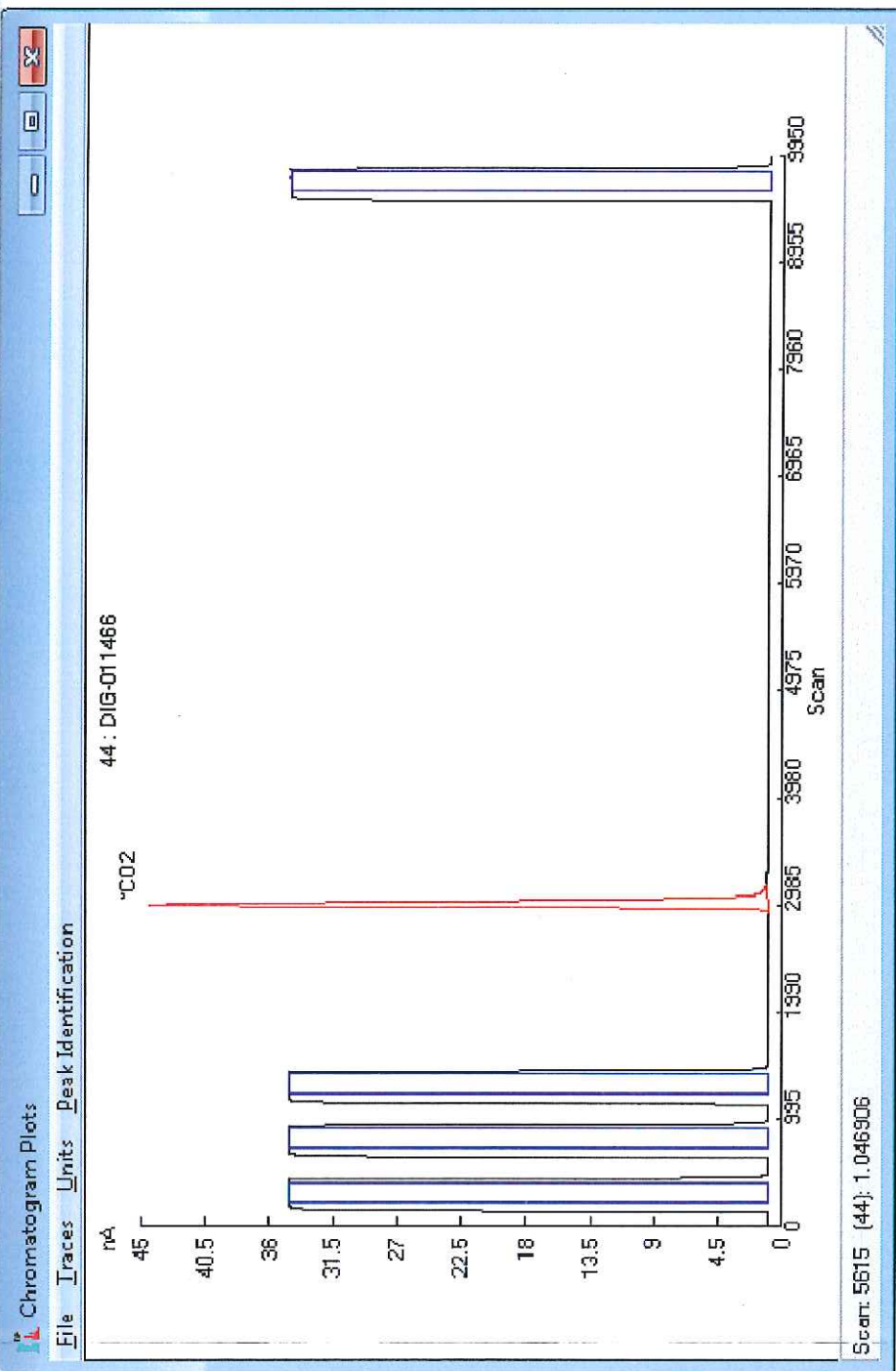


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011466.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011466.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011457  
**Client:** Vista Geoscience  
**Sample Name(s):** VW080628171123

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011457  
 Client: Vista Geoscience  
 Sample Name: VW080628171123  
 Date Sampled: 06/28/17  
 Time Sampled: 11:23  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	792937	79.22	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	186620	18.64	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	21361	2.13	-	-24.2	-	
Carbon Monoxide (CO)	15	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰

# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 1706984

NTG 04451-011458

Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub>	RSK-175* for composition with dissolved Cl <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub>	8°C Methane (Carbon)	8°C Methane (Hydrogen)	8°C Ethane-Pentane (C <sub>2</sub> to C <sub>5</sub> if present)	
	VW200628171158	6-28-17	11:58	X		X	X	X	+D13C CO2
	VW170628171222	6-28-17	12:22	X		X	X	X	+D13C CO2
	VW20628171204	6-28-17	12:04	X		X	X	X	+D13C CO2
	VW120628171131	6-28-17	11:31	X		X	X	X	+D13C CO2
	VW280628171152	6-28-17	11:52	X		X	X	X	+D13C CO2
	VW010628171143	6-28-17	11:43	X		X	X	X	+D13C CO2
	VW080628171123	6-28-17	11:23	X		X	X	X	+D13C CO2
	VW030628171116	6-28-17	11:16	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista GeoScience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>06/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

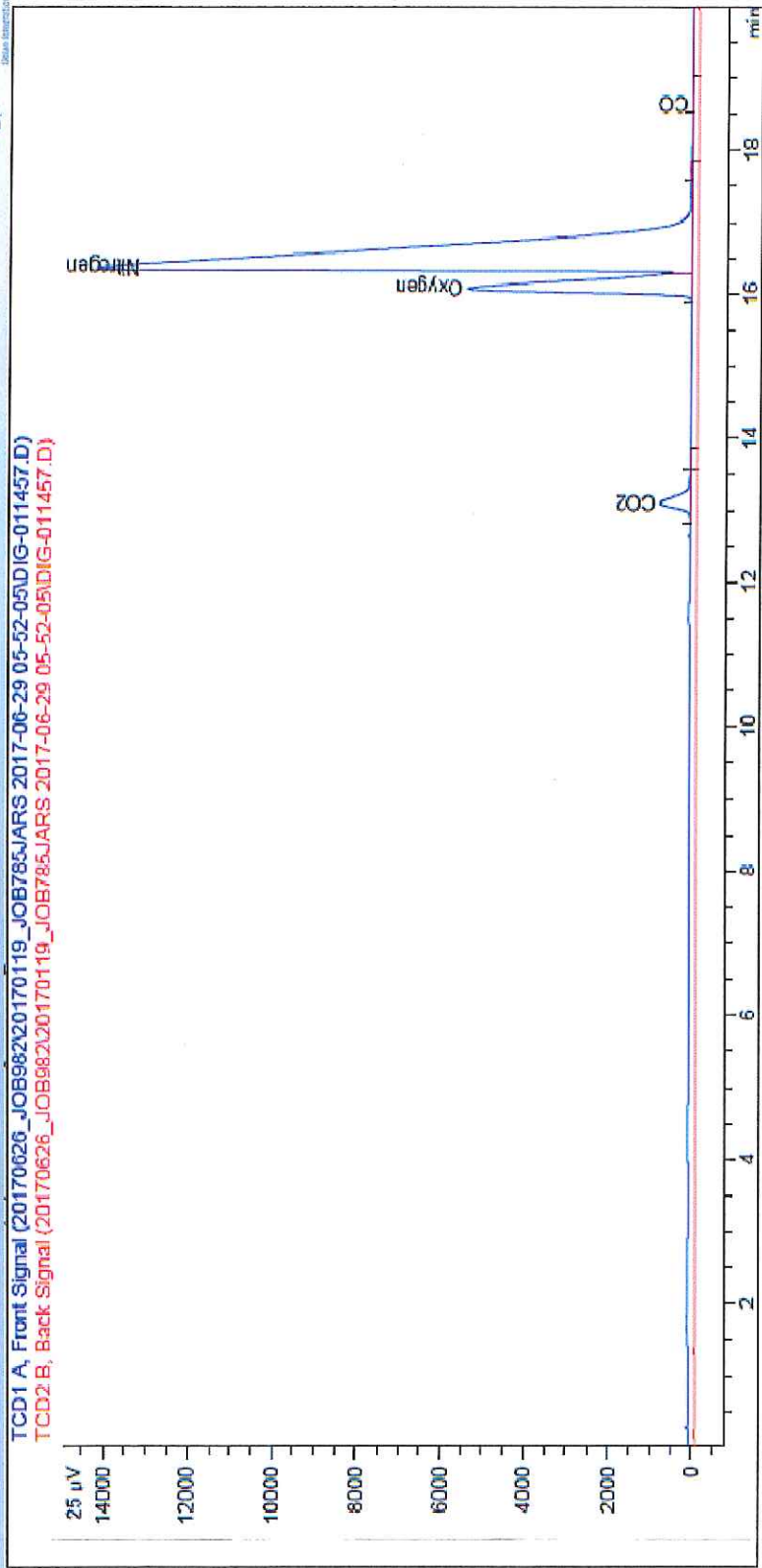




# Gas Chromatography (GC) Chromatogram

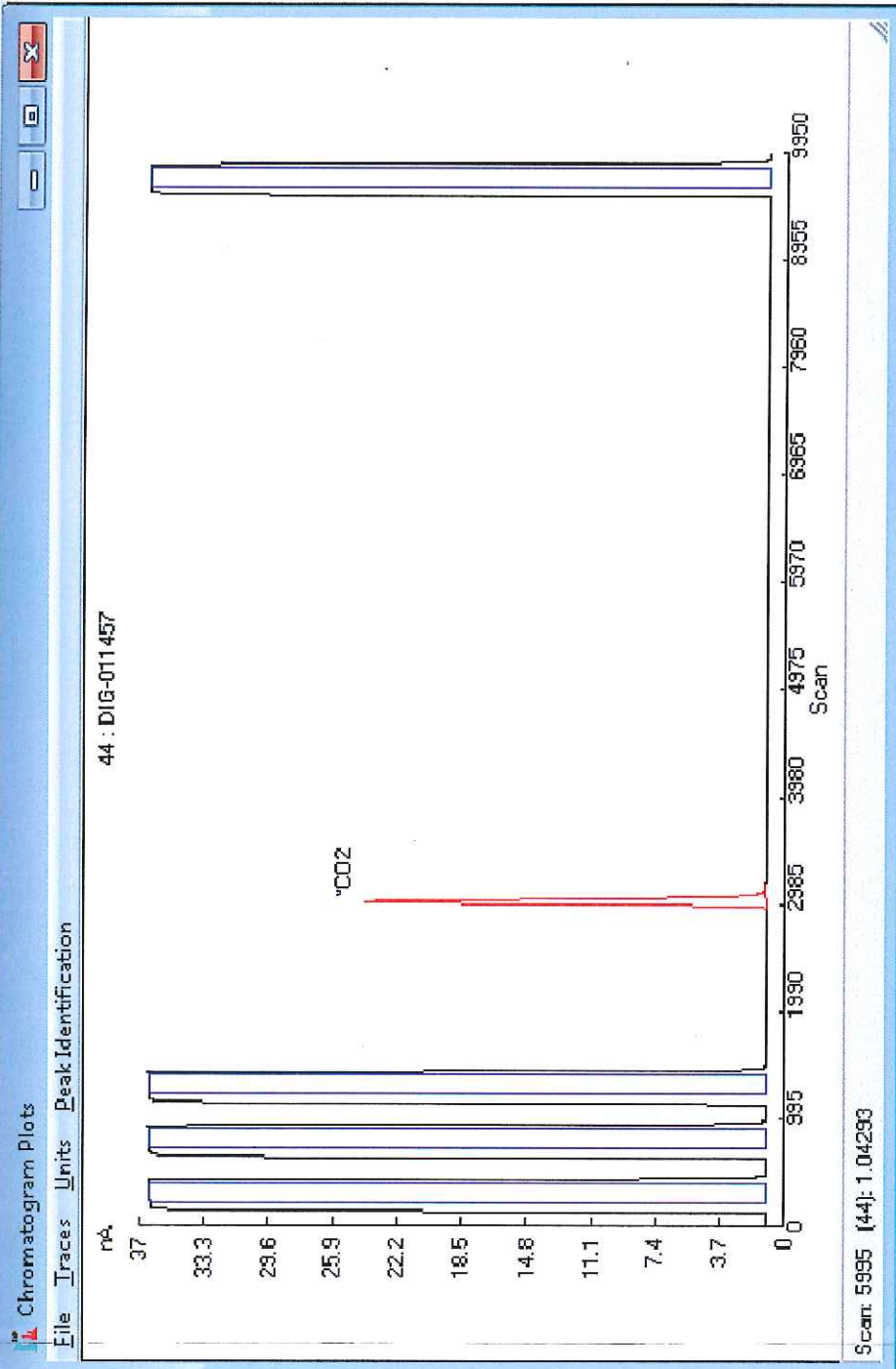


TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785.JARS 2017-06-29 05:52-05.D\IG-011457.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785.JARS 2017-06-29 05:52-05.D\IG-011457.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060984  
**Lab #:** DIG-011473  
**Client:** Vista Geoscience  
**Sample Name(s):** VW090628171008

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011473  
 Client: Vista Geoscience  
 Sample Name: VW090628171008  
 Date Sampled: 06/28/17  
 Time Sampled: 10:08  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/30/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	806705	78.73	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	207086	20.21	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	10844	1.06	-	-29.3	-	
Carbon Monoxide ( $\text{CO}$ )	16	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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## Geochemistry for Energy

1317 West 121st Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 17060984 **RUSH!**  
DIG - 011467-  
011474

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

Analysis Requested					
Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175* (in composition) H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> with dissolved Cl <sub>2</sub> , Cl <sub>2</sub> & C <sub>2</sub> H <sub>6</sub>	8PC Methane (Carbon)	8D Methane (Hydrogen)	8PC Ethane-Pentane (C <sub>2</sub> to C <sub>5</sub> if present)	

## Sample Description

Container #	Sample Identification	Date Sampled	Time	X	X	X	X	Comments
	VW160628171231	6-28-17	12:31	X		X	X	+D13C CO2
	VW0628170945	6-28-17	09:45	X		X	X	+D13C CO2
	VW050628171037	6-28-17	10:37	X		X	X	+D13C CO2
	VW040628171239	6-28-17	12:39	X		X	X	+D13C CO2
	VW150628171944	6-28-17	9:44	X		X	X	+D13C CO2
	VW110628171142	6-28-17	11:42	X		X	X	+D13C CO2
	VW090628171008	6-28-17	10:08	X		X	X	+D13C CO2
	VW160628171233	6-28-17	12:33	X		X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista GeoScience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

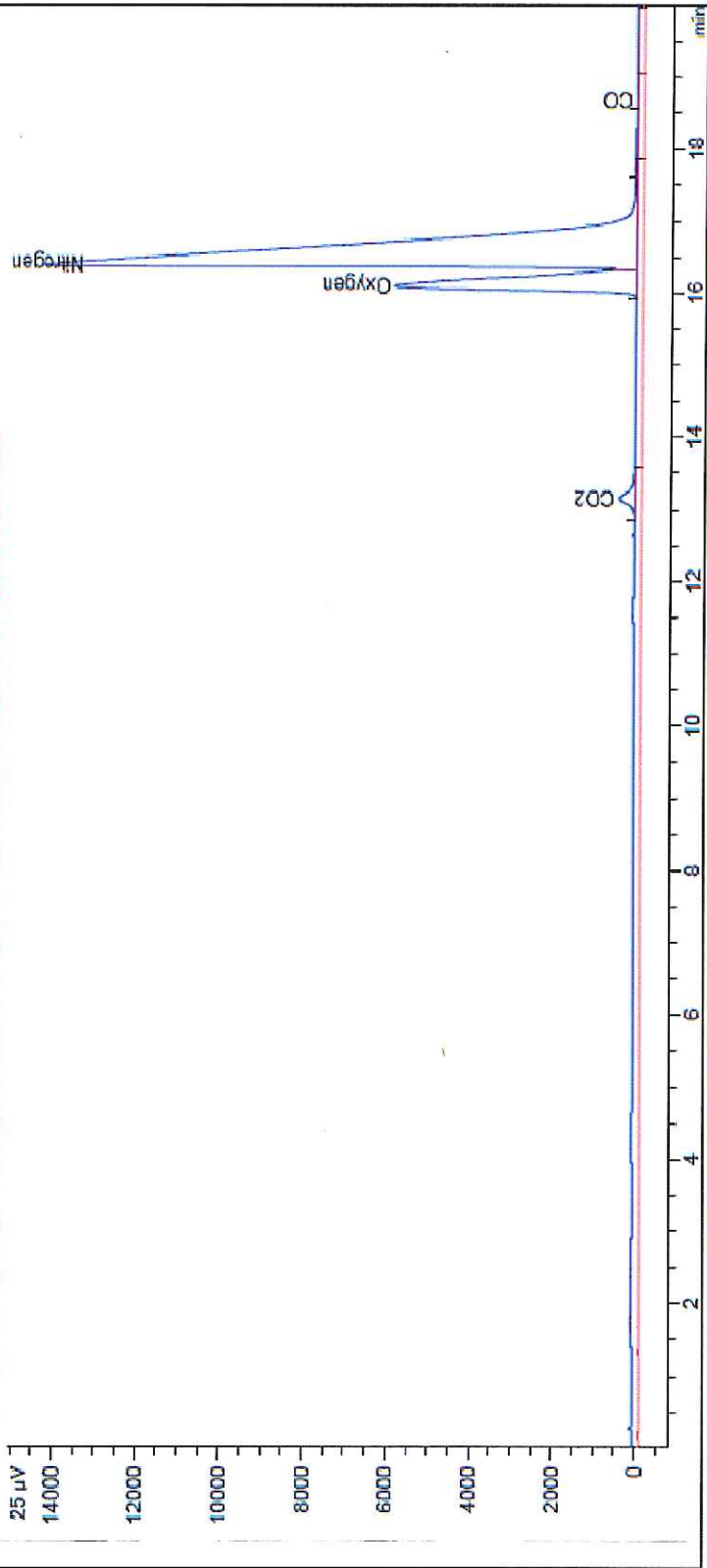
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030



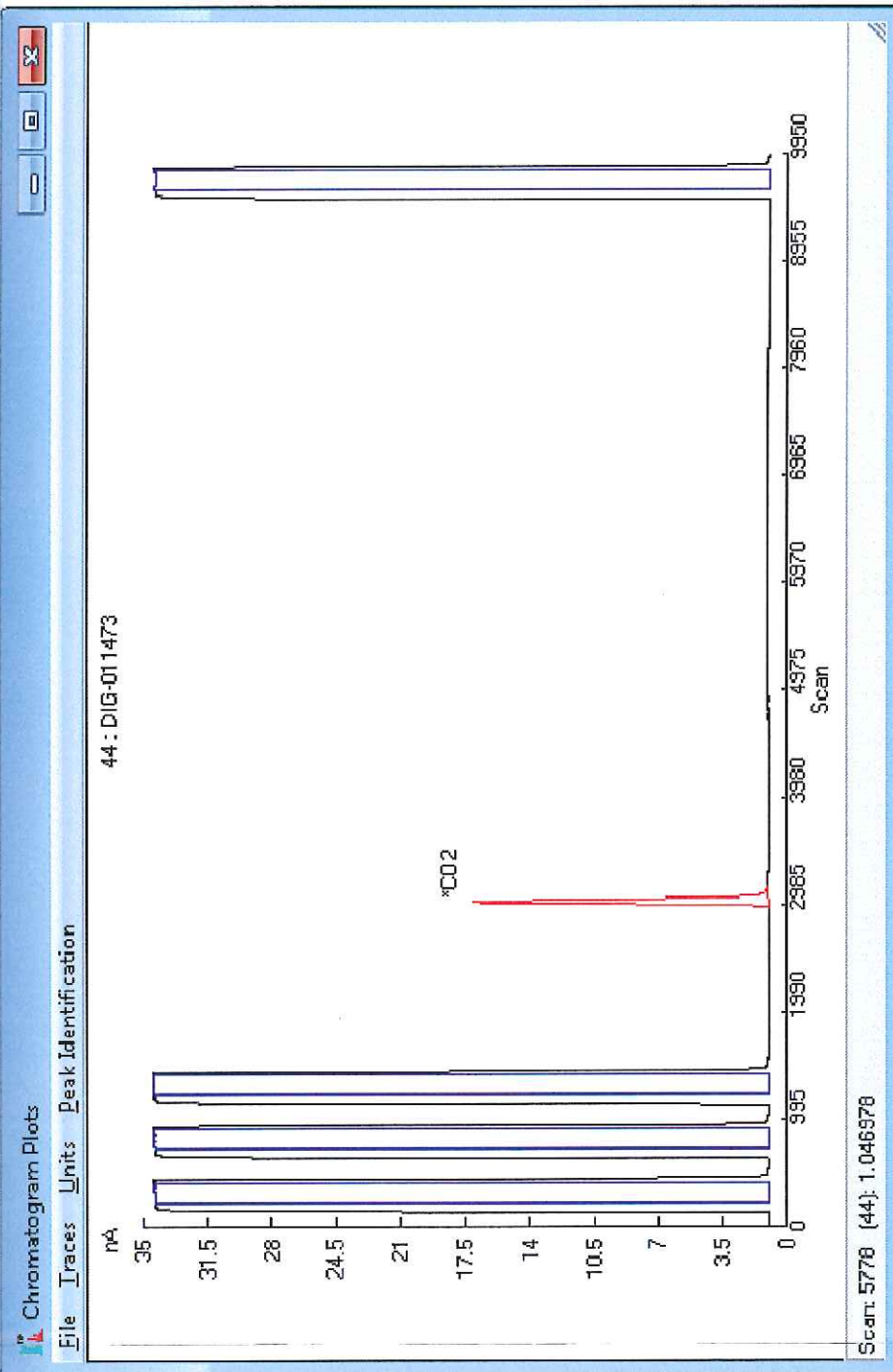
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785\IARS 2017-06-29 05-52-05\DIG-011473.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785\IARS 2017-06-29 05-52-05\DIG-011473.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011461  
**Client:** Vista Geoscience  
**Sample Name(s):** VW100628171003

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011461  
 Client: Vista Geoscience  
 Sample Name: VW100628171003  
 Date Sampled: 06/28/17  
 Time Sampled: 10:03  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	792961	78.95	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	200152	19.93	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	11229	1.12	-	-30.1	-	
Carbon Monoxide ( $\text{CO}$ )	17	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Westminster, CO 80234  
p: 303.531.2030

JOB 1706A84  
DIG 011454-011466  
Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Fireside  
Sampled By: JMT

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested						Comments
				Gas Composition * H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub>	RSK-175 <sup>†</sup> Gas composition ppm dissolved C <sub>1</sub> , C <sub>2</sub> , C <sub>3</sub>	ppm dissolved C <sub>1</sub> , C <sub>2</sub> , C <sub>3</sub>	ppm Methane (Carbon)	ppm Methane (Hydrogen)	ppm Ethane-Pentane (C <sub>2</sub> to C <sub>5</sub> if present)	
	VW060628171044	6-28-17	10:44	X		X	X	X		+D13C CO2
	VW170628171108	6-28-17	11:08	X		X	X	X		+D13C CO2
	VW100628171003	6-28-17	10:03	X		X	X	X		+D13C CO2
	VW050628171039	6-28-17	10:39	X		X	X	X		+D13C CO2
	VW190628171059	6-28-17	10:59	X		X	X	X		+D13C CO2
	VW560628171027	6-28-17	10:27	X		X	X	X		+D13C CO2
	VW630628171019	6-28-17	10:19	X		X	X	X		+D13C CO2
	VW070628171052	6-28-17	10:52	X		X	X	X		+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista GeoScience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>06/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

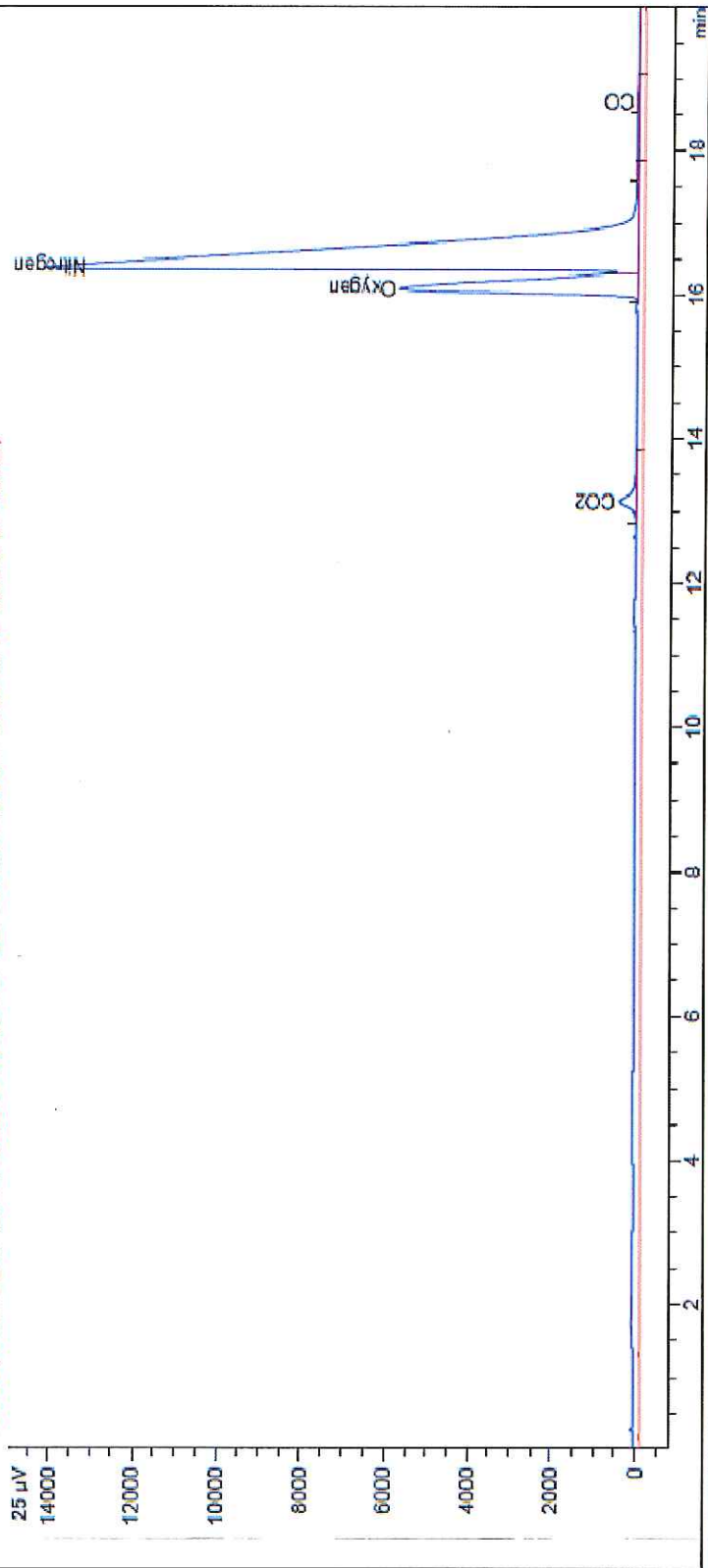




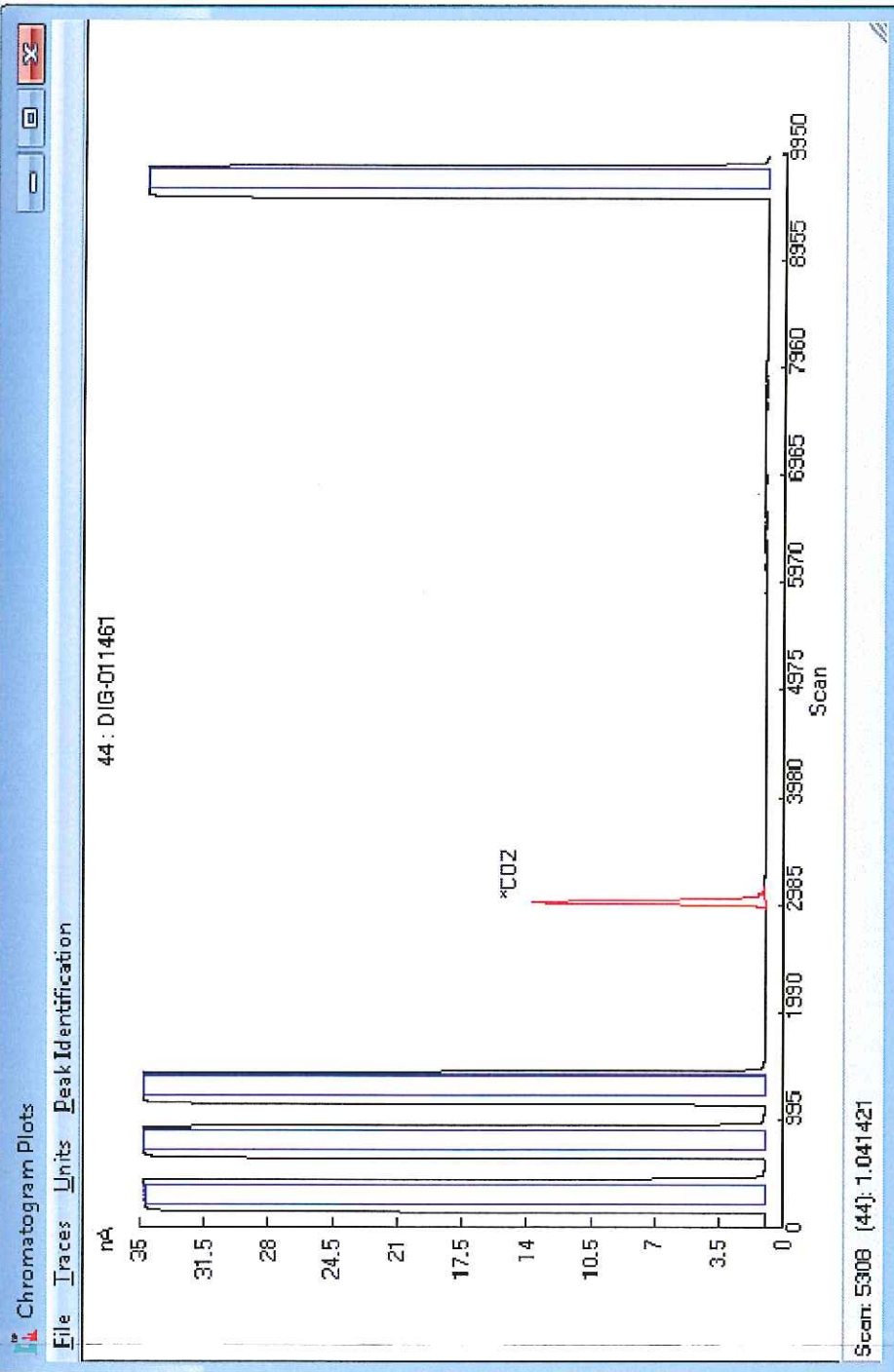
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB882\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011461.D)  
TCD2 B, Back Signal (20170626\_JOB882\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011461.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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**Geochemistry for Energy**

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p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011472  
**Client:** Vista Geoscience  
**Sample Name(s):** VW110628171142

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011472  
 Client: Vista Geoscience  
 Sample Name: VW110628171142  
 Date Sampled: 06/28/17  
 Time Sampled: 11:42  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/30/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	807799	79.32	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	185860	18.25	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	24690	2.42	-	-25.7	-	
Carbon Monoxide (CO)	16	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +/C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Dolan Integration Group

## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 17060984 **RUSH!**  
DLG - 011467-  
011474

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175 <sup>®</sup> Gas Composition H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>1</sub> -C <sub>4</sub> with dissolved Cl <sub>2</sub> , C <sub>2</sub> & C <sub>3</sub>	δ <sup>13</sup> C Methane (Carbon)	δ <sup>13</sup> C Methane (Hydrogen)	δ <sup>13</sup> C Ethane + propane (C <sub>2</sub> & C <sub>3</sub> if present)	
	VW160628171231	6-28-17	12:31	X		X	X	X	+D13C CO2
	VW0628170945	6-28-17	09:45	X		X	X	X	+D13C CO2
	VW050628171037	6-28-17	10:37	X		X	X	X	+D13C CO2
	VW040628171239	6-28-17	12:39	X		X	X	X	+D13C CO2
	VW57062817944	6-28-17	9:44	X		X	X	X	+D13C CO2
	VW10628171142	6-28-17	11:42	X		X	X	X	+D13C CO2
	VW070628171008	6-28-17	10:08	X		X	X	X	+D13C CO2
	VW160628171233	6-28-17	12:33	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista GeoScience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DLG</u>	<u>6/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

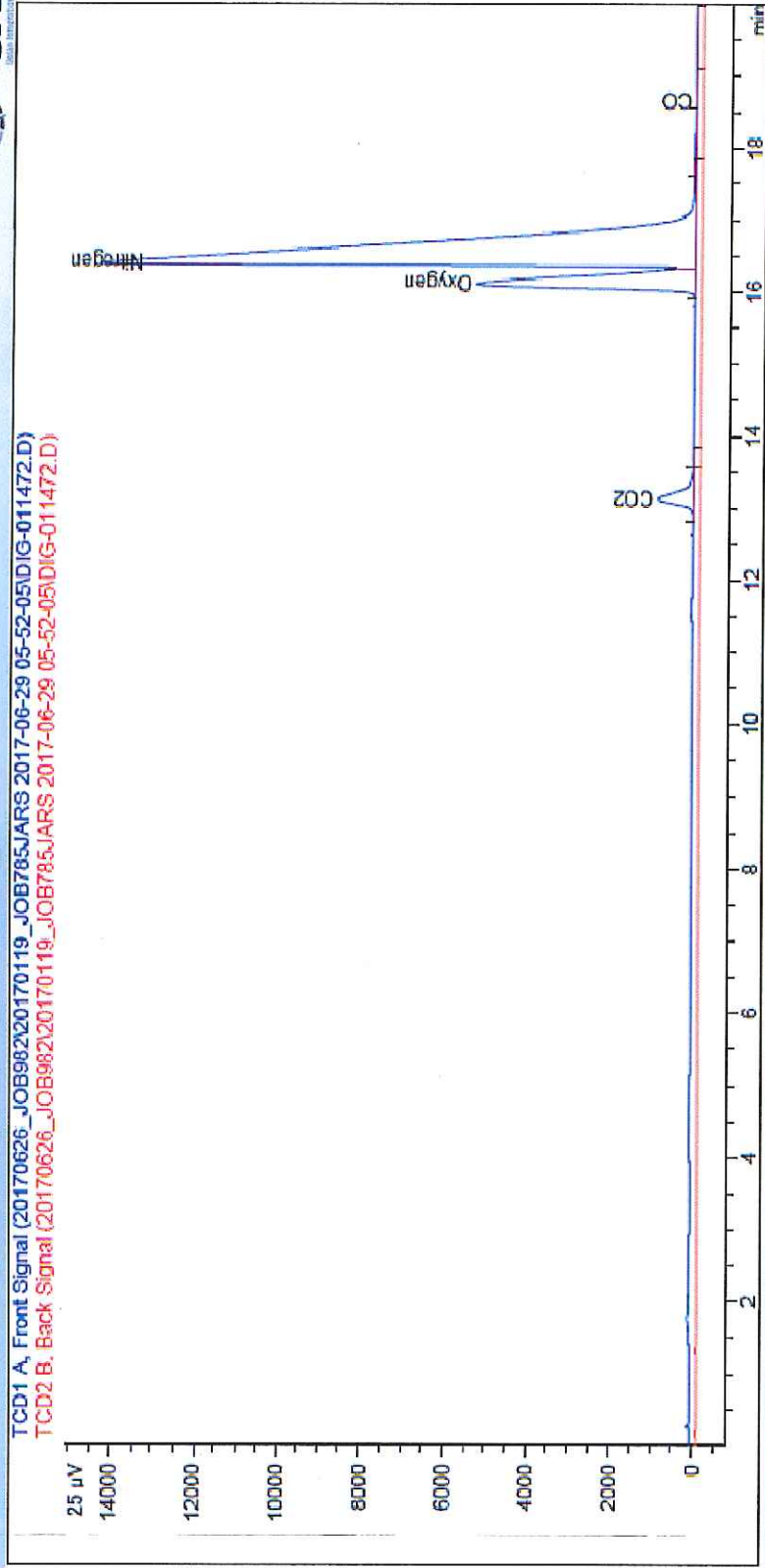




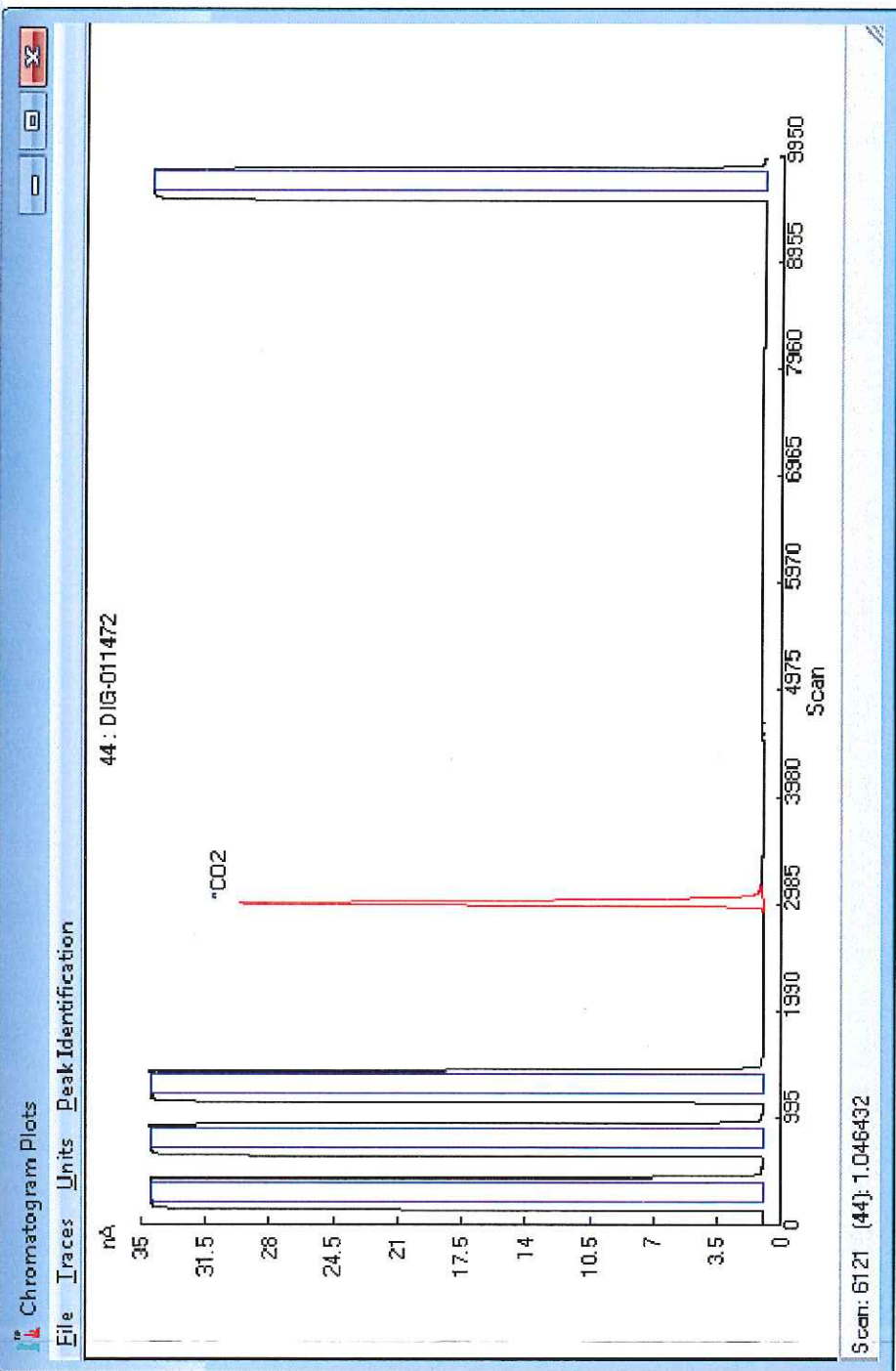
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-29 05-52-05\DIG-011472.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-29 05-52-05\DIG-011472.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011454  
**Client:** Vista Geoscience  
**Sample Name(s):** VW120628171131

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011454  
 Client: Vista Geoscience  
 Sample Name: VW120628171131  
 Date Sampled: 06/28/17  
 Time Sampled: 11:31  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	787793	79.40	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	177017	17.84	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	27367	2.76	-	-25.2	-	
Carbon Monoxide (CO)	16	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	#DIV/0!
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰

# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy  
1317 West 121st Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 1706984

NTG 04451-011458

Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>, C<sub>3</sub>

RSK-175\* (see composition)  
with dissolved Cl<sub>2</sub>, C<sub>2</sub>, C<sub>3</sub>

8°C Methane (Carbon)

60 Methane (Hydrogen)

8°C Ethane-Pentane  
(C<sub>2</sub> to C<sub>5</sub> if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW200628171158	6-28-17	11:58	X		X	X	X	+D13C CO2
	VW170628171222	6-28-17	12:22	X		X	X	X	+D13C CO2
	VW20628171204	6-28-17	12:04	X		X	X	X	+D13C CO2
	VW170628171131	6-28-17	11:31	X		X	X	X	+D13C CO2
	VW280628171152	6-28-17	11:52	X		X	X	X	+D13C CO2
	VW010618171143	6-28-17	11:43	X		X	X	X	+D13C CO2
	VW080628171123	6-28-17	11:23	X		X	X	X	+D13C CO2
	VW030628171116	6-28-17	11:16	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by	Vista GeoScience	6/28/17	14:22
Received by	DIG	06/28/17	14:25
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

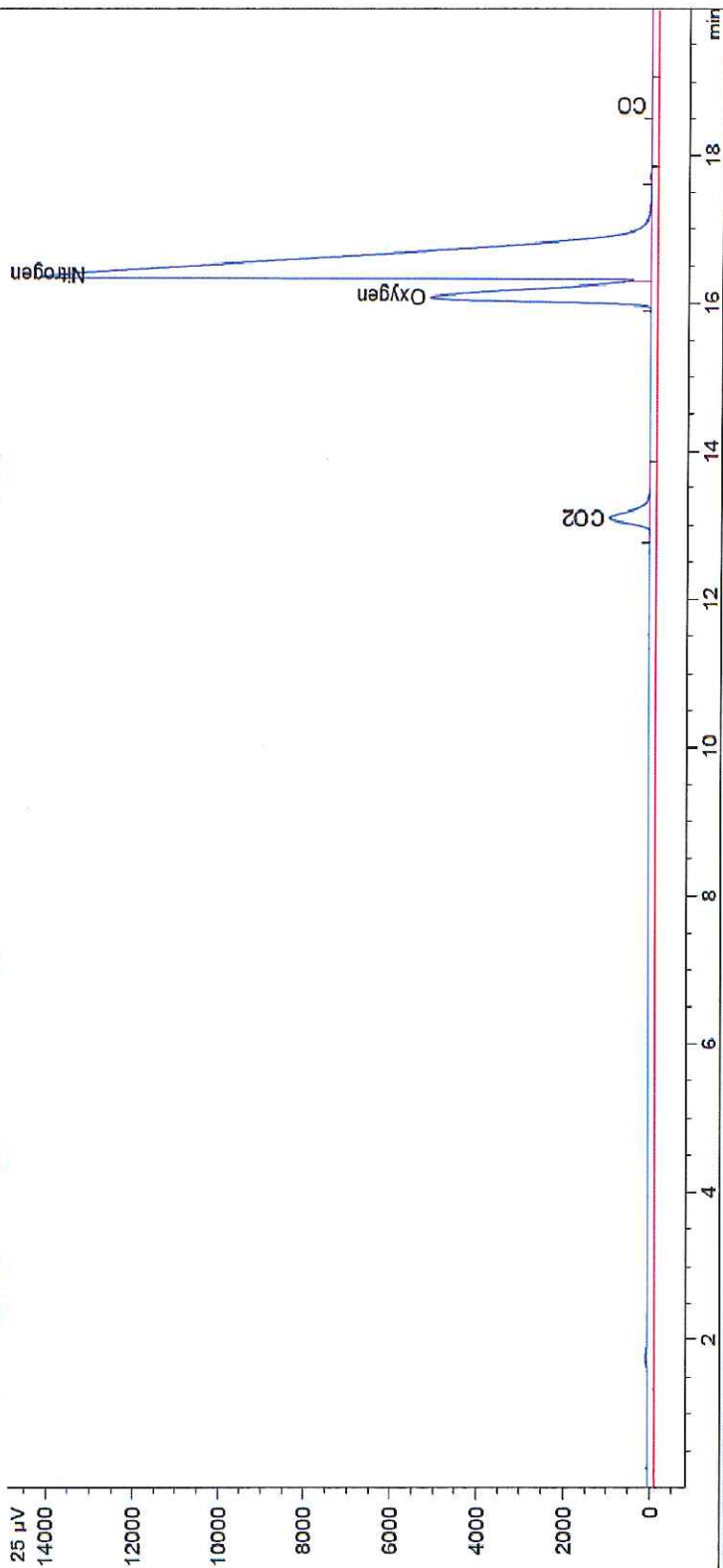
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030





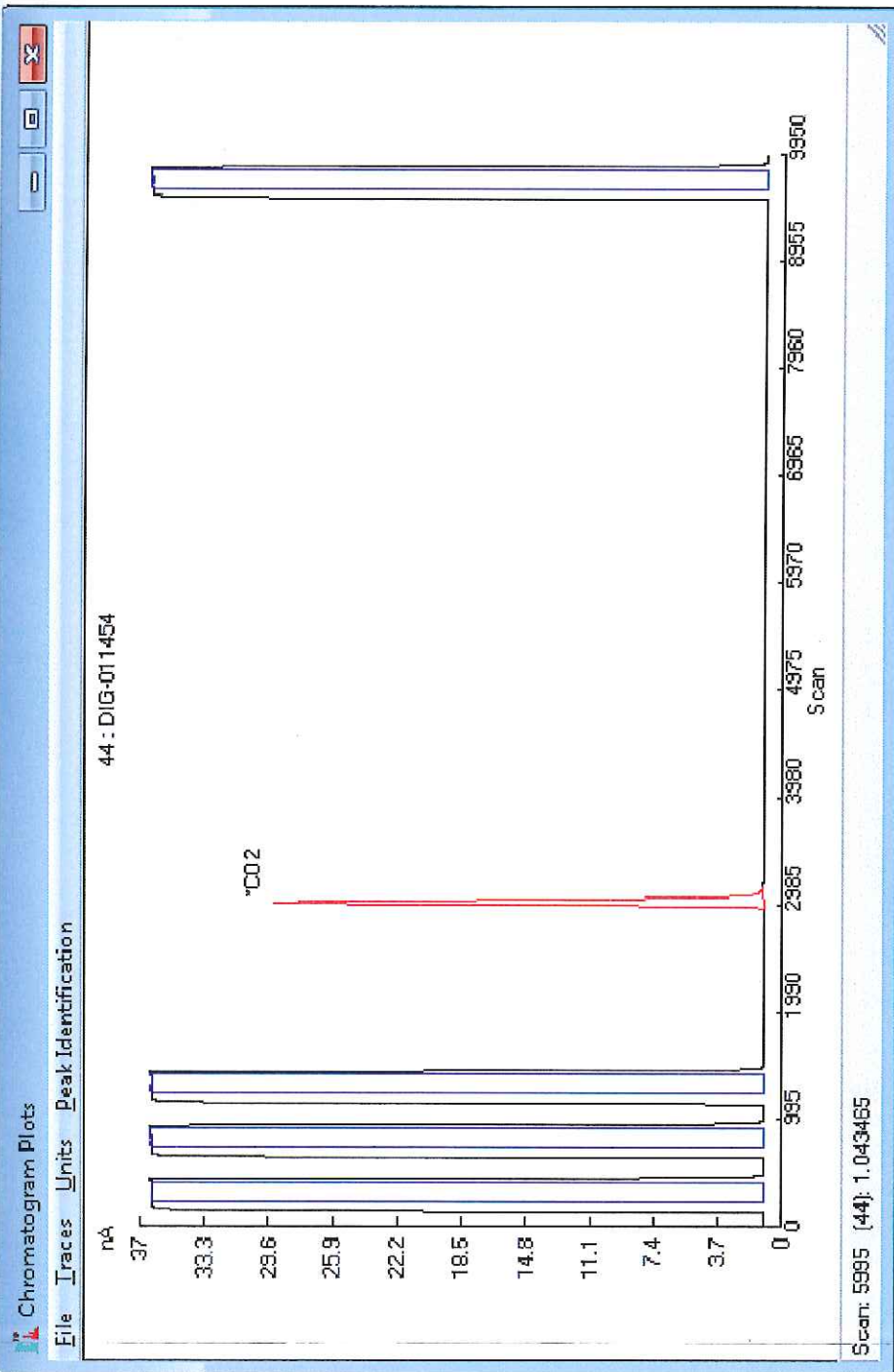
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011454.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011454.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011421  
**Client:** Vista Geoscience  
**Sample Name(s):** VW130627171241

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011421  
 Client: Vista Geoscience  
 Sample Name: VW130627171241  
 Date Sampled: 06/27/17  
 Time Sampled: 12:41  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	789223	79.58	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	151187	15.24	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	51317	5.17	-	-18.6	-	
Carbon Monoxide ( $\text{CO}$ )	12	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + / \text{C}_1 +$ )	
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Geochemistry for Energy

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Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested				
Gas Composition*	RSK-175* (Gas composition)	δ <sup>13</sup> C Methane (Carbon)	δD Methane (Hydrogen)	δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)
N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> H <sub>8</sub>	N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> H <sub>8</sub> with dissolved Cl <sub>2</sub> , Cl <sub>2</sub> & C <sub>3</sub>			

# Sample Description

Container #	Sample Identification	Date Sampled	Time	X	X	X	X	Comments
	VW 54	062717	1032	X		X	X	+D13C CO2
	VW 49	062717	1117	X		X	X	+D13C CO2
	VW 18	062717	1246	X		X	X	+D13C CO2
	VW 43	062717	1043	X		X	X	+D13C CO2
	VW 13	062717	1241	X		X	X	+D13C CO2
	VW 55	062717	1343	X		X	X	+D13C CO2
	VW 47	062717	1210	X		X	X	+D13C CO2
	VW 24	062717	1401	X		X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:27</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

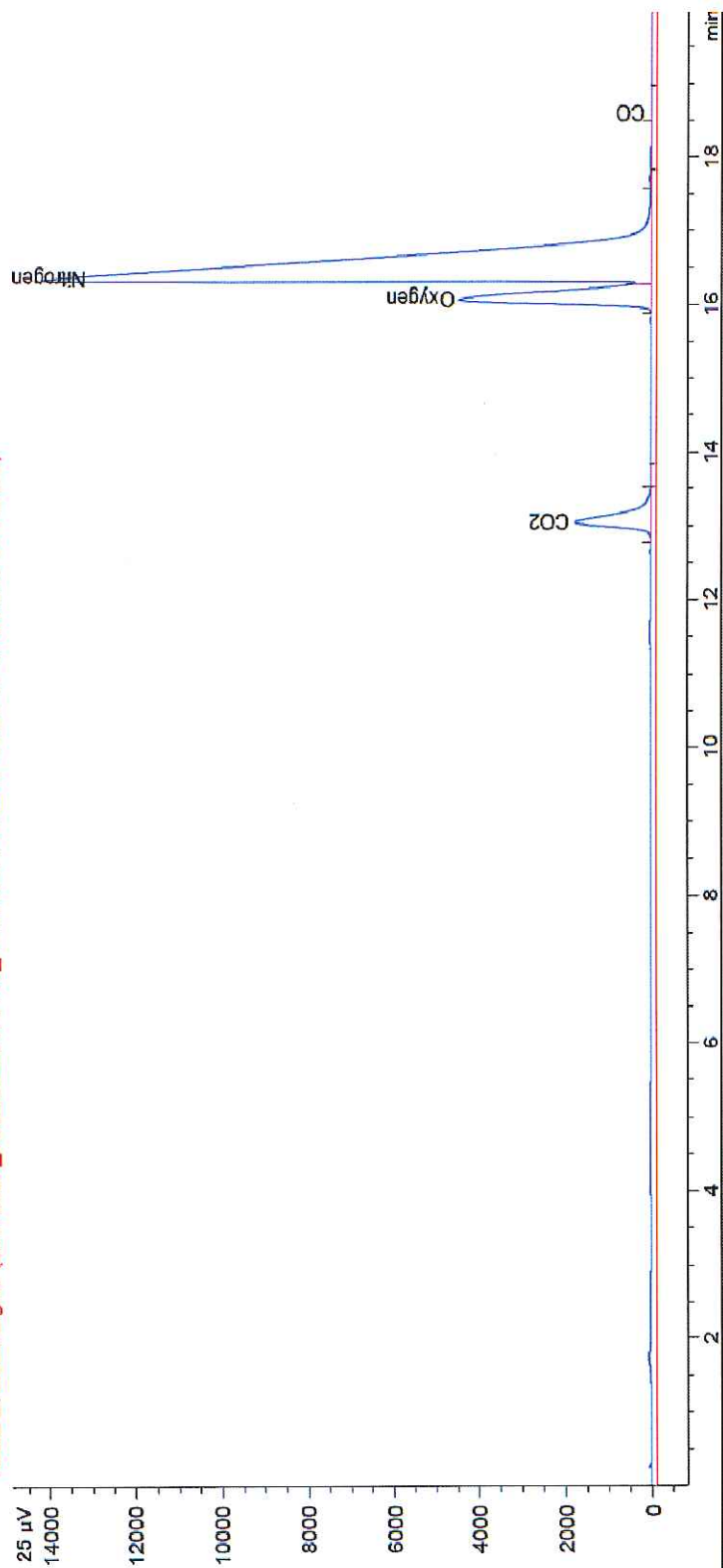
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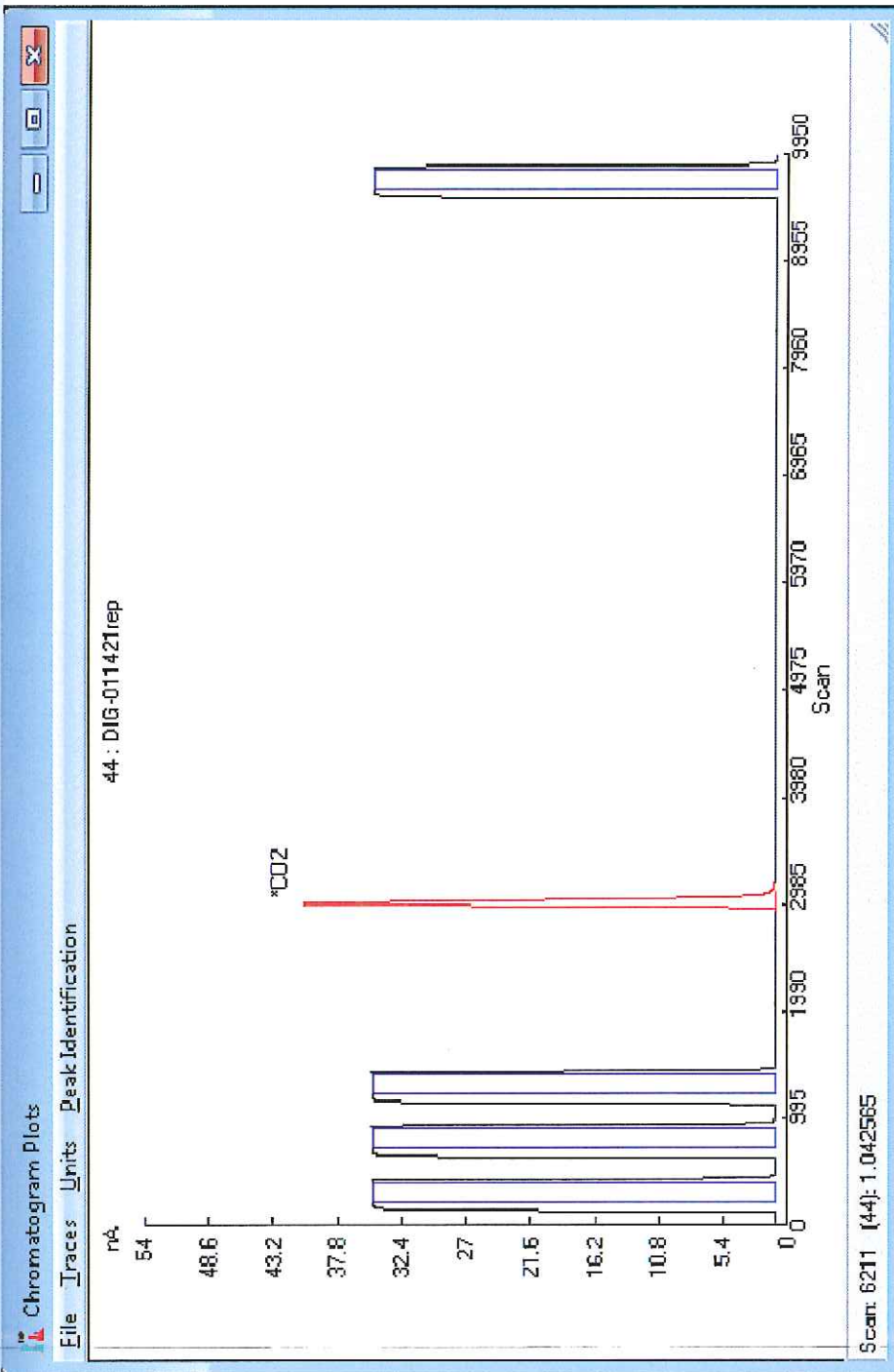


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26)DIG-011421.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26)DIG-011421.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011429  
**Client:** Vista Geoscience  
**Sample Name(s):** VW140627171444

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011429  
 Client: Vista Geoscience  
 Sample Name: VW140627171444  
 Date Sampled: 06/27/17  
 Time Sampled: 14:44  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	763040	77.15	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	198393	20.06	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	27548	2.79	-	-19.9	-	
Carbon Monoxide (CO)	16	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



**dig**  
Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>-C<sub>6</sub>+

RSK-175<sup>®</sup>  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>-C<sub>6</sub>+,  
with dissolved Cl<sub>2</sub>, C<sub>2</sub> & C<sub>3</sub>

δ<sup>13</sup>C Methane (Carbon)

δD Methane (Hydrogen)

δ<sup>13</sup>C Ethane-pentane  
(C<sub>2</sub>-C<sub>5</sub> if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X	X	X	X	Comments
	VW 42	062717	1030	X		X	X	
	VW 23	062717	1439	X		X	X	+D13C CO2
	VW 33	062717	1334	X		X	X	+D13C CO2
	VW 40	062717	1204	X		X	X	+D13C CO2
	VW 14	062717	1444	X		X	X	+D13C CO2
	VW 25	062717	1258	X		X	X	+D13C CO2
	VW 38	062717	1132	X		X	X	+D13C CO2
	VW 61	062717	1314	X		X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175: Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

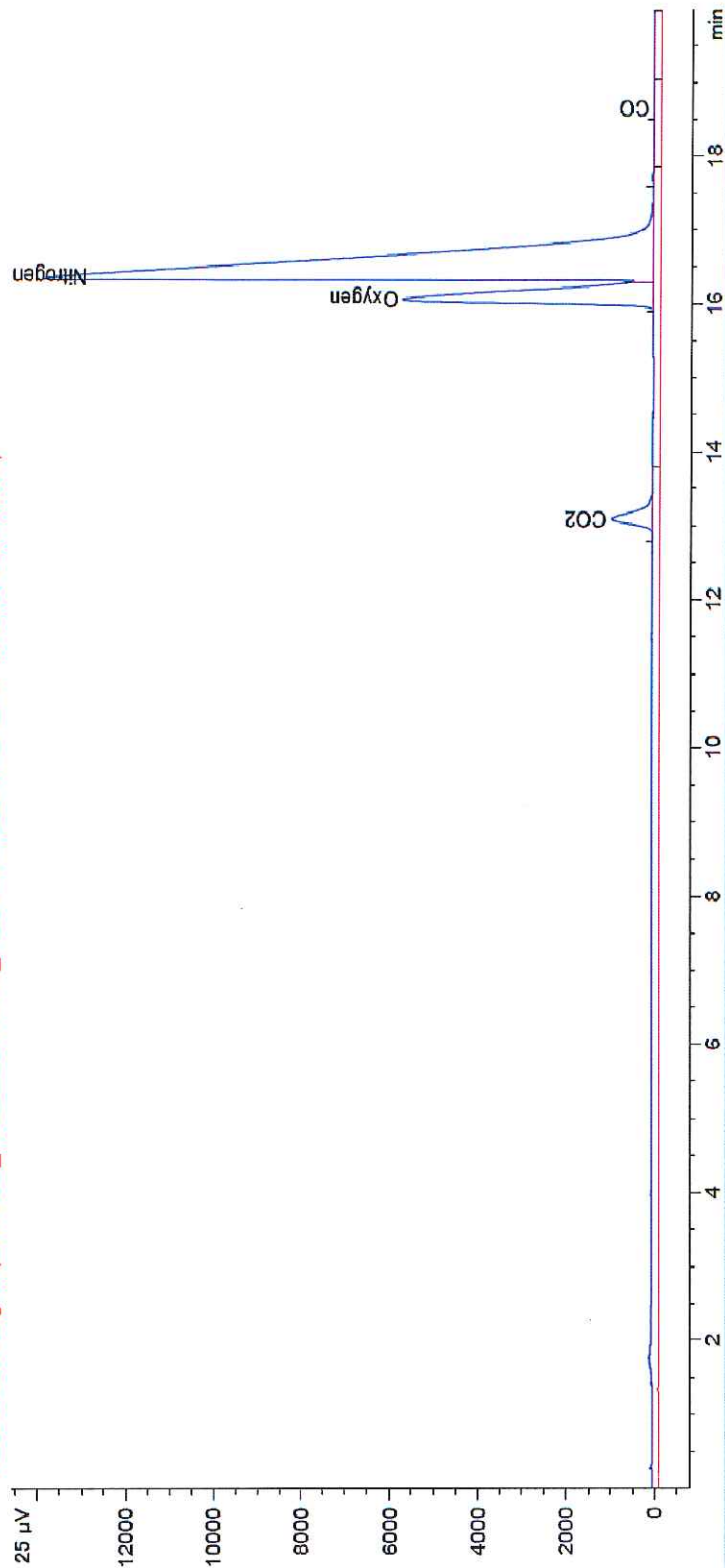


[illegible]

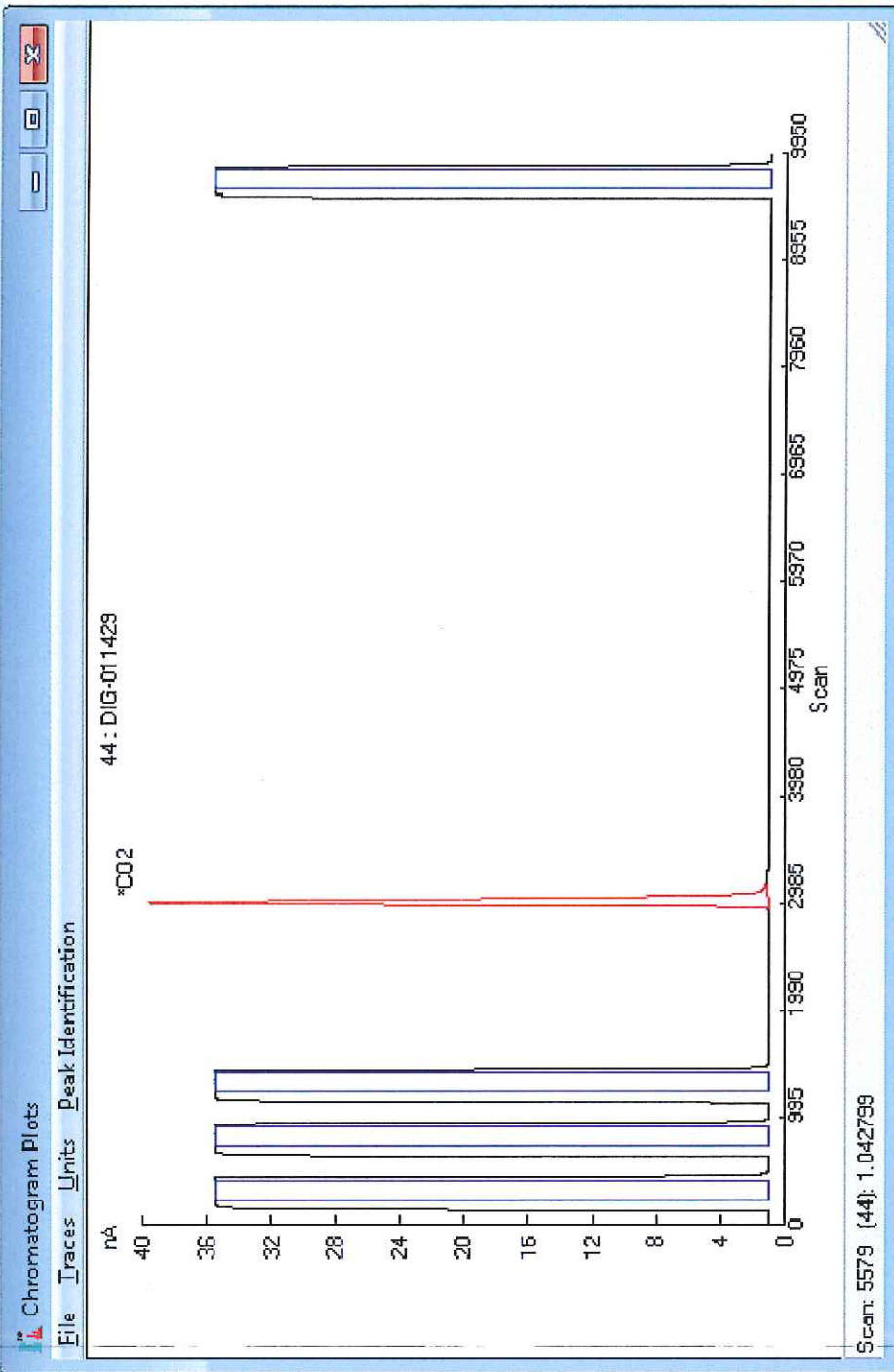


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011429.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011429.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011468  
**Client:** Vista Geoscience  
**Sample Name(s):** VW150628170945

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011468  
 Client: Vista Geoscience  
 Sample Name: VW150628170945  
 Date Sampled: 06/28/17  
 Time Sampled: 9:45  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	796239	78.61	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	206262	20.36	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	10428	1.03	-	-28.7	-	
Carbon Monoxide (CO)	20	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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## Geochemistry for Energy

1317 West 121st Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 17060984 **RUSH!**  
DLG - 011417  
011474

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

Analysis Requested			
Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> C-C <sub>4</sub>	RSK-175* (see comments) H <sub>2</sub> O, CO <sub>2</sub> , He, H <sub>2</sub> C-C <sub>4</sub> with dissolved Cl <sub>2</sub> , Cl <sub>2</sub> & G	δ <sup>13</sup> C Methane (Carbon)	δ <sup>13</sup> C Methane (Hydrogen)
		δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	

## Sample Description

Container #	Sample Identification	Date Sampled	Time	X	X	X	X	Comments
	VW160628171231	6-28-17	12:31	X		X	X	+D13C CO2
	VW0628170945	6-28-17	0945	X		X	X	+D13C CO2
	VW050628171037	6-28-17	10:37	X		X	X	+D13C CO2
	VW040628171239	6-28-17	1239	X		X	X	+D13C CO2
	VW15062817944	6-28-17	9:44	X		X	X	+D13C CO2
	VW110628171142	6-28-17	11:42	X		X	X	+D13C CO2
	VW090628171008	6-28-17	10:08	X		X	X	+D13C CO2
	VW160628171233	6-28-17	12:33	X		X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista GeoScience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DLG</u>	<u>6/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

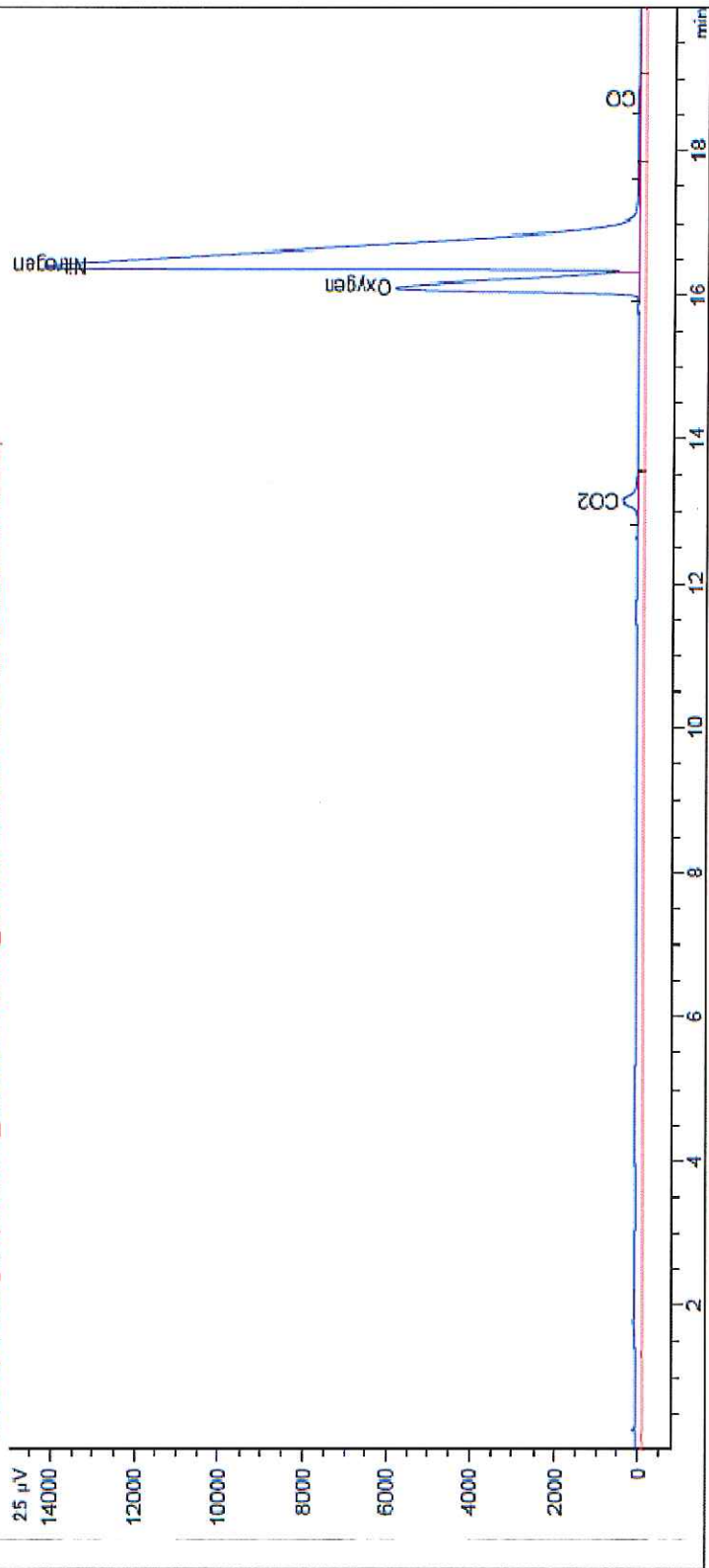




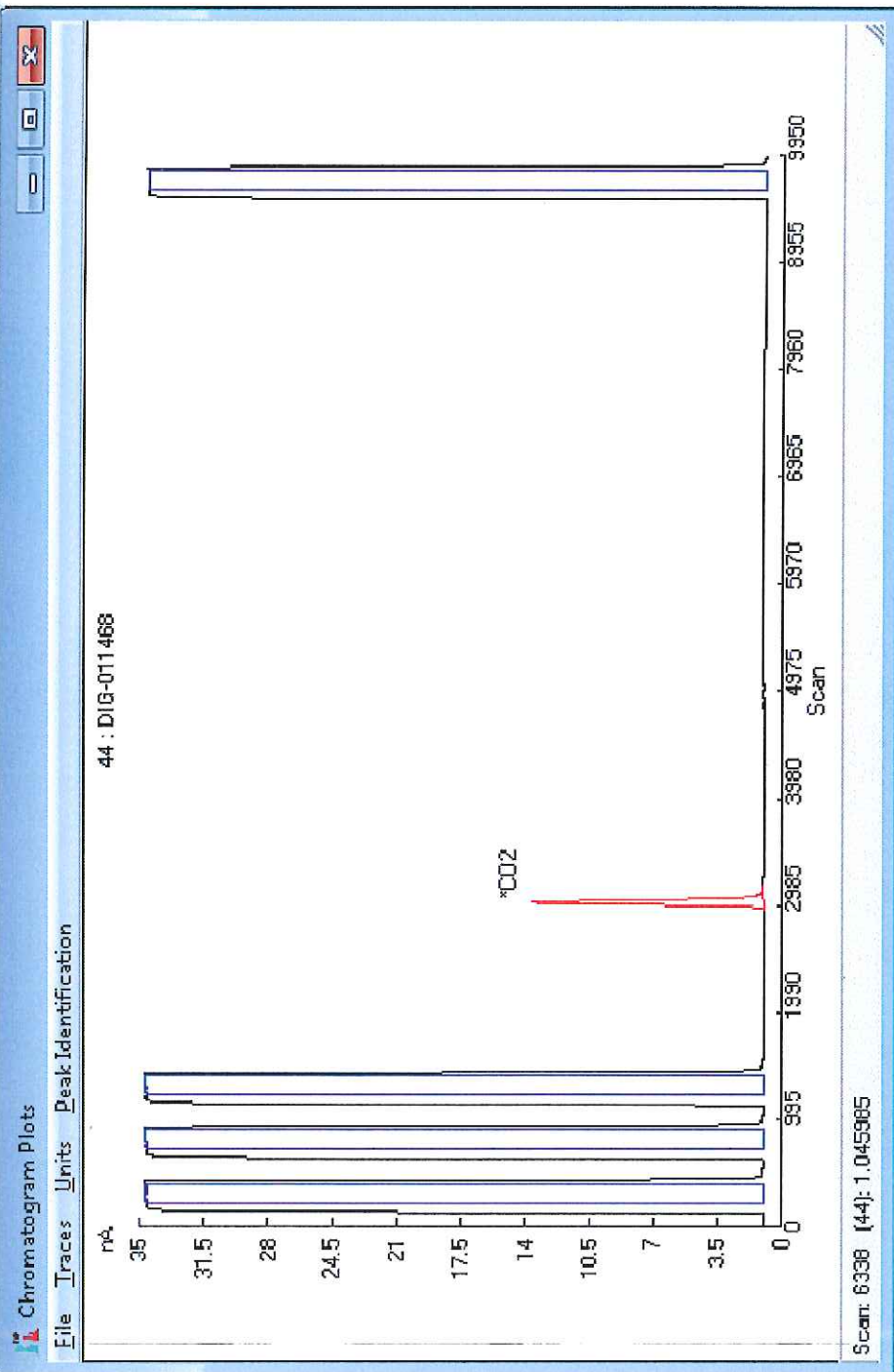
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-29 05-52-05\DIG-011468.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-29 05-52-05\DIG-011468.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011467  
**Client:** Vista Geoscience  
**Sample Name(s):** VW160628171231

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011467  
 Client: Vista Geoscience  
 Sample Name: VW160628171231  
 Date Sampled: 06/28/17  
 Time Sampled: 12:31  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	782462	77.06	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	197814	19.48	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	35139	3.46	-	-22.1	-	
Carbon Monoxide (CO)	17	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰

# Chain of Custody Form



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## Geochemistry for Energy

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Westminster, CO 80234  
p: 303.531.2030

JOB 17060984 **RUSH!**  
DLG-011467-  
011474

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

### Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> H <sub>8</sub>	RSK-175* for composition with dissolved Cl <sub>2</sub> , CO <sub>2</sub> & CH <sub>4</sub>	δ <sup>13</sup> C Methane (Carbon)	δD Methane (Hydrogen)	δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> - C <sub>5</sub> if present)	
	VW160628171231	6-28-17	12:31	X		X	X	X	+D13C CO2
	VW0628170945	6-28-17	0945	X		X	X	X	+D13C CO2
	VW050628171037	6-28-17	10:37	X		X	X	X	+D13C CO2
	VW040628171239	6-28-17	12:39	X		X	X	X	+D13C CO2
	VW57062817944	6-28-17	9:44	X		X	X	X	+D13C CO2
	VW110628171142	6-28-17	11:42	X		X	X	X	+D13C CO2
	VW090628171008	6-28-17	10:08	X		X	X	X	+D13C CO2
	VW160628171233	6-28-17	12:33	X		X	X	X	+D13C CO2

### Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista GeoScience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DLG</u>	<u>6/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

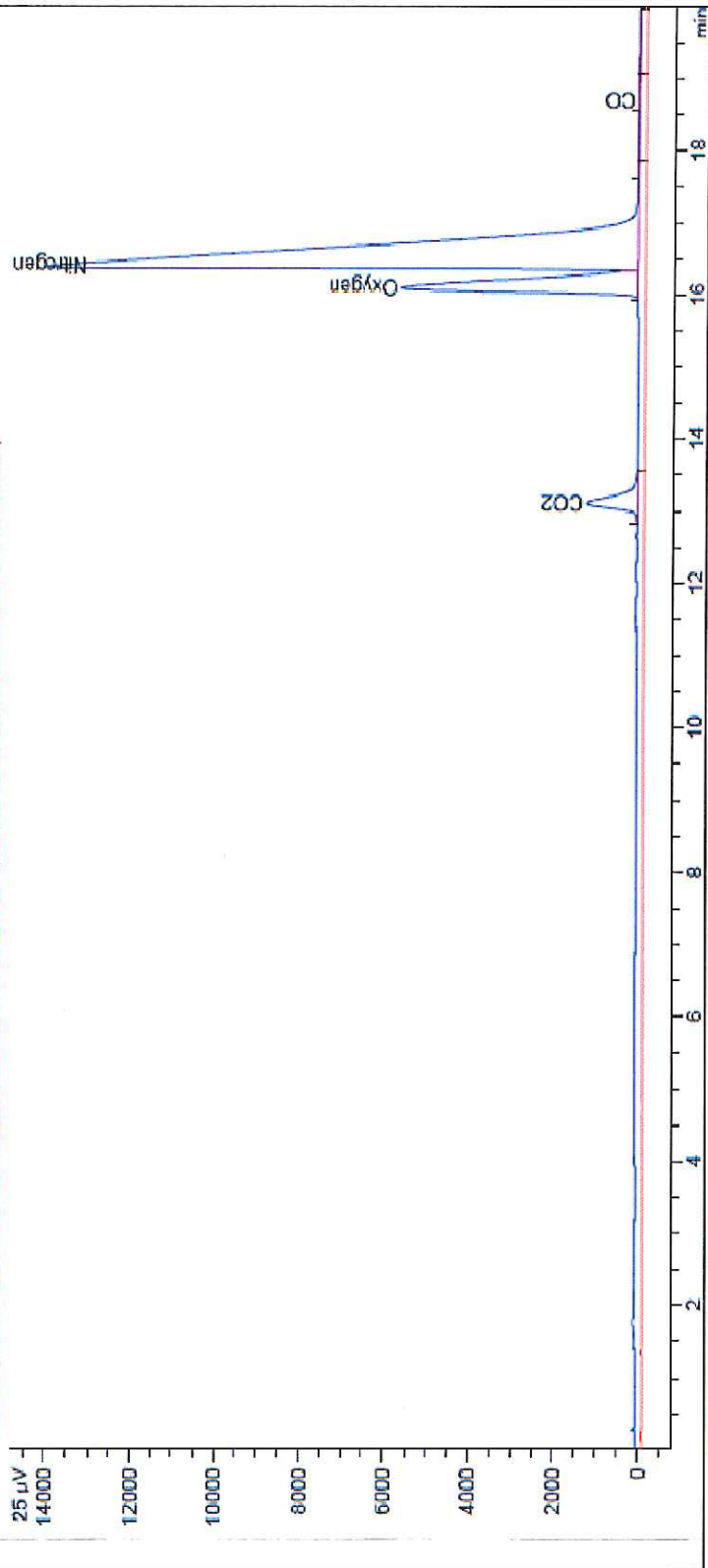
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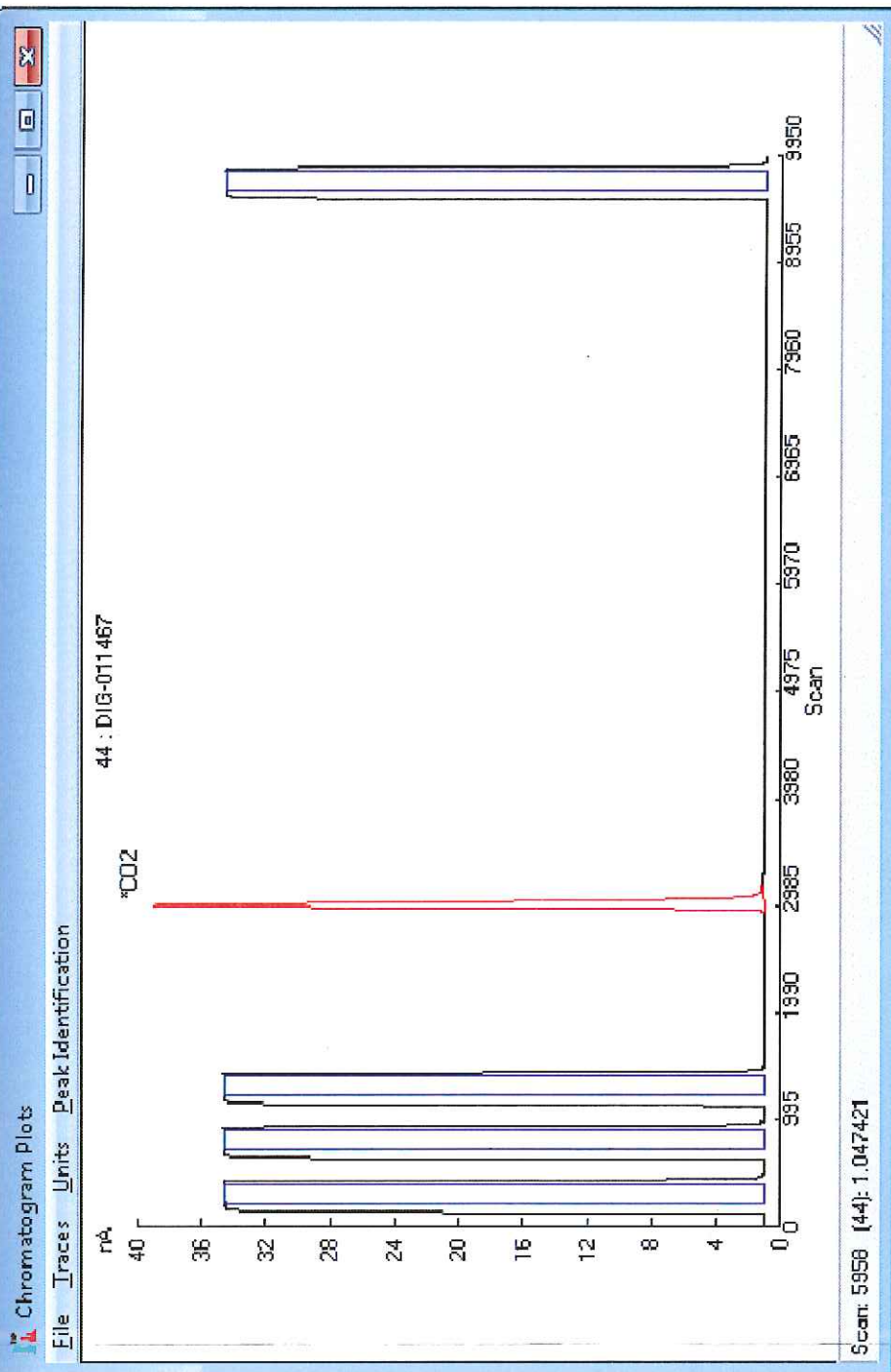
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB8982120170119\_JOB785JARS 2017-06-29 05:52-05:55) DIG-011467.D)  
TCD2 B, Back Signal (20170626\_JOB8982120170119\_JOB785JARS 2017-06-29 05:52-05:55) DIG-011467.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011474  
**Client:** Vista Geoscience  
**Sample Name(s):** VW160628171233

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011474  
 Client: Vista Geoscience  
 Sample Name: VW160628171233  
 Date Sampled: 06/28/17  
 Time Sampled: 12:33  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/30/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	785938	77.08	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	197432	19.36	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	36286	3.56	-	-22.1	-	
Carbon Monoxide ( $\text{CO}$ )	17	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Dolan Integration Group

## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 17060984 RUSH!  
DIG - 0114167-  
011474

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

Analysis Requested			
Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175* (see composition) H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> with dissolved Cl <sub>2</sub> , Cl <sub>2</sub> & C <sub>2</sub> H <sub>6</sub>	87°C Methane (Carbon)	87°C Methane (Hydrogen)
		87°C Ethane-Pentane (C <sub>2</sub> to C <sub>5</sub> if present)	

## Sample Description

Container #	Sample Identification	Date Sampled	Time	X	X	X	X	Comments
	VW160628171231	6-28-17	12:31	X	X	X	X	+D13C CO2
	VW0628170945	6-28-17	0945	X	X	X	X	+D13C CO2
	VW050628171037	6-28-17	10:37	X	X	X	X	+D13C CO2
	VW040628171239	6-28-17	12:39	X	X	X	X	+D13C CO2
	VW57062817944	6-28-17	9:44	X	X	X	X	+D13C CO2
	VW110628171142	6-28-17	11:42	X	X	X	X	+D13C CO2
	VW090628171008	6-28-17	10:08	X	X	X	X	+D13C CO2
	VW160628171233	6-28-17	12:33	X	X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista GeoScience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

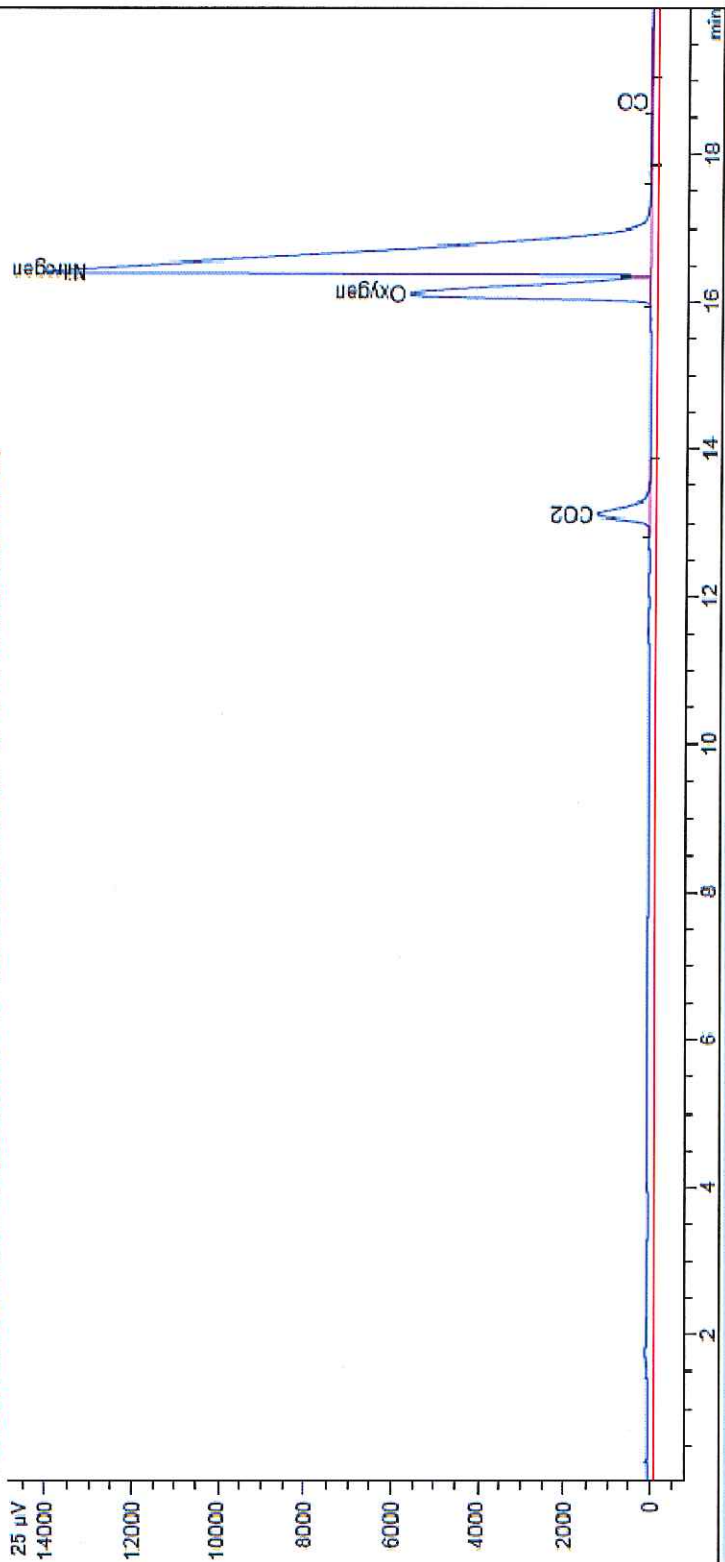
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030



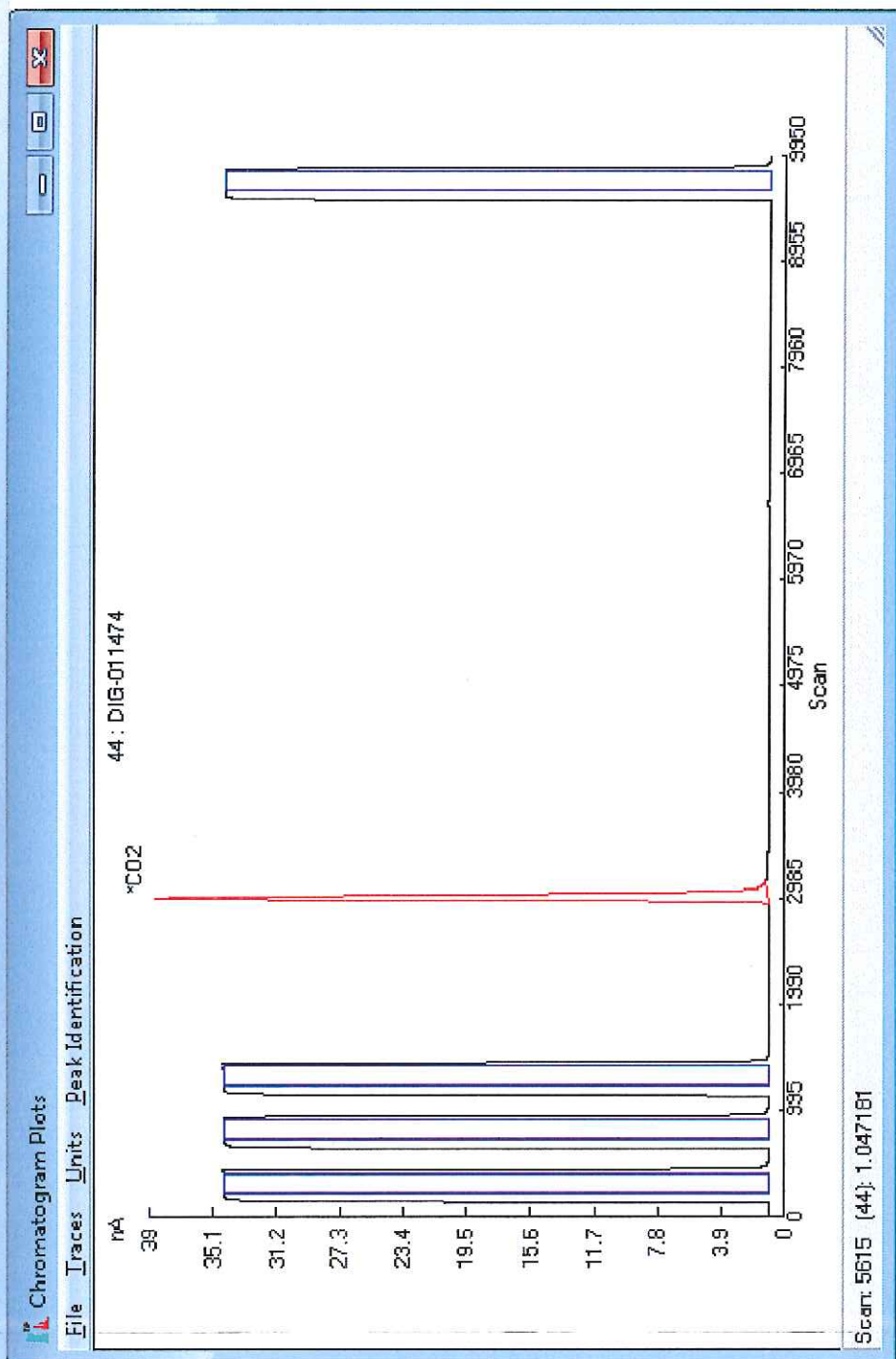
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-29 05-52-05\DIG-011474.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-29 05-52-05\DIG-011474.D)



Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011460  
**Client:** Vista Geoscience  
**Sample Name(s):** VW170628171108

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

Dolan Integration Group shall use commercially reasonable efforts to maintain the Samples it receives from Customer in the condition in which same were initially received, and shall store, free of charge, any portion(s) of the Sample(s) not consumed or altered in the course of testing and analysis for a period of 90 days after their initial receipt, after which time the Samples will be destroyed. At Customer's written request and expense, Dolan Integration Group shall return unused Samples to Customer. At Customer's written request, Dolan Integration Group will also store and maintain Customer's Samples beyond the Free Storage Period for a monthly fee in accordance with Dolan Integration Group's the current storage rates. If Customer fails to timely pay any applicable storage charges, Dolan Integration Group shall

# Analytical Report



Job #: 17060984  
 Lab #: DIG-011460  
 Client: Vista Geoscience  
 Sample Name: VW170628171108  
 Date Sampled: 06/28/17  
 Time Sampled: 11:08  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	774246	77.54	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	179604	17.99	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	44641	4.47	-	-20.6	-	
Carbon Monoxide (CO)	18	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 1706984  
DIG 011454-011466  
Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firesone  
Sampled By: JMT

## Sample Description

agorody@gmail.com

Analysis Requested					
Gas Composition*					
H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>6</sub> +					
RSK-175* (see composition)					
H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>6</sub> +					
with dissolved Cl <sup>-</sup> , C <sub>2</sub> & C <sub>3</sub>					
δ <sup>13</sup> C Methane (Carbon)					
δD Methane (Hydrogen)					
δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)					

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW060628171044	6-28-17	10:44	X		X	X	X	+D13C CO2
	VW170628171108	6-28-17	11:08	X		X	X	X	+D13C CO2
	VW100628171003	6-28-17	10:03	X		X	X	X	+D13C CO2
	VW050628171039	6-28-17	10:39	X		X	X	X	+D13C CO2
	VW190628171059	6-28-17	10:59	X		X	X	X	+D13C CO2
	VW560628171027	6-28-17	10:27	X		X	X	X	+D13C CO2
	VW630628171019	6-28-17	10:19	X		X	X	X	+D13C CO2
	VW070628171052	6-28-17	10:52	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geoscience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>06/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

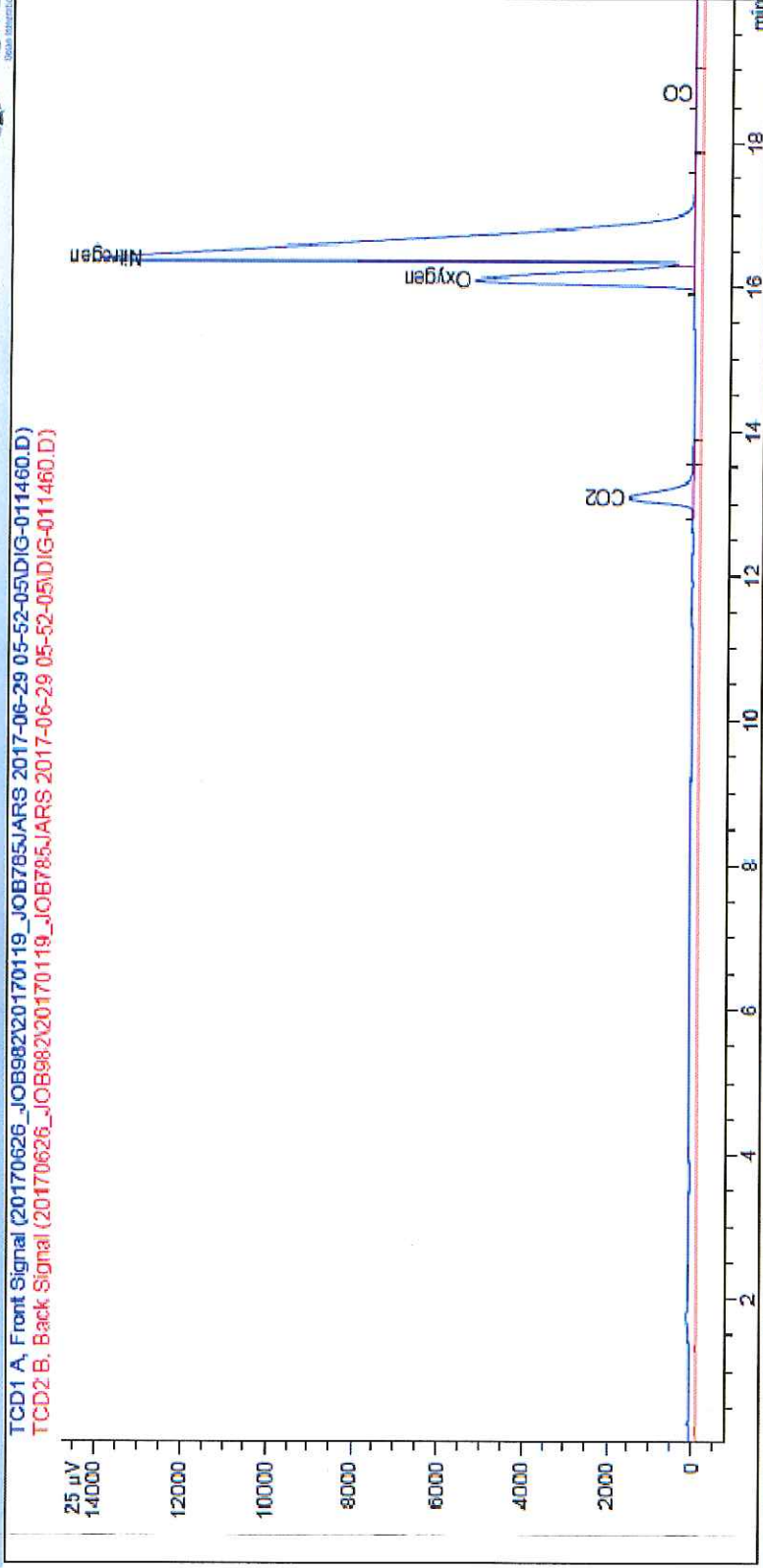




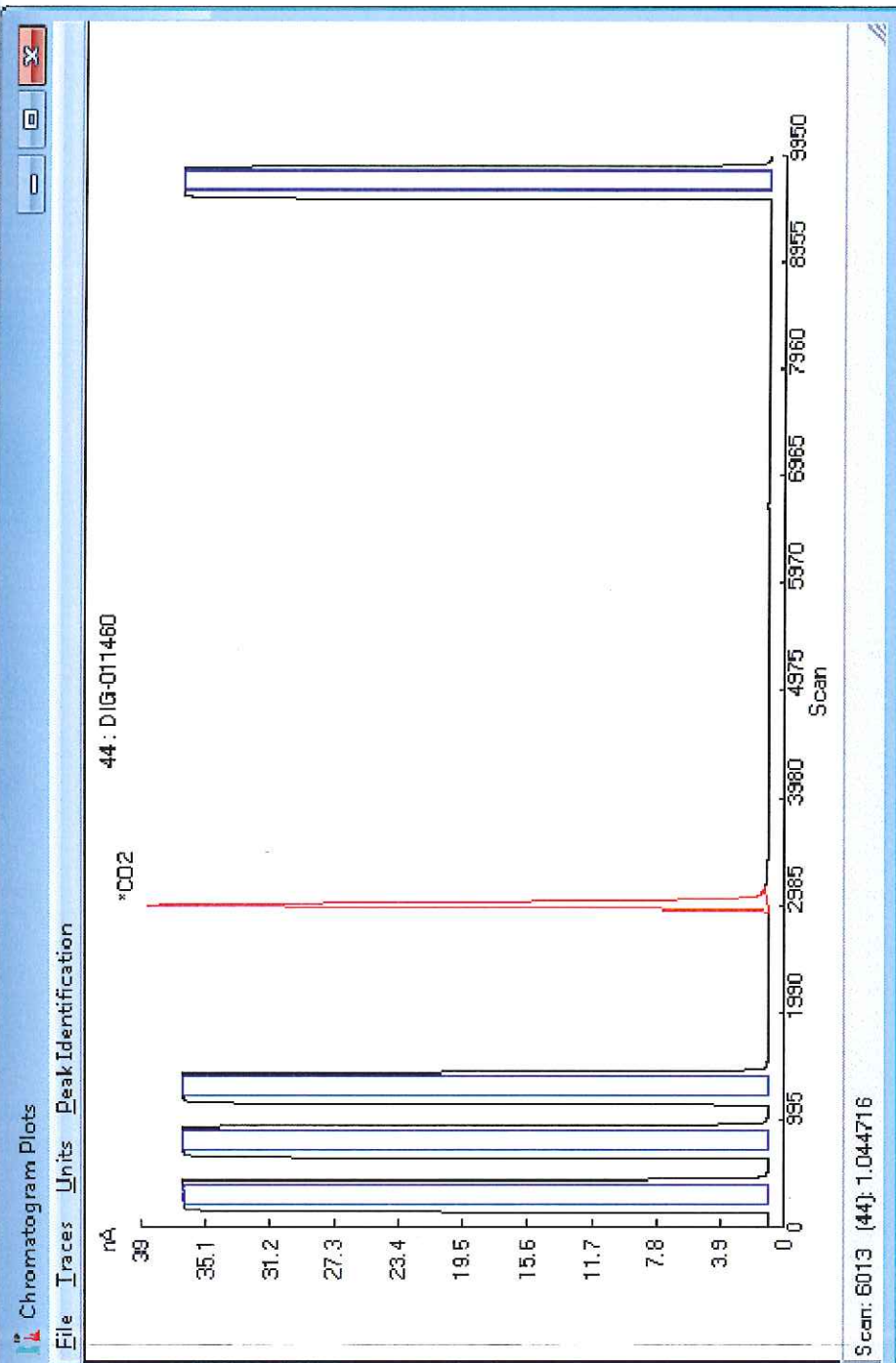
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982120170119\_JOB785JARS 2017-06-29 05-52-05)DIG-011460.D)  
TCD2 B, Back Signal (20170626\_JOB982120170119\_JOB785JARS 2017-06-29 05-52-05)DIG-011460.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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**Geochemistry for Energy**

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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011419  
**Client:** Vista Geoscience  
**Sample Name(s):** VW180627171246

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011419  
 Client: Vista Geoscience  
 Sample Name: VW180627171246  
 Date Sampled: 06/27/17  
 Time Sampled: 12:46  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	797647	79.99	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	135569	13.59	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	63979	6.42	-	-23.5	-	
Carbon Monoxide ( $\text{CO}$ )	13	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + / \text{C}_1 +$ )	
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested						Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>1</sub> -C <sub>4</sub>	RSK-175 <sup>®</sup> (gas composition) N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>1</sub> -C <sub>4</sub> * with dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	gC <sub>1</sub> Methane (Carbon)	gC <sub>2</sub> Ethane (Carbon)	gC <sub>3</sub> Propane (Carbon)	gC <sub>4</sub> Butane (Carbon)	
	VW 54	062717	1032	X		X	X	X		+D13C CO2
	VW 49	062717	1117	X		X	X	X		+D13C CO2
	VW 18	062717	1246	X		X	X	X		+D13C CO2
	VW 43	062717	1043	X		X	X	X		+D13C CO2
	VW 13	062717	1241	X		X	X	X		+D13C CO2
	VW 55	062717	1343	X		X	X	X		+D13C CO2
	VW 47	062717	1210	X		X	X	X		+D13C CO2
	VW 24	062717	1401	X		X	X	X		+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

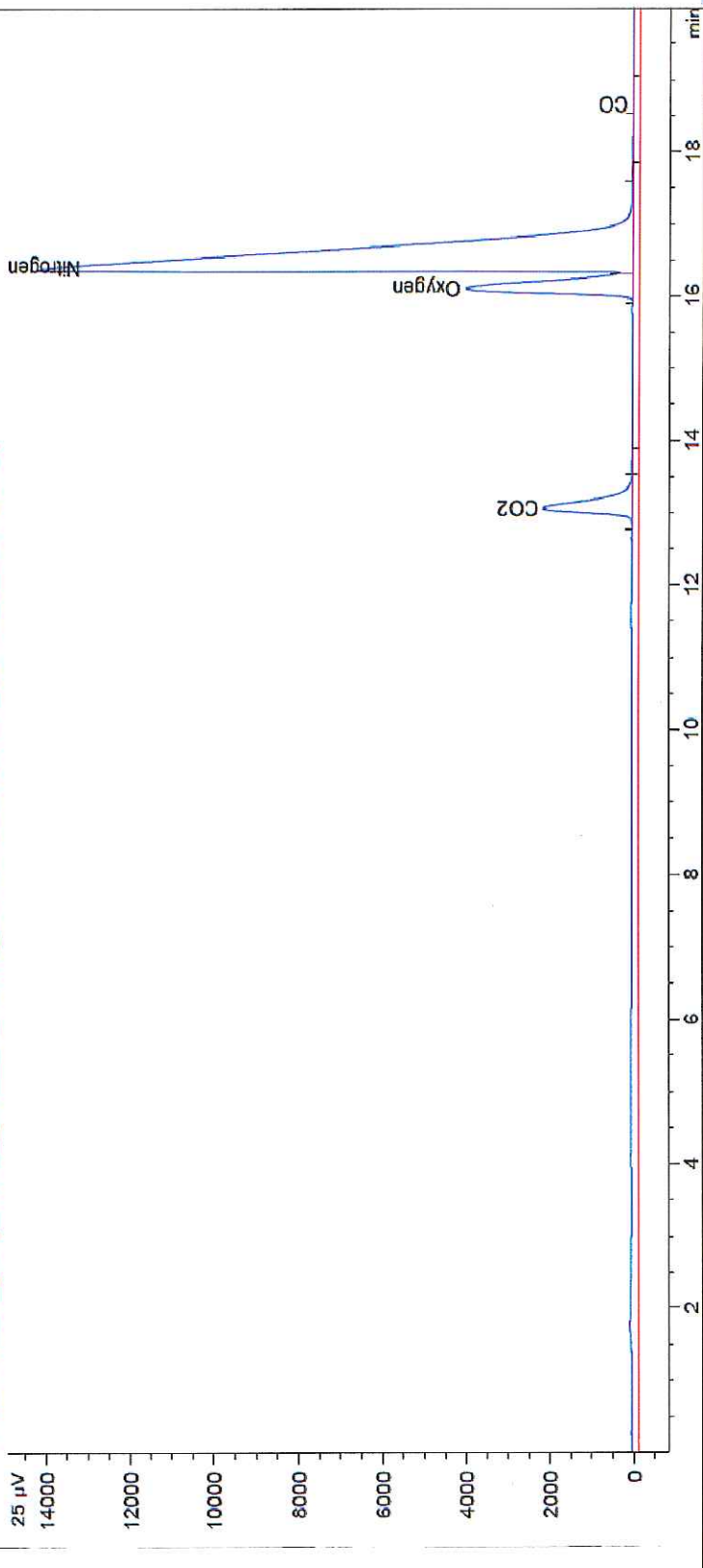
Organization	Reporting Organization	Reporting Organization Name	Order Number	Entity Requesting Analysis	Purpose	Project	Project Number	Chain of Custody ID	Date Received by Lab	Final Vol Units	Final Vol Units	Analysis Date and Time	Report Basis	Comments	File Name	Column #	Instrument Detection Limit	Method Detection Limit	Comments
Sample	COGCC Facility No.	Sample Date and Time	API #	Lab Sample ID	Sample Type	Matrix	Comments	Project Number	Chain of Custody ID	Final Vol Units	Final Vol Units	Analysis Date and Time	Report Basis	Comments	File Name	Column #	Instrument Detection Limit	Method Detection Limit	Comments
Batch	LabID	Lab Sample Date and Time	Lab Sample ID	Lab Sample ID	Sample Type	Matrix	Comments	Project Number	Chain of Custody ID	Final Vol Units	Final Vol Units	Analysis Date and Time	Report Basis	Comments	File Name	Column #	Instrument Detection Limit	Method Detection Limit	Comments
Result	CAS Number	Analysis Name	Analysis Method	Analysis Method	Unit	Result Value	Qualifier	Test Type	Result Text	Data Flag	Dilution	Fraction Type	MDC	Requested MDC	Detection Limit	Column #	Instrument Detection Limit	Method Detection Limit	Comments
	024-91	COGEN + ARION	SOP	SOP	MOL %	11.60									0.005	0.005	0.005	0.005	17600913
	124-38-9	CARBON DIOXIDE	SOP	SOP	MOL %	8.42									0.005	0.005	0.005	0.005	17600913
	630-08-0	CARBON MONOXIDE	SOP	SOP	MOL %	0.00									0.005	0.005	0.005	0.005	17600913
	7440-59-7	Helium	SOP	SOP	MOL %	0.01	ND								0.005	0.005	0.005	0.005	17600913
	1333-74-0	HYDROGEN	SOP	SOP	MOL %	0.01	ND								0.005	0.005	0.005	0.005	17600913
	74-82-8	METHANE	SOP	SOP	MOL %	0.01	ND								0.005	0.005	0.005	0.005	17600913
	74-84-6	ETHANE	SOP	SOP	MOL %	0.01	ND								0.005	0.005	0.005	0.005	17600913
	74-98-6	PROPANE	SOP	SOP	MOL %	0.01	ND								0.005	0.005	0.005	0.005	17600913
	115-07-1	ISOBUTANE	SOP	SOP	MOL %	0.01	ND								0.005	0.005	0.005	0.005	17600913
	75-28-5	ISOBUTANE	SOP	SOP	MOL %	0.01	ND								0.005	0.005	0.005	0.005	17600913
	108-97-8	ISOPENTANE	SOP	SOP	MOL %	0.01	ND								0.005	0.005	0.005	0.005	17600913
	109-66-0	N-PENTANE	SOP	SOP	MOL %	0.01	ND								0.005	0.005	0.005	0.005	17600913
	92113-69-1	C6+ (Hexanes +)	SOP	SOP	MOL %	0.01	ND								0.005	0.005	0.005	0.005	17600913
	delta13C_C1	delta13C_C1	SOP	SOP	per mil	nd	ND								0.005	0.005	0.005	0.005	17600913
	delta13C_C2	delta13C_C2	SOP	SOP	per mil	nd	ND								0.005	0.005	0.005	0.005	17600913
	delta13C_C3	delta13C_C3	SOP	SOP	per mil	nd	ND								0.005	0.005	0.005	0.005	17600913
	delta13C_C4	delta13C_C4	SOP	SOP	per mil	nd	ND								0.005	0.005	0.005	0.005	17600913
	delta13C_nC4	delta13C_nC4	SOP	SOP	per mil	nd	ND								0.005	0.005	0.005	0.005	17600913
	delta13C_nC5	delta13C_nC5	SOP	SOP	per mil	nd	ND								0.005	0.005	0.005	0.005	17600913
	delta13C_nC6	delta13C_nC6	SOP	SOP	per mil	nd	ND								0.005	0.005	0.005	0.005	17600913
	delta13C_C00	delta13C_C00	SOP	SOP	per mil	-23.5	ND								0.005	0.005	0.005	0.005	17600913



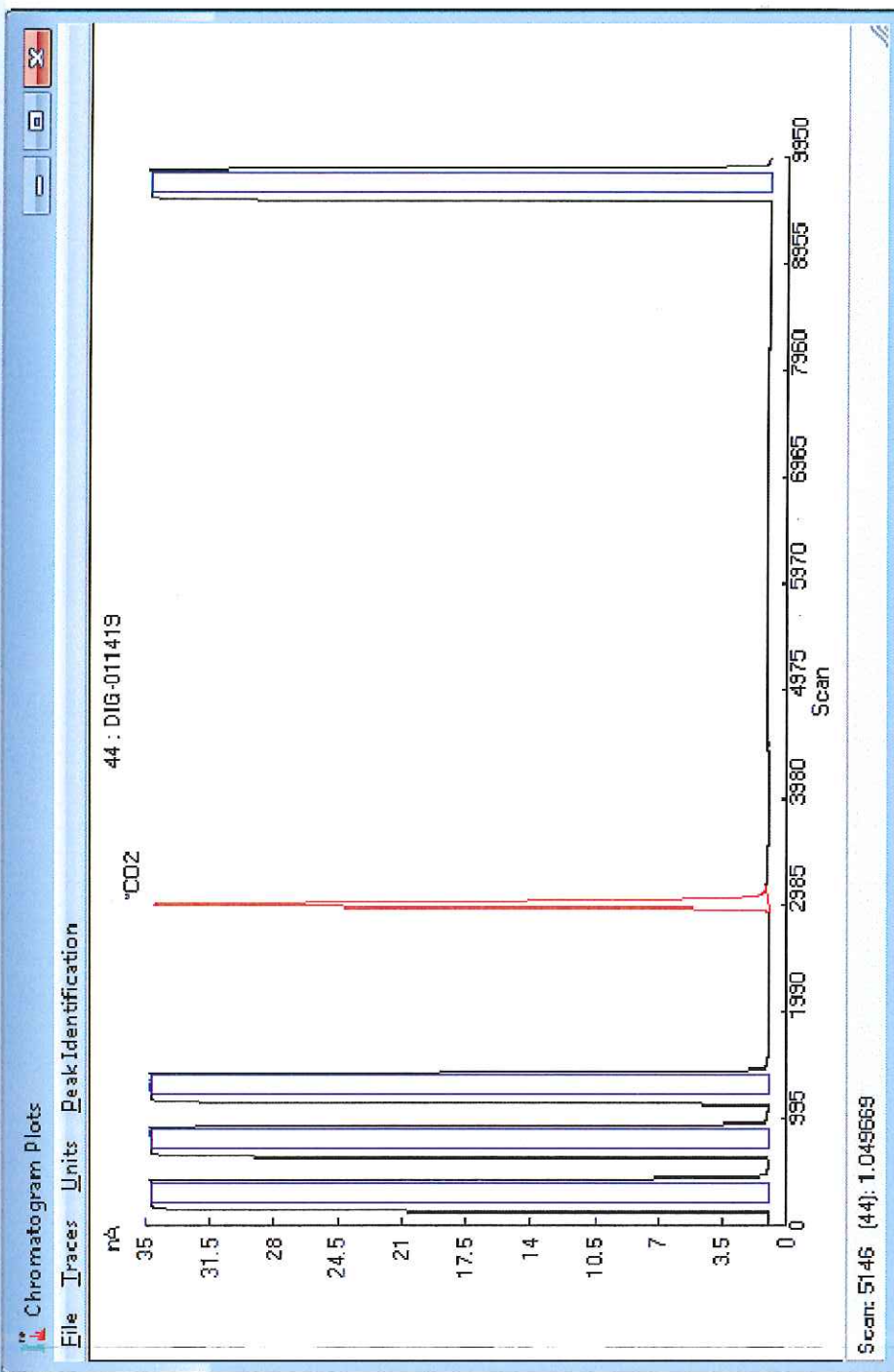


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011419.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011419.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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Dolan Integration Group

## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060984  
**Lab #:** DIG-011463  
**Client:** Vista Geoscience  
**Sample Name(s):** VW190628171059

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011463  
 Client: Vista Geoscience  
 Sample Name: VW190628171059  
 Date Sampled: 06/28/17  
 Time Sampled: 10:59  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	791005	78.82	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	158170	15.76	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	54380	5.42	-	-26.6	-	
Carbon Monoxide (CO)	15	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰

# Chain of Custody Form



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Westminster, CO 80234  
p: 303.531.2030

JOB 1706A84  
DIG 011454-011466  
Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMT

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub>	RSK-175* Gas composition N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub> with dissolved Cl <sub>2</sub> , CO <sub>2</sub> & O <sub>3</sub>	δ <sup>13</sup> C Methane (Carbon)	δD Methane (Hydrogen)	δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	
	VW060628171044	6-28-17	10:44	X		X	X	X	+D13C CO <sub>2</sub>
	VW170628171108	6-28-17	11:08	X		X	X	X	+D13C CO <sub>2</sub>
	VW100628171003	6-28-17	10:03	X		X	X	X	+D13C CO <sub>2</sub>
	VW050628171039	6-28-17	10:39	X		X	X	X	+D13C CO <sub>2</sub>
	VW190628171059	6-28-17	10:59	X		X	X	X	+D13C CO <sub>2</sub>
	VW060628171027	6-28-17	10:27	X		X	X	X	+D13C CO <sub>2</sub>
	VW060628171019	6-28-17	10:19	X		X	X	X	+D13C CO <sub>2</sub>
	VW070628171052	6-28-17	10:52	X		X	X	X	+D13C CO <sub>2</sub>

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geoscience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>06/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

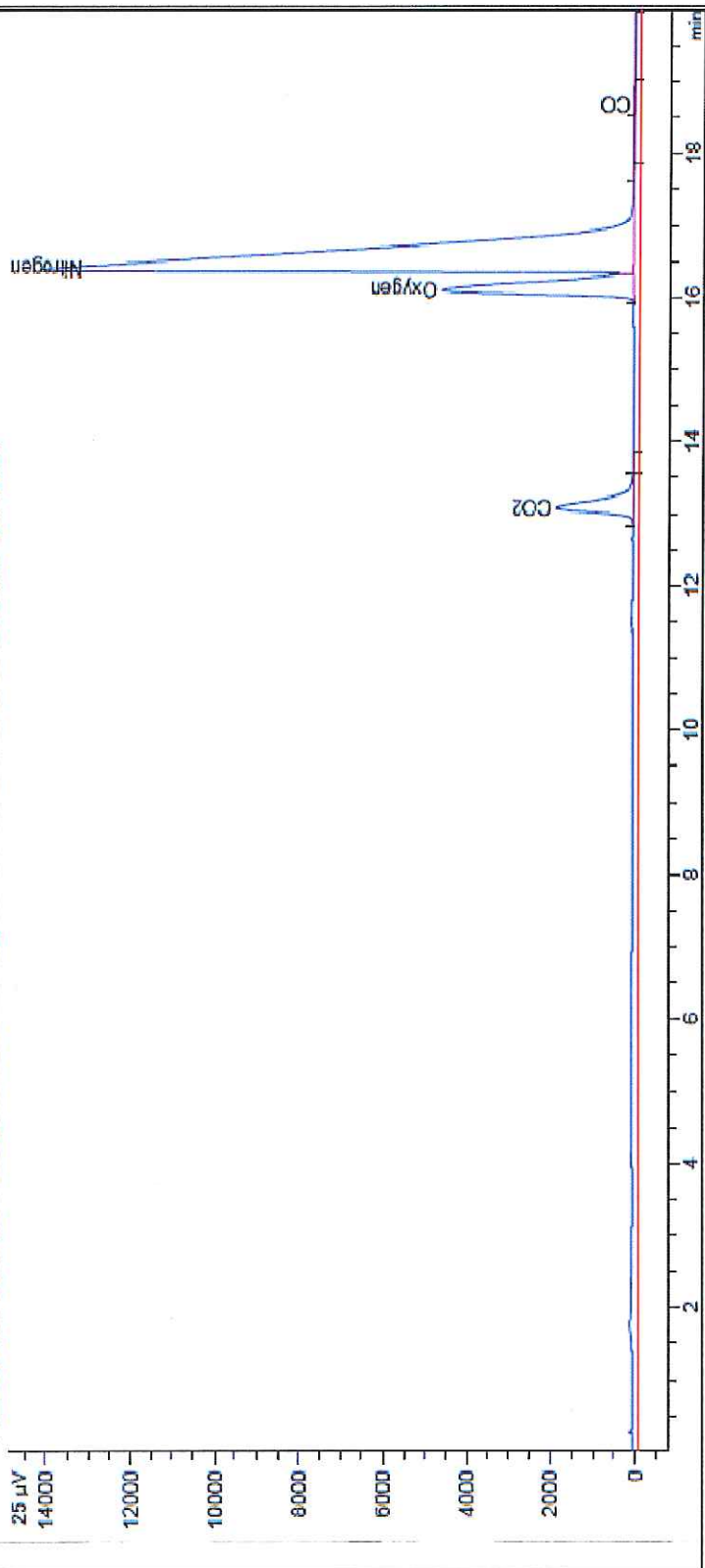
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030





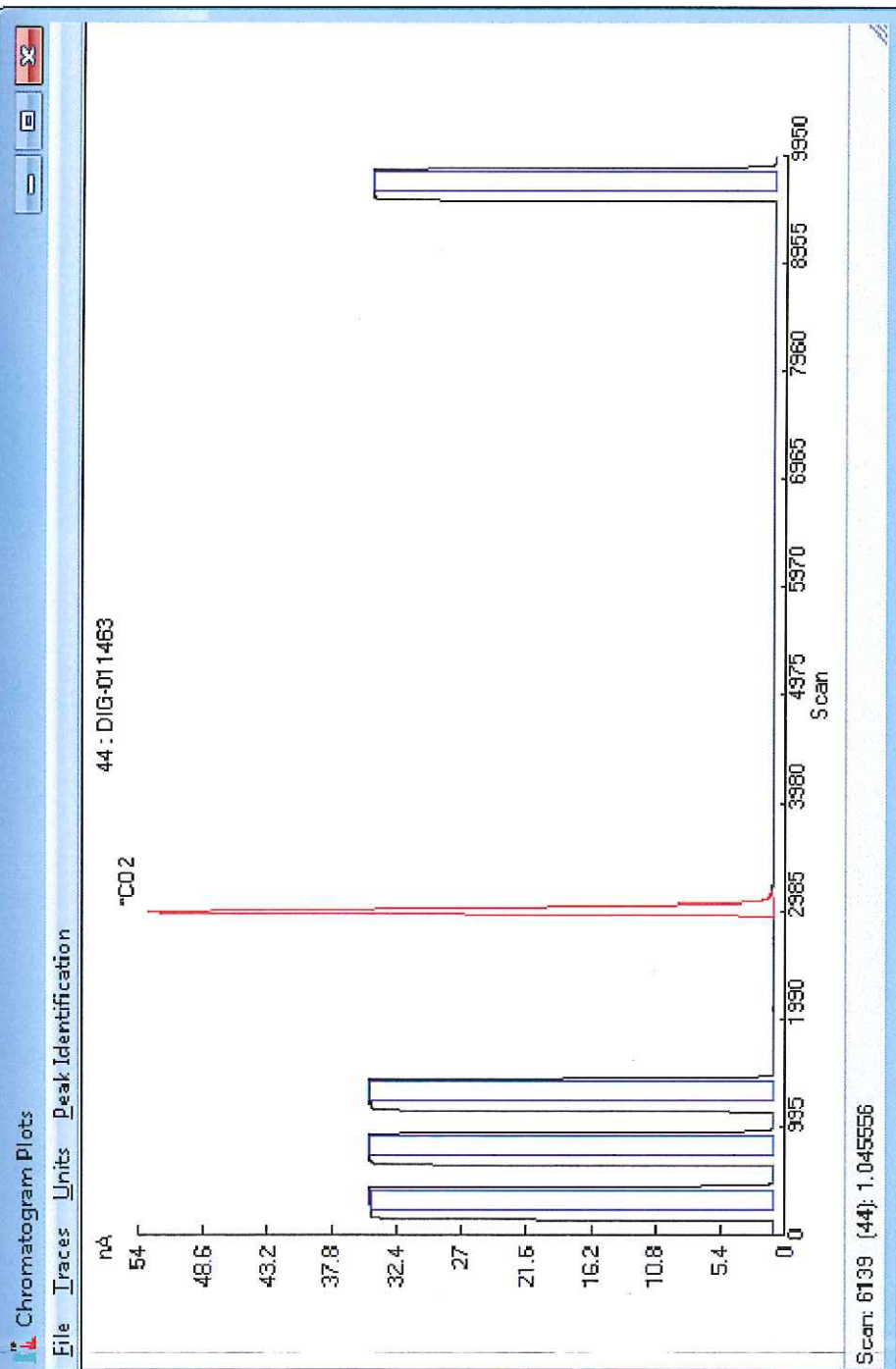
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB8982\20170119\_JOB8785JARS 2017-06-29 05-52-05\DIG-011463.D)  
TCD2 B, Back Signal (20170626\_JOB8982\20170119\_JOB8785JARS 2017-06-29 05-52-05\DIG-011463.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

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### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060984  
**Lab #:** DIG-011451  
**Client:** Vista Geoscience  
**Sample Name(s):** VW200628171158

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011451  
 Client: Vista Geoscience  
 Sample Name: VW200628171158  
 Date Sampled: 06/28/17  
 Time Sampled: 11:58  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	789978	79.47	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	174711	17.58	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	29315	2.95	-	-25.0	-	
Carbon Monoxide (CO)	16	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	#DIV/0!
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



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JOB 1706984

NTG 04451-011458

Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>1</sub> -C <sub>4</sub> <sup>+</sup>	RSK-175* for composition N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>1</sub> -C <sub>4</sub> <sup>+</sup> with dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	60°C Methane (Carbon)	60°C Methane (Hydrogen)	60°C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	
	VW200628171158	6-28-17	11:58	X		X	X	X	+D13C CO <sub>2</sub>
	VW170628171222	6-28-17	12:22	X		X	X	X	+D13C CO <sub>2</sub>
	VW200628171204	6-28-17	12:04	X		X	X	X	+D13C CO <sub>2</sub>
	VW120628171131	6-28-17	11:31	X		X	X	X	+D13C CO <sub>2</sub>
	VW200628171152	6-28-17	11:52	X		X	X	X	+D13C CO <sub>2</sub>
	VW010628171148	6-28-17	11:48	X		X	X	X	+D13C CO <sub>2</sub>
	VW080628171123	6-28-17	11:23	X		X	X	X	+D13C CO <sub>2</sub>
	VW200628171116	6-28-17	11:16	X		X	X	X	+D13C CO <sub>2</sub>

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by	Vista GeoScience	6/28/17	14:22
Received by	DIG	06/28/17	14:25
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

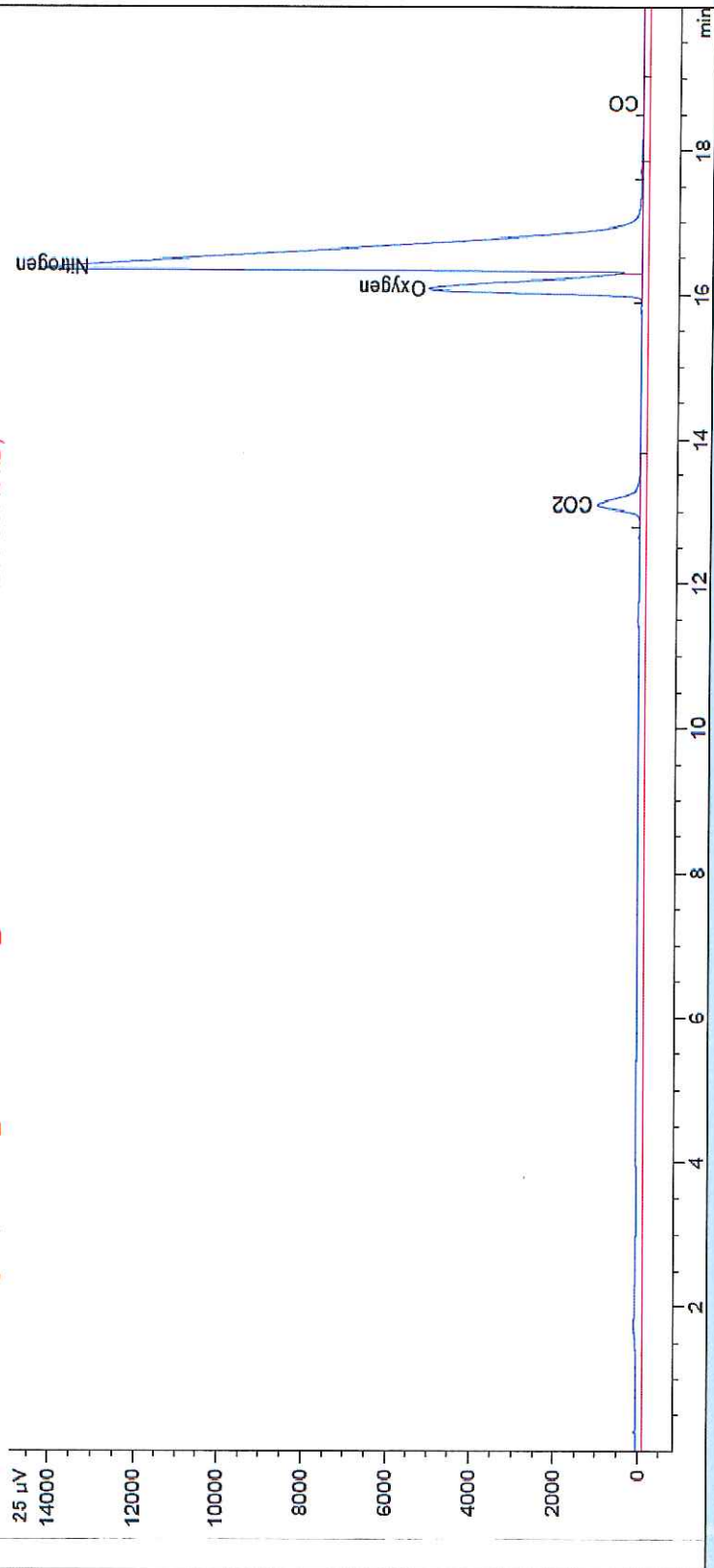
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030



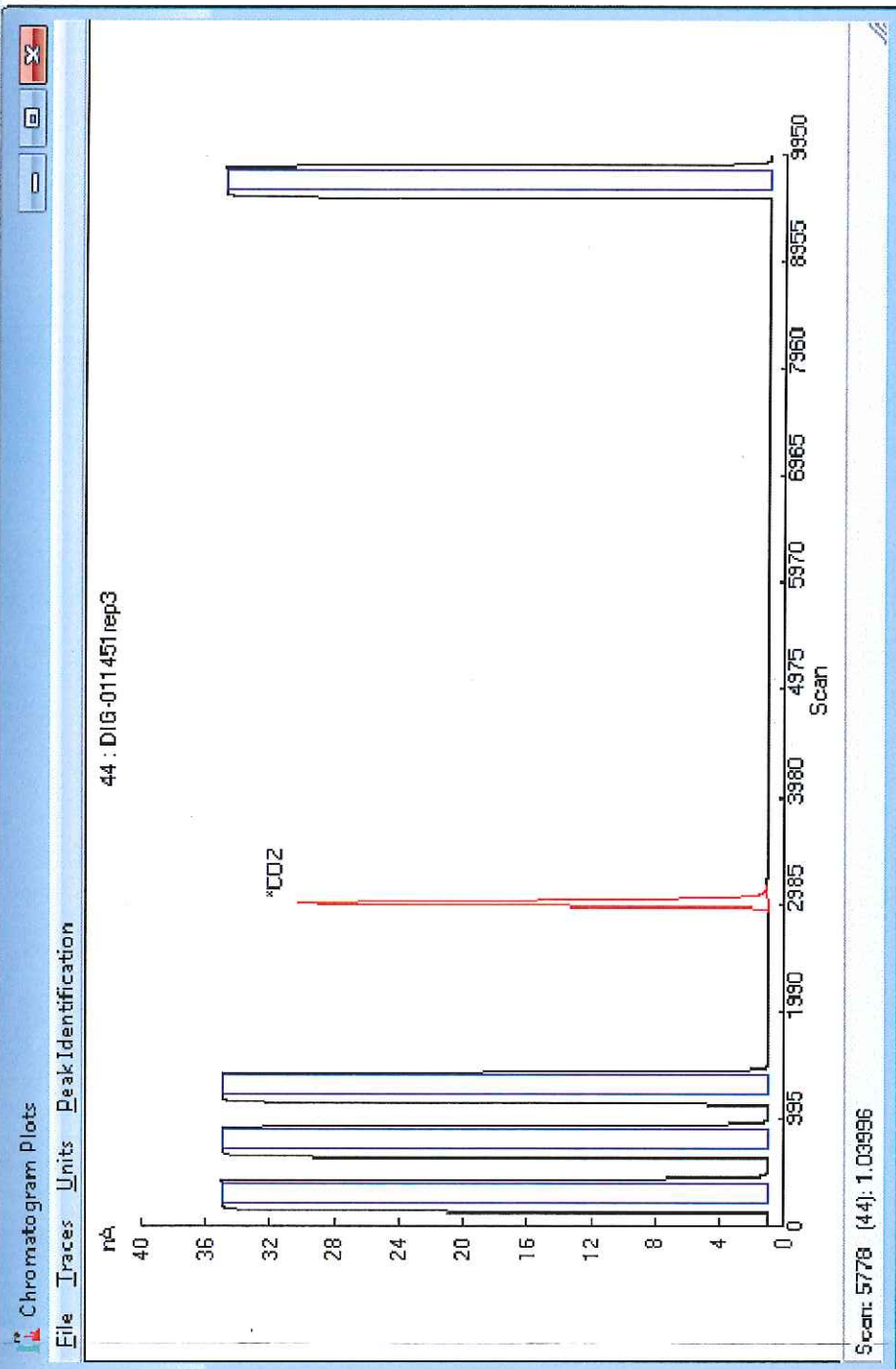
# Gas Chromatography (GC) Chromatogram



TCD1 A. Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011451.D)  
TCD2 B. Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011451.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011475  
**Client:** Vista Geoscience  
**Sample Name(s):** VW210628171227

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011475  
 Client: Vista Geoscience  
 Sample Name: VW210628171227  
 Date Sampled: 06/28/17  
 Time Sampled: 12:27  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/30/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	788739	77.56	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	167284	16.45	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	60914	5.99	-	-24.2	-	
Carbon Monoxide ( $\text{CO}$ )	16	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	#DIV/0!
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Westminster, CO 80234  
p: 303.531.2030

Job 17.060484

DIL-04475-04476

Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JM TS

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>1</sub> -C <sub>4</sub> <sup>+</sup>	RSK-175* for composition with dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	8°C Methane (Carbon)	60 Methane (Hydrogen)	8°C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	
	VW210628171227	062817	1227	X		X	X	X	+D13C CO <sub>2</sub>
	VW450628171253	062817	1253	X		X	X	X	+D13C CO <sub>2</sub>
				X		X	X	X	+D13C CO <sub>2</sub>
				X		X	X	X	+D13C CO <sub>2</sub>
				X		X	X	X	+D13C CO <sub>2</sub>
				X		X	X	X	+D13C CO <sub>2</sub>
				X		X	X	X	+D13C CO <sub>2</sub>
				X		X	X	X	+D13C CO <sub>2</sub>

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	Vista Geoscience	6/28/17	14:27
Received by <u>[Signature]</u>	DIG	6/28/17	14:25
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

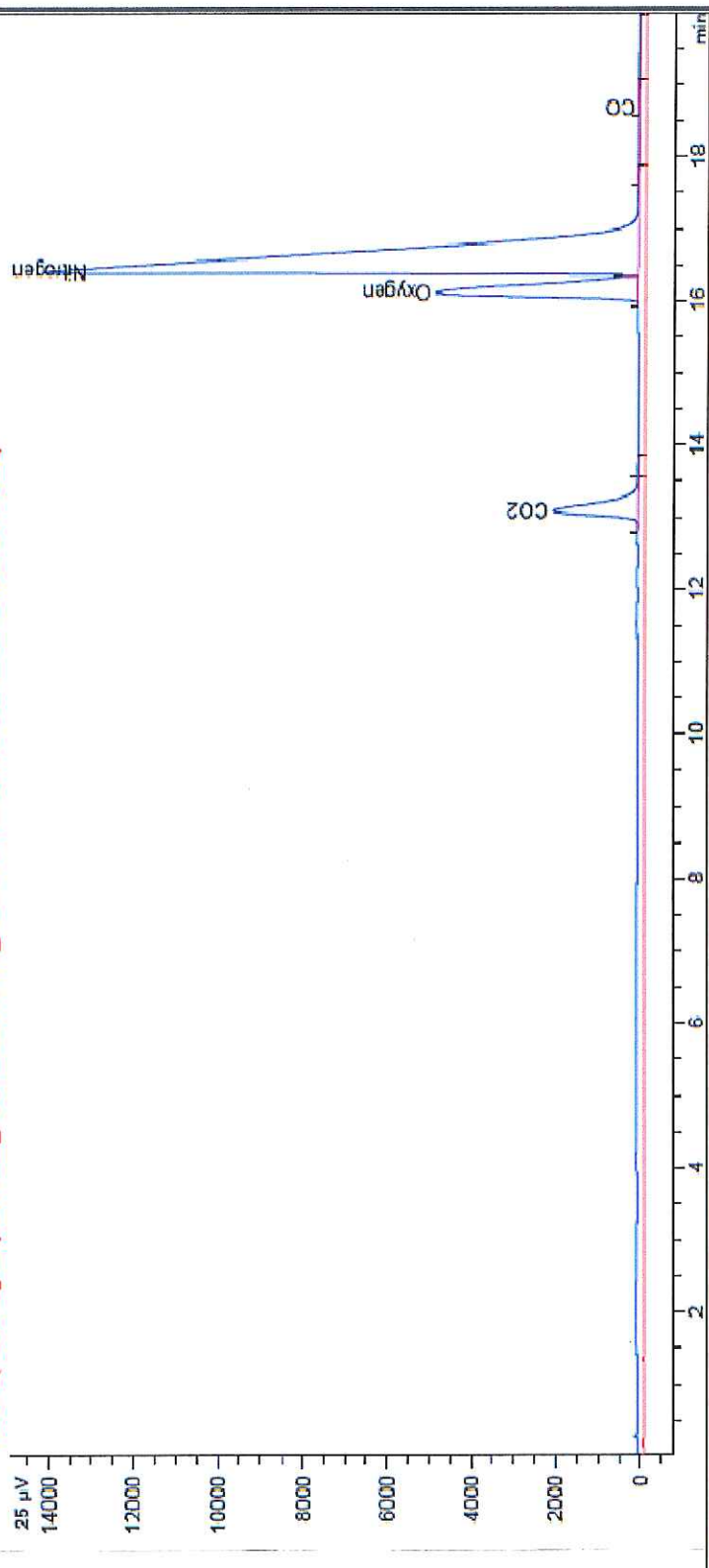
Sample	Batch	LabID	Reporting Organization	Reporting Organization Name	Sample Date and Time	API #	Order Number	Entity/Requesting Analysis		Purpose	Project	Comments	Project Number		Chain of Custody ID	Date Received by Lab	Initial Vol Units	Final Vol Units	Analysis Date and Time	Fraction Type	Report Basis	Comments	File Name	Detection Limit	Instrument Detection Limit	Method Detection Limit	Comments	Analytical Batch ID																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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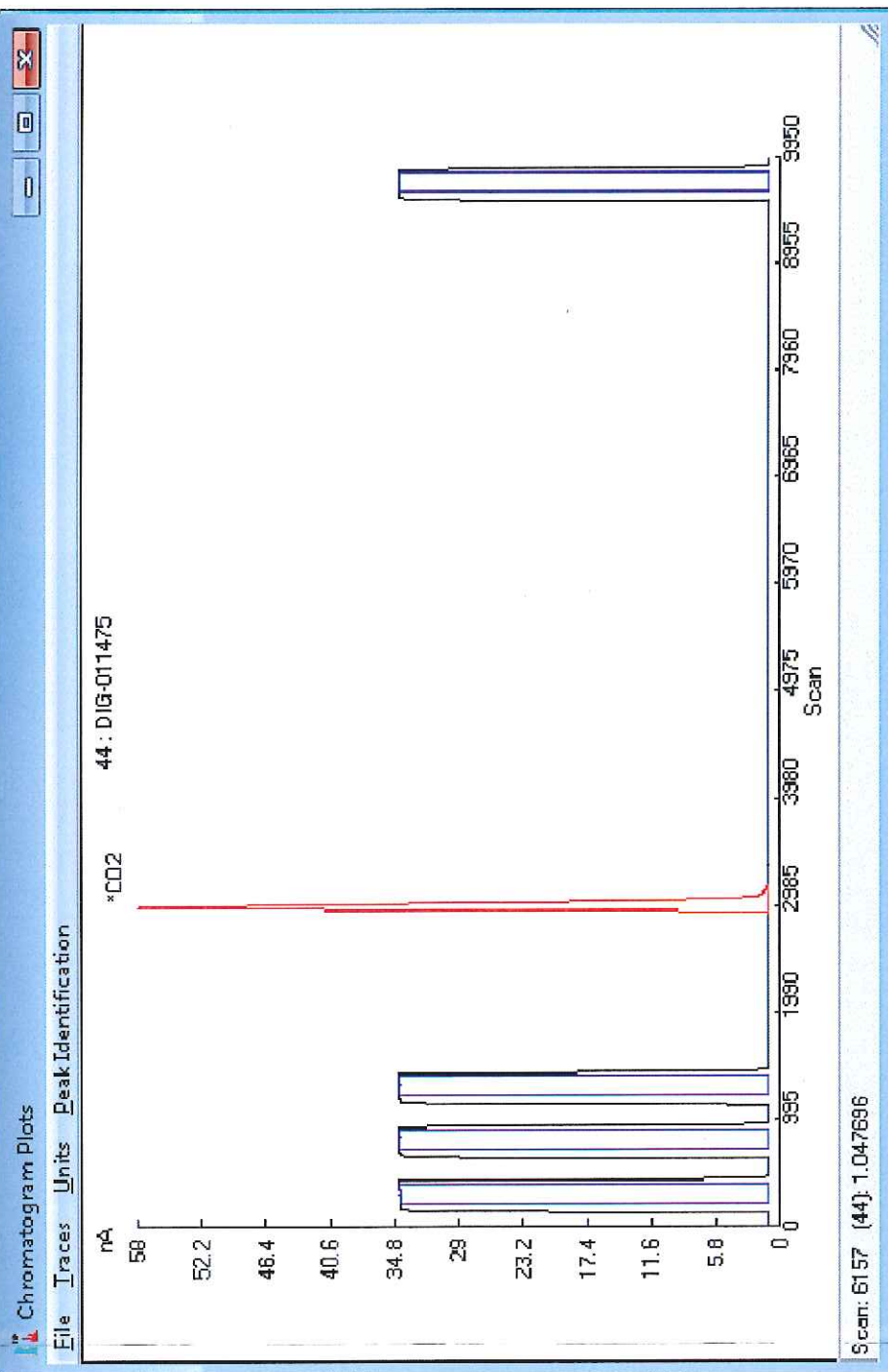


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB882020170119\_JOB785JARS 2017-06-29 05-52-05)DIG-011475.D)  
TCD2 B, Back Signal (20170626\_JOB882020170119\_JOB785JARS 2017-06-29 05-52-05)DIG-011475.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011414  
**Client:** Vista Geoscience  
**Sample Name(s):** VW220627171451

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

Dolan Integration Group shall use commercially reasonable efforts to maintain the Samples it receives from Customer in the condition in which same were initially received, and shall store, free of charge, any portion(s) of the Sample(s) not consumed or altered in the course of testing and analysis for a period of 90 days after their initial receipt, after which time the Samples will be destroyed. At Customer's written request and expense, Dolan Integration Group shall return unused Samples to Customer. At Customer's written request, Dolan Integration Group will also store and maintain Customer's Samples beyond the Free Storage Period for a monthly fee in accordance with Dolan Integration Group's the current storage rates. If Customer fails to timely pay any applicable storage charges, Dolan Integration Group shall



# Analytical Report



Job #: 17060983  
 Lab #: DIG-011414  
 Client: Vista Geoscience  
 Sample Name: VW220627171451  
 Date Sampled: 06/27/17  
 Time Sampled: 14:51  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/30/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	790472	79.01	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	178458	17.84	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	31517	3.15	-	-19.3	-	
Carbon Monoxide ( $\text{CO}$ )	17	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + / \text{C}_1 +$ )	
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰

# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175* Gas composition N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> with dissolved Cl <sup>-</sup> , SO <sub>4</sub> <sup>2-</sup>	8°C Methane (Carbon)	8°C Methane (Hydrogen)	8°C Ethane-Pentane (C <sub>5</sub> & if present)	
	VW 51	062717	1102	X		X	X	X	
	VW 55	062717	1342	X		X	X	X	+D13C CO2
	VW 32	062717	1356	X		X	X	X	+D13C CO2
	VW 24	062717	1258	X		X	X	X	+D13C CO2
	VW 35	062717	1458	X		X	X	X	+D13C CO2
	VW 22	062717	1451	X		X	X	X	+D13C CO2
	VW 52	062717	1108	X		X	X	X	+D13C CO2
	VW 50	062717	1056	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>15:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

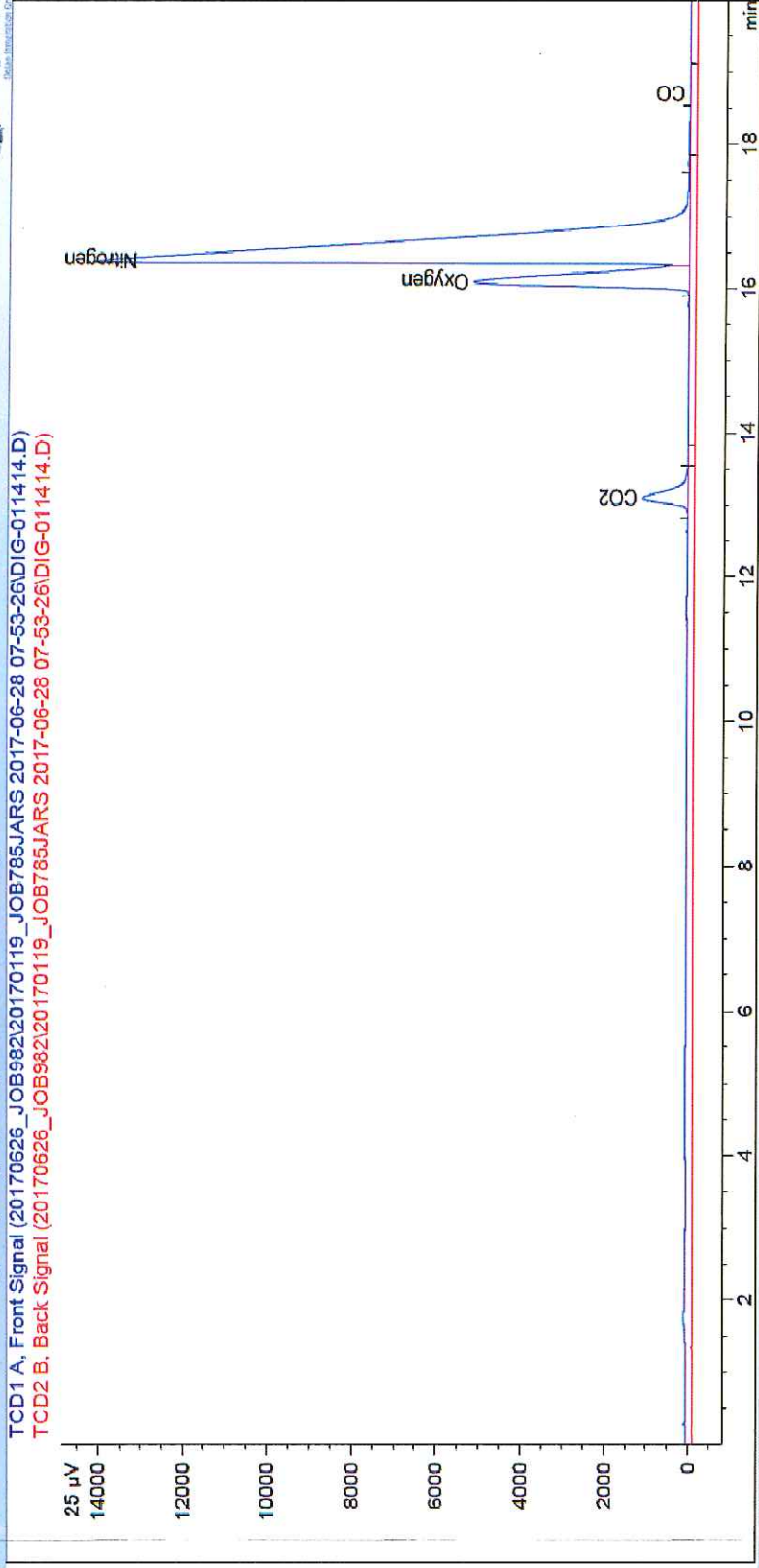




# Gas Chromatography (GC) Chromatogram

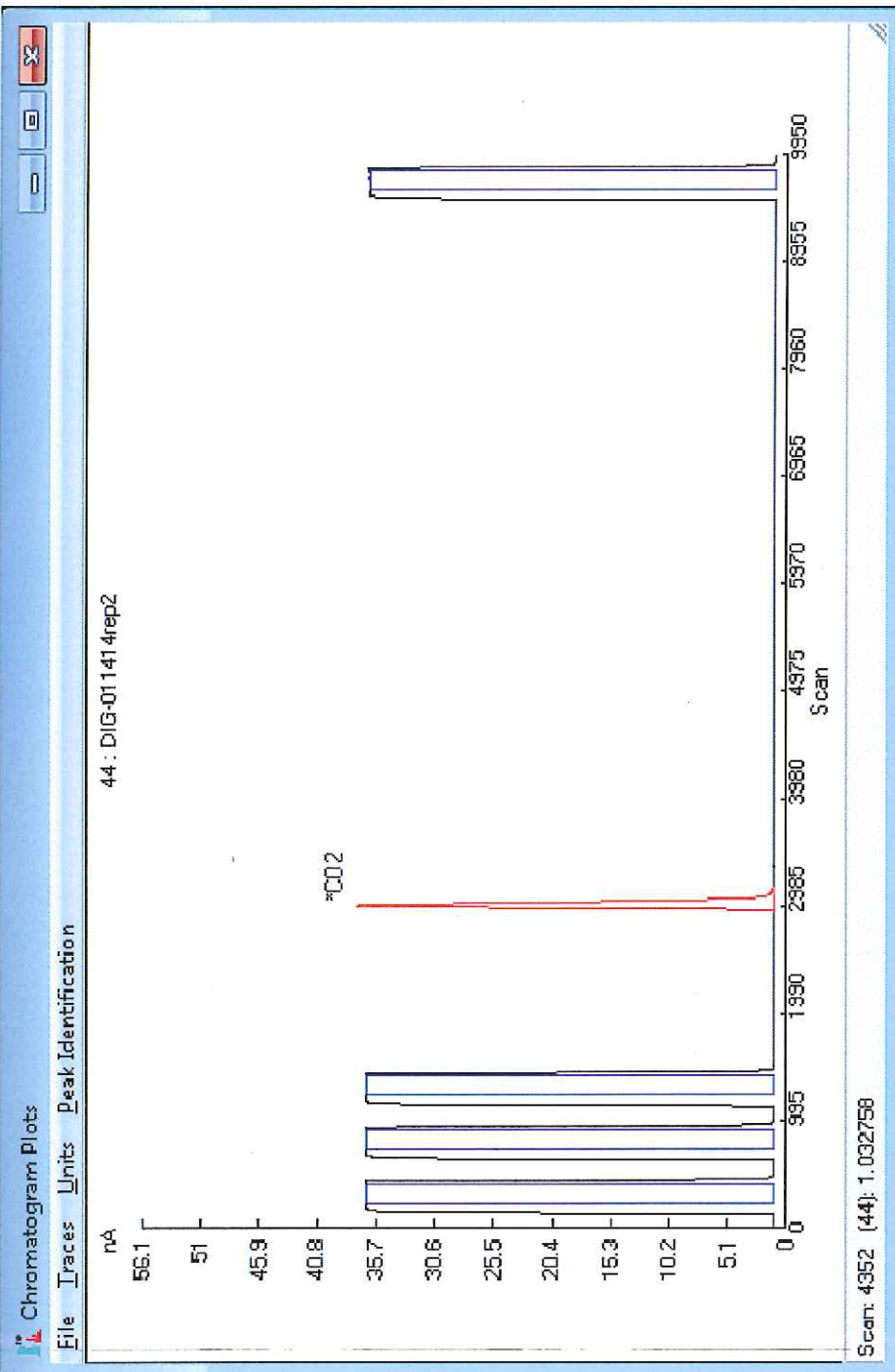


TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011414.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011414.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011426  
**Client:** Vista Geoscience  
**Sample Name(s):** VW230627171439

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011426  
 Client: Vista Geoscience  
 Sample Name: VW230627171439  
 Date Sampled: 06/27/17  
 Time Sampled: 14:39  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	778517	79.09	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	176966	17.98	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	28842	2.93	-	-20.0	-	
Carbon Monoxide (CO)	17	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



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Westminster, CO 80234  
p: 303.531.2030

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Company: Vista GeoScience  
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Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested						Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>8</sub>	RSK-175* (gas composition) with dissolved C <sub>2</sub> -C <sub>8</sub>	gC Methane (Carbon)	gC Ethane (Carbon)	gC Propane (Carbon)	gC Butane (Carbon)	
	VW 42	062717	1030	X		X	X	X		+D13C CO2
	VW 23	062717	1439	X		X	X	X		+D13C CO2
	VW 33	062717	1334	X		X	X	X		+D13C CO2
	VW 40	062717	1204	X		X	X	X		+D13C CO2
	VW 14	062717	1444	X		X	X	X		+D13C CO2
	VW 25	062717	1258	X		X	X	X		+D13C CO2
	VW 38	062717	1132	X		X	X	X		+D13C CO2
	VW 61	062717	1314	X		X	X	X		+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
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Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

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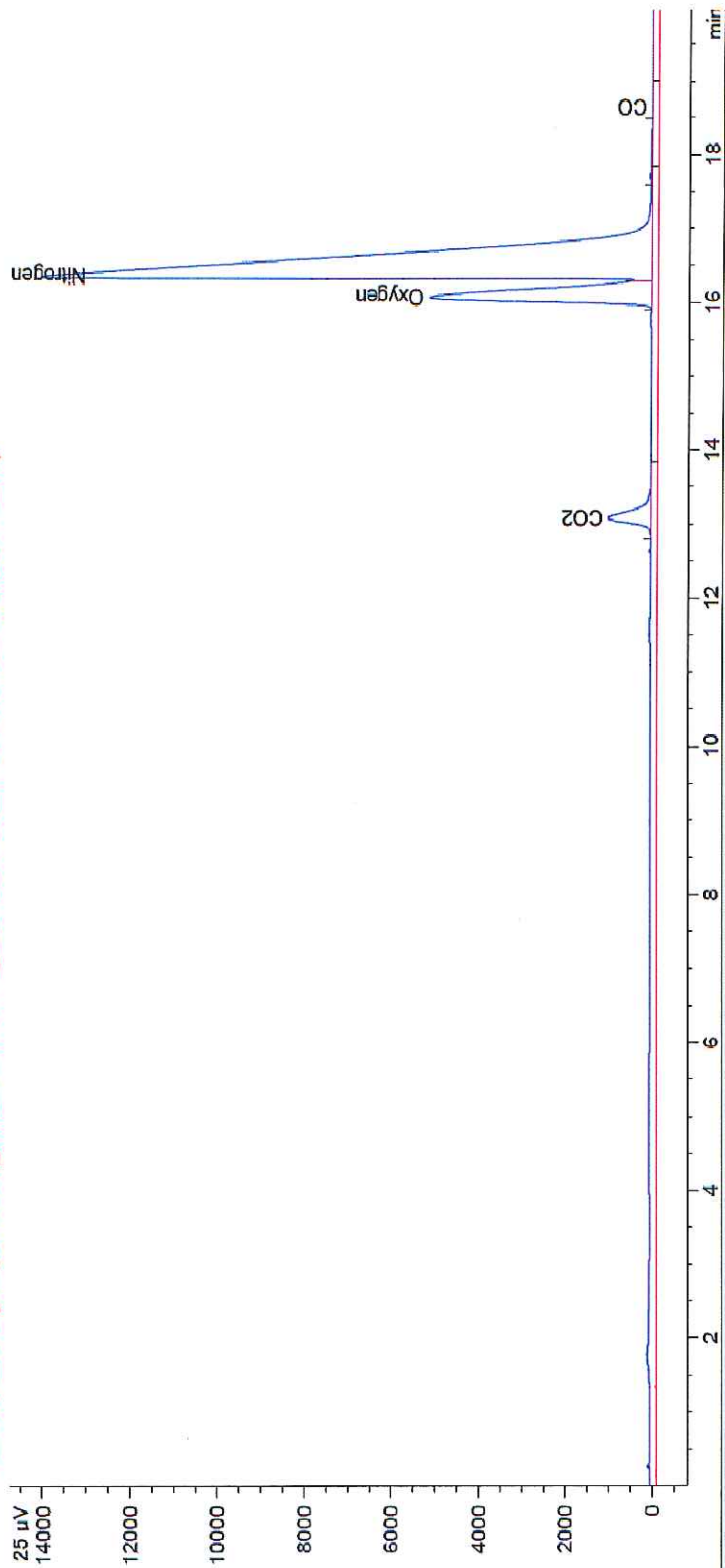
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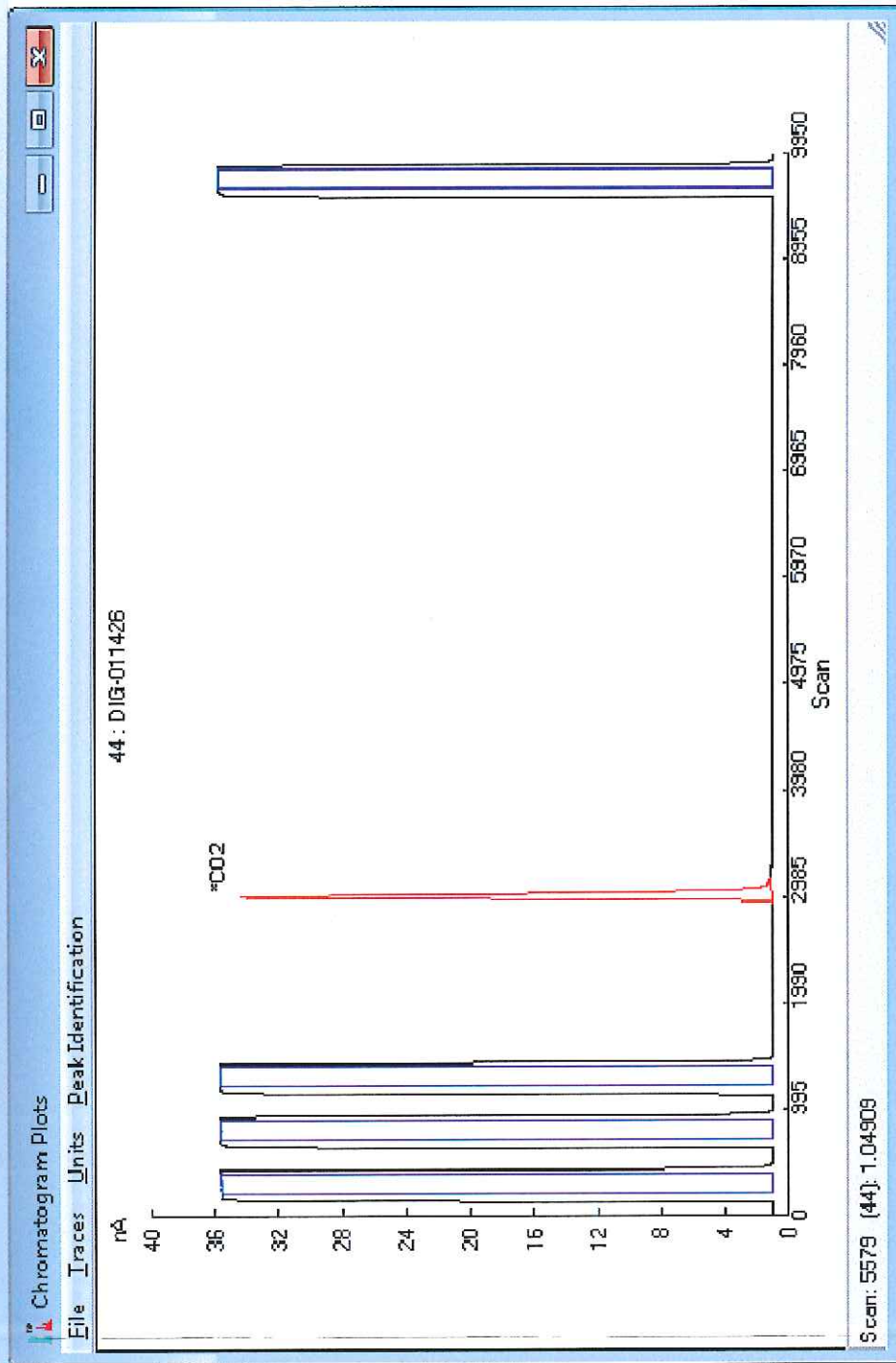
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-28 07-53-26\DIG-011426.D)

TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-28 07-53-26\DIG-011426.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011424  
**Client:** Vista Geoscience  
**Sample Name(s):** VW240627171401

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011424  
 Client: Vista Geoscience  
 Sample Name: VW240627171401  
 Date Sampled: 06/27/17  
 Time Sampled: 14:01  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	777808	78.83	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	188721	19.13	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	20198	2.05	-	-19.0	-	
Carbon Monoxide ( $\text{CO}$ )	15	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Geochemistry for Energy

1317 West 121st Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175* Gas Composition with dissolved Cl <sub>2</sub> , O <sub>2</sub> & C <sub>2</sub> H <sub>6</sub>	δ <sup>13</sup> C Methane (Carbon)	δD Methane (Hydrogen)	δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	
	VW 54	062717	1032	X		X	X	X	+D13C CO2
	VW 49	062717	1117	X		X	X	X	+D13C CO2
	VW 18	062717	1246	X		X	X	X	+D13C CO2
	VW 43	062717	1043	X		X	X	X	+D13C CO2
	VW 13	062717	1241	X		X	X	X	+D13C CO2
	VW 55	062717	1343	X		X	X	X	+D13C CO2
	VW 47	062717	1210	X		X	X	X	+D13C CO2
	VW 24	062717	1401	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

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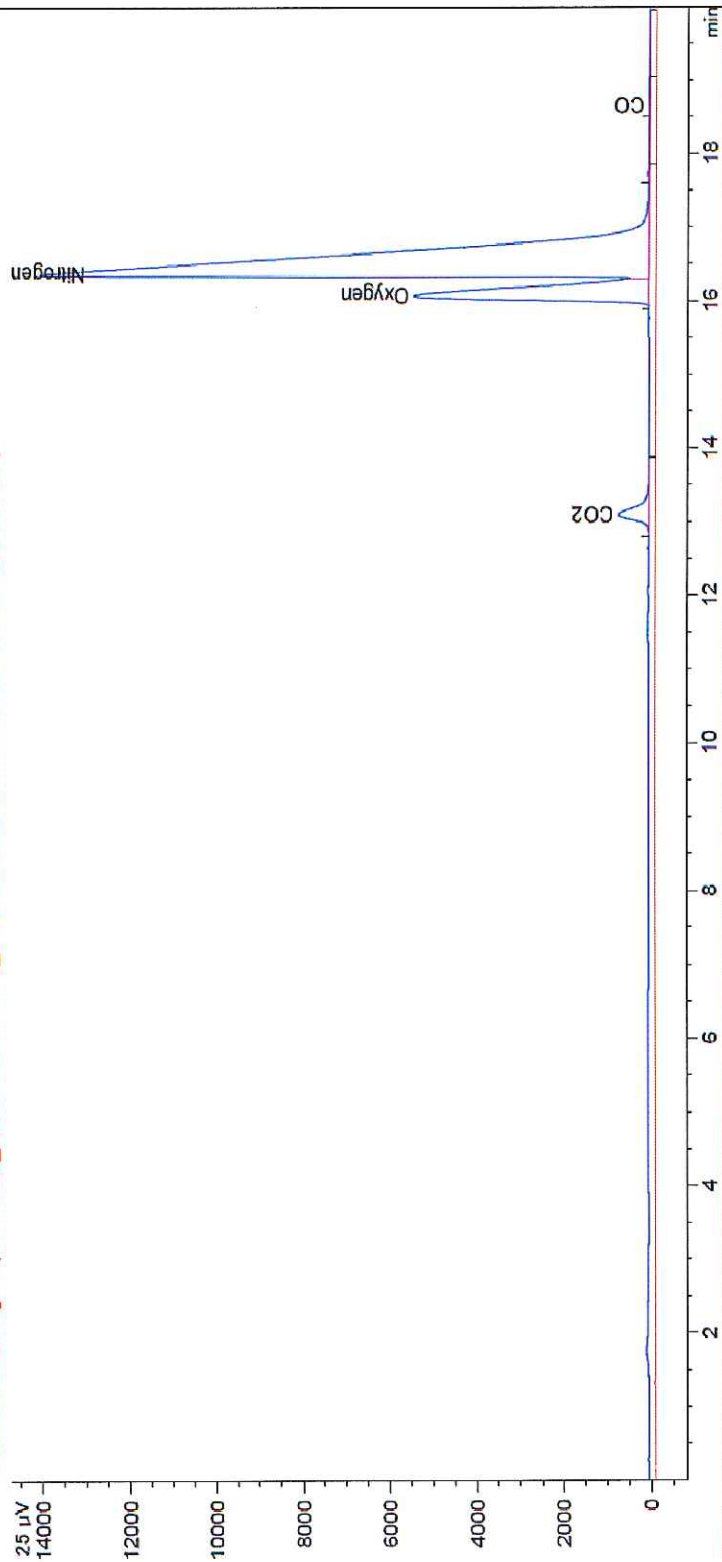
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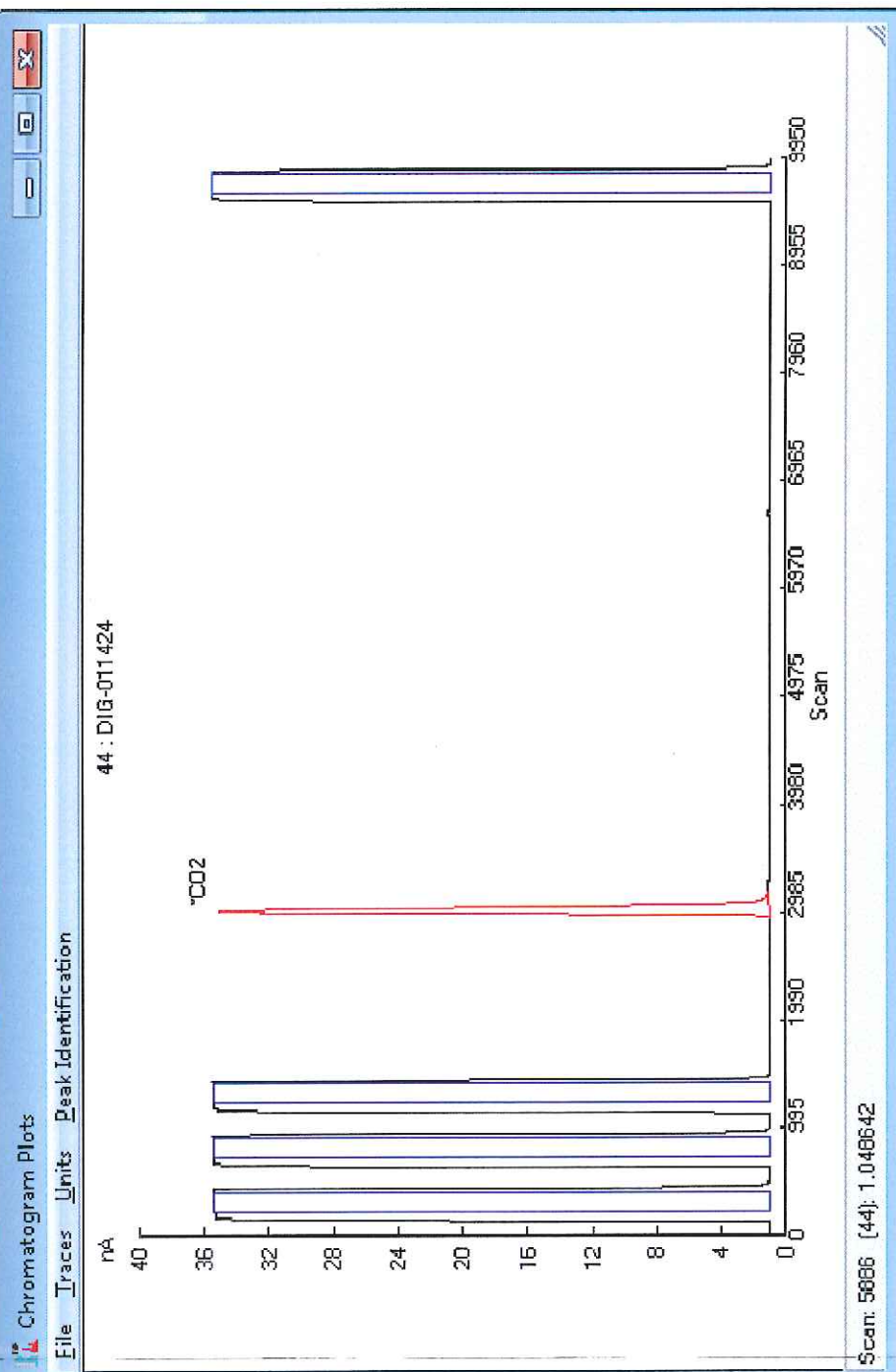
# Gas Chromatography (GC) Chromatogram

TCD1 A. Front Signal (20170626\_JOB982) 20170119\_JOB785JARS 2017-06-28 07-53-26 (DIG-011424.D)

TCD2 B. Back Signal (20170626\_JOB982) 20170119\_JOB785JARS 2017-06-28 07-53-26 (DIG-011424.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011430  
**Client:** Vista Geoscience  
**Sample Name(s):** VW250627171258

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011430  
 Client: Vista Geoscience  
 Sample Name: VW250627171258  
 Date Sampled: 06/27/17  
 Time Sampled: 12:58  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	774271	78.16	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	152271	15.37	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	64121	6.47	-	-17.1	-	
Carbon Monoxide ( $\text{CO}$ )	14	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



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agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>

RSK-175<sup>®</sup> (see composition)  
with dissolved Cl, C<sub>2</sub>H<sub>6</sub>, C<sub>3</sub>H<sub>8</sub>

g/L Methane (Carbon)

g/L Methane (Hydrogen)

g/L Ethane-Pentane  
(C<sub>2</sub>-C<sub>5</sub> if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 42	062717	1030	X		X	X	X	
	VW 23	062717	1439	X		X	X	X	+D13C CO2
	VW 33	062717	1334	X		X	X	X	+D13C CO2
	VW 40	062717	1204	X		X	X	X	+D13C CO2
	VW 14	062717	1444	X		X	X	X	+D13C CO2
	VW 25	062717	1258	X		X	X	X	+D13C CO2
	VW 38	062717	1132	X		X	X	X	+D13C CO2
	VW 61	062717	1314	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

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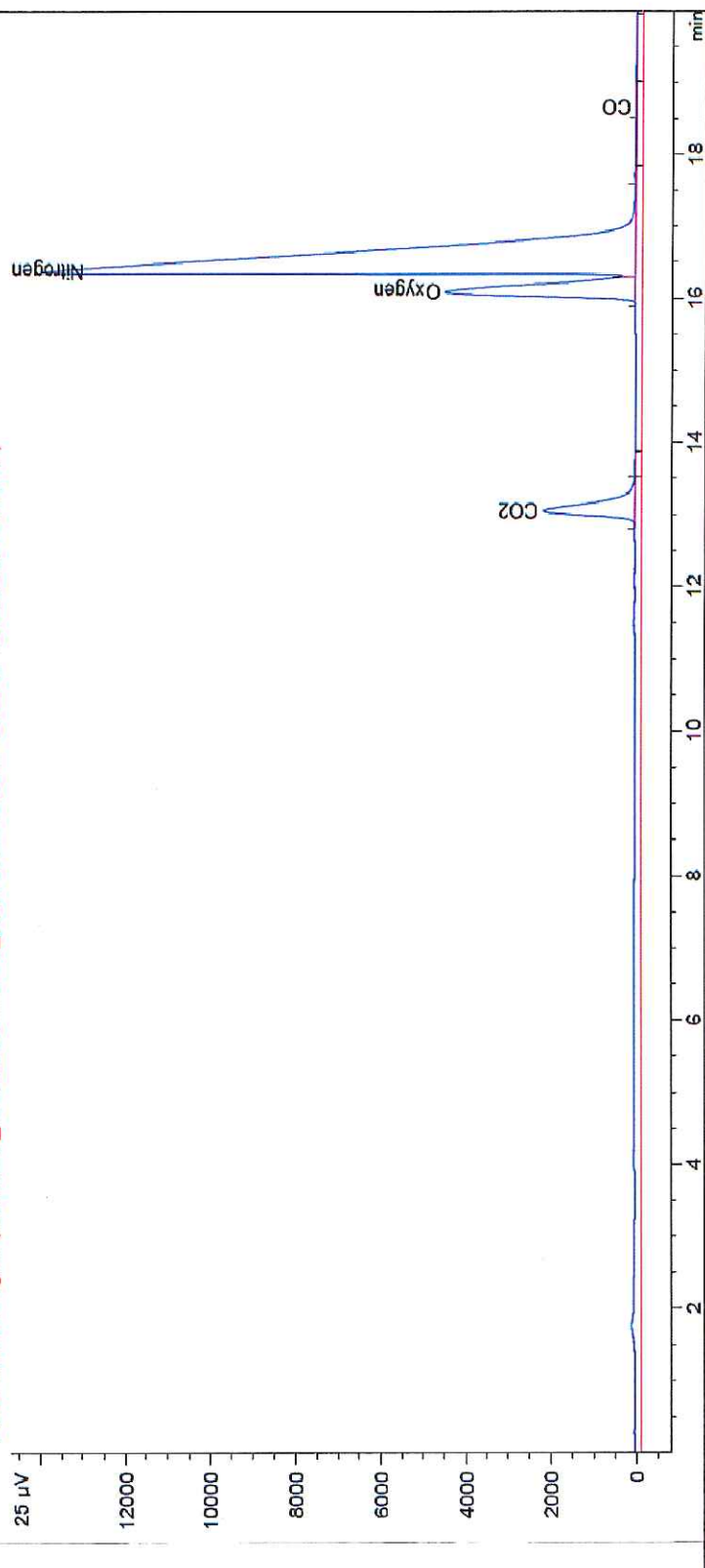




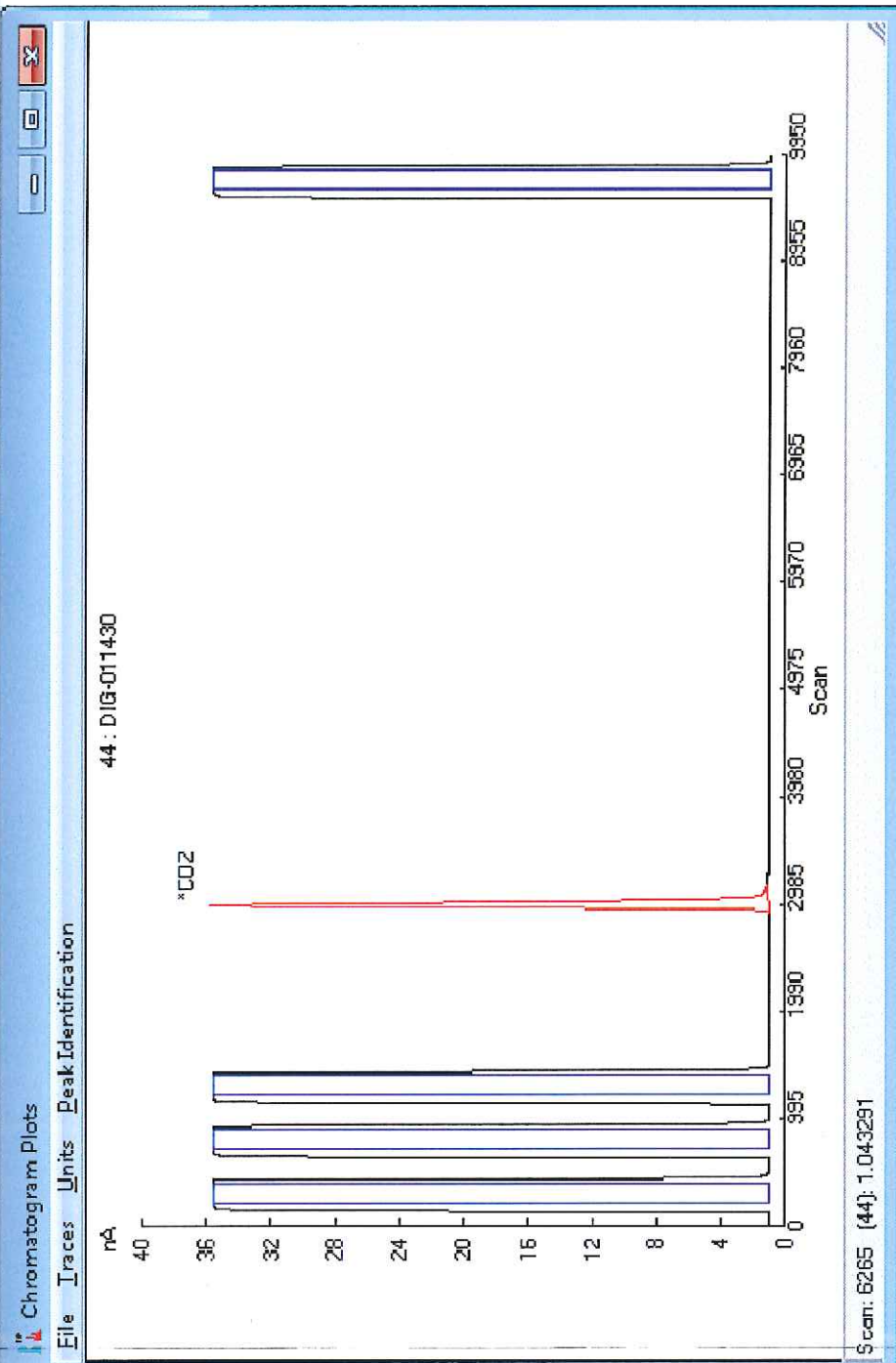


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011430.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011430.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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Geochemistry for Energy

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p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011412  
**Client:** Vista Geoscience  
**Sample Name(s):** VW260627171258

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011412  
 Client: Vista Geoscience  
 Sample Name: VW260627171258  
 Date Sampled: 06/27/17  
 Time Sampled: 13:56  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/27/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	798432	80.51	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	103602	10.45	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	89711	9.05	-	-21.1	-	
Carbon Monoxide (CO)	nd	nd	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰

# Chain of Custody Form



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Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
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p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
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agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
H<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>

RSK-175\* (see comments)  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>,  
with dissolved C<sub>1</sub>, C<sub>2</sub> & C<sub>3</sub>

5°C Methane (Carbon)

50 Methane (Hydrogen)

5°C Ethane-Pentane  
(C<sub>2</sub> & C<sub>3</sub> if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 51	062717	1102	X		X	X	X	
	VW 55	062717	1342	X		X	X	X	+D13C CO2
	VW 32	062717	1356	X		X	X	X	+D13C CO2
	VW 24	062717	1258	X		X	X	X	+D13C CO2
	VW 35	062717	1458	X		X	X	X	+D13C CO2
	VW 22	062717	1451	X		X	X	X	+D13C CO2
	VW 52	062717	1108	X		X	X	X	+D13C CO2
	VW 50	062717	1056	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>15:45</u>
Relinquished by			
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\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

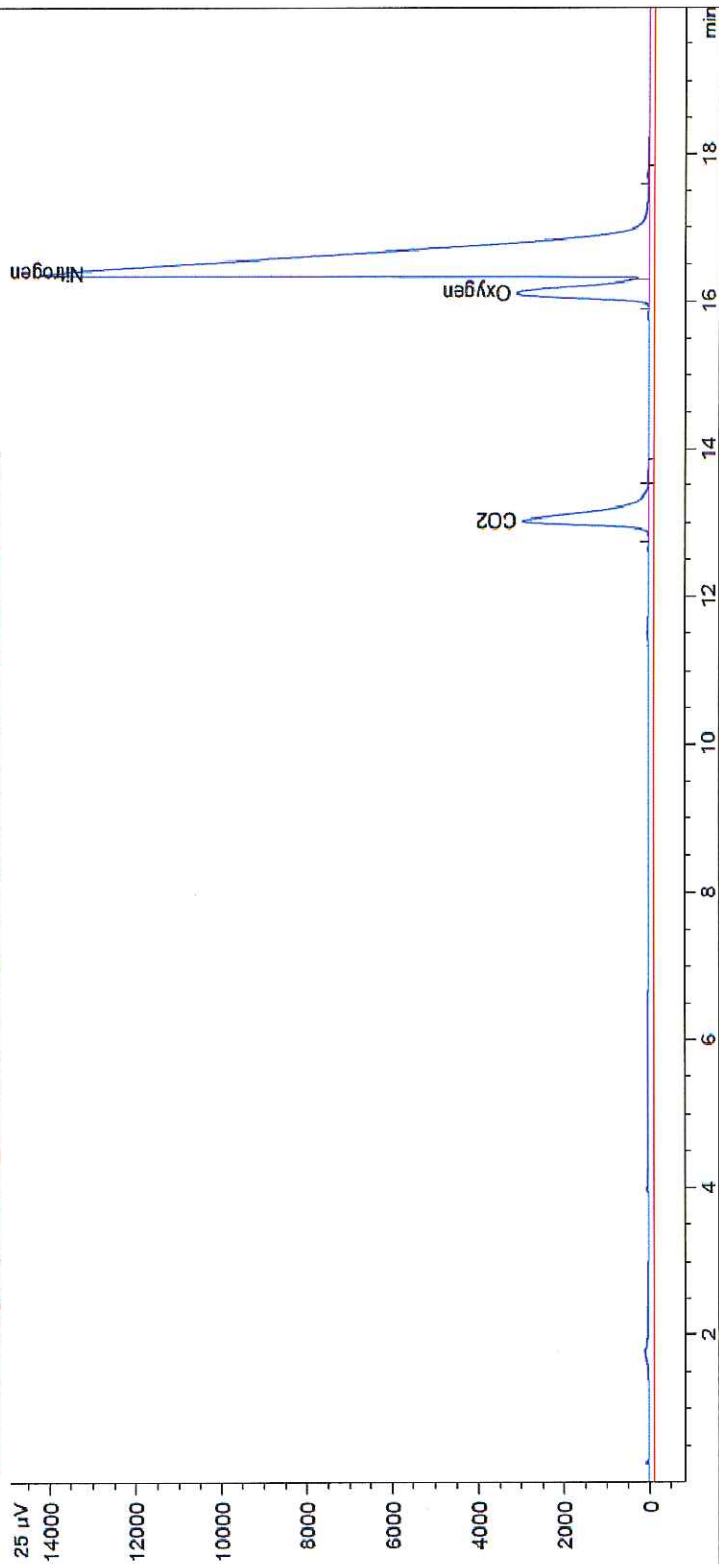






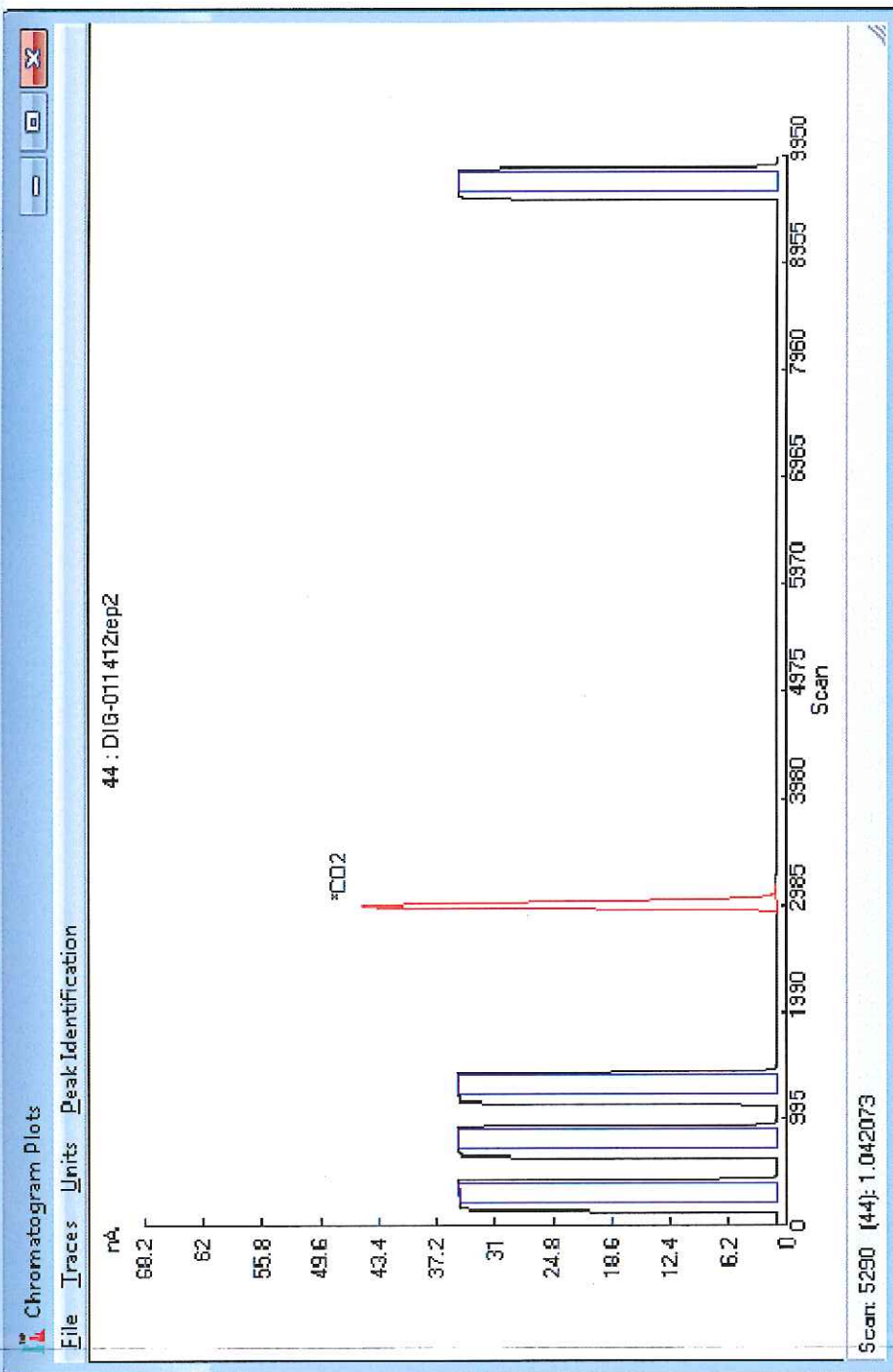
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-27 17-39-48\DIG-011412.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-27 17-39-48\DIG-011412.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060984  
**Lab #:** DIG-011452  
**Client:** Vista Geoscience  
**Sample Name(s):** VW270628171222

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011452  
 Client: Vista Geoscience  
 Sample Name: VW270628171222  
 Date Sampled: 06/28/17  
 Time Sampled: 12:22  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	775637	78.00	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	191249	19.23	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	27456	2.76	-	-24.5	-	
Carbon Monoxide ( $\text{CO}$ )	16	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	#DIV/0!
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 1706984

NTG 011451-011458

Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C-C <sub>4</sub> <sup>+</sup>	RSK-175* (see composition) H <sub>2</sub> O, CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> , C-C <sub>4</sub> <sup>+</sup> with dissolved Cl <sup>-</sup> , CO <sub>2</sub> & CH <sub>4</sub>	δ <sup>13</sup> C Methane (Carbon)	δ <sup>13</sup> C Methane (Hydrogen)	δ <sup>13</sup> C Ethane-Pentane (C <sub>3</sub> & if present)	
	VW200628171158	6-28-17	11:58	X		X	X	X	+D13C CO <sub>2</sub>
	VW170628171222	6-28-17	12:22	X		X	X	X	+D13C CO <sub>2</sub>
	VW20628171204	6-28-17	12:04	X		X	X	X	+D13C CO <sub>2</sub>
	VW170628171131	6-28-17	11:31	X		X	X	X	+D13C CO <sub>2</sub>
	VW280628171152	6-28-17	11:52	X		X	X	X	+D13C CO <sub>2</sub>
	VW010628171148	6-28-17	11:48	X		X	X	X	+D13C CO <sub>2</sub>
	VW080628171123	6-28-17	11:23	X		X	X	X	+D13C CO <sub>2</sub>
	VW030628171116	6-28-17	11:16	X		X	X	X	+D13C CO <sub>2</sub>

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	Vista GeoScience	6/28/17	14:22
Received by <u>[Signature]</u>	DIG	06/28/17	14:25
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

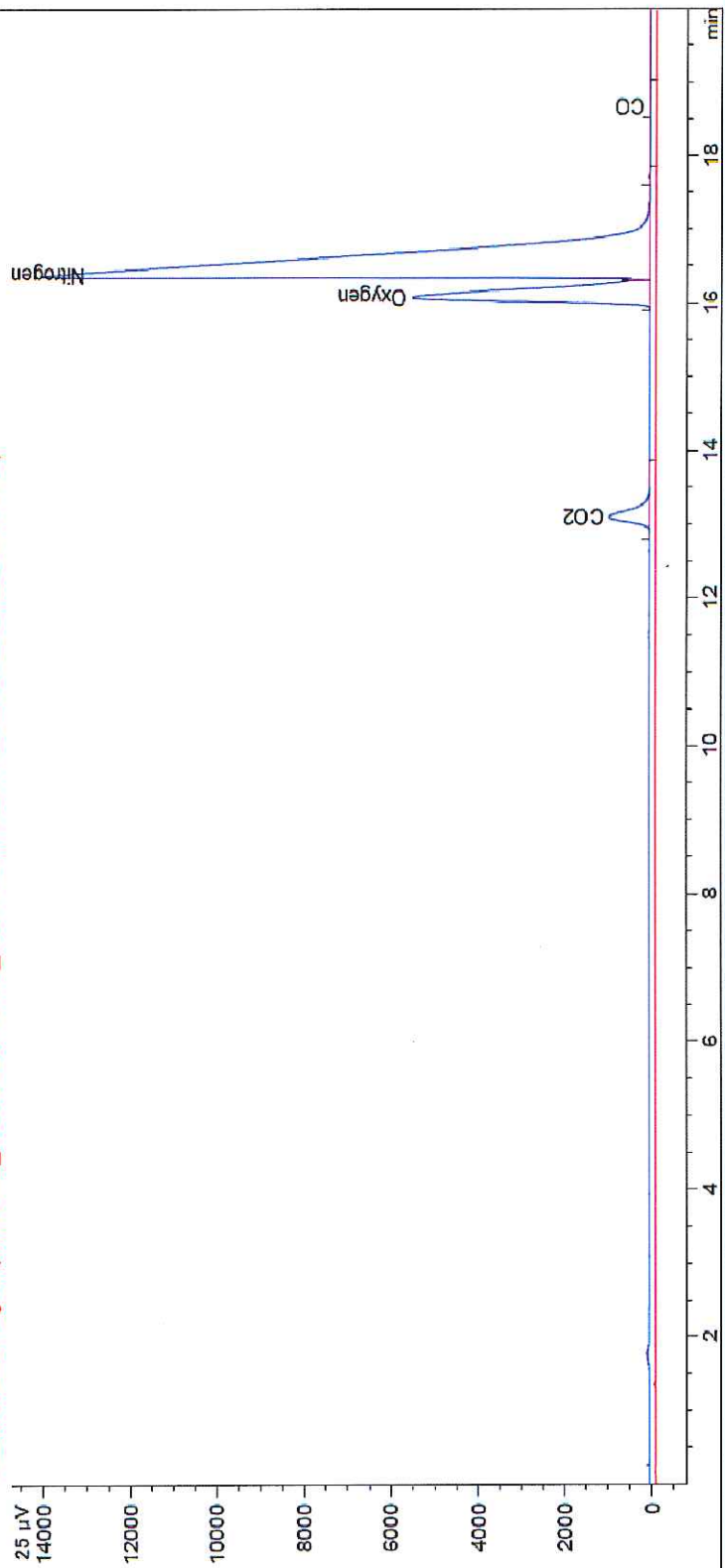
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

[illegible]

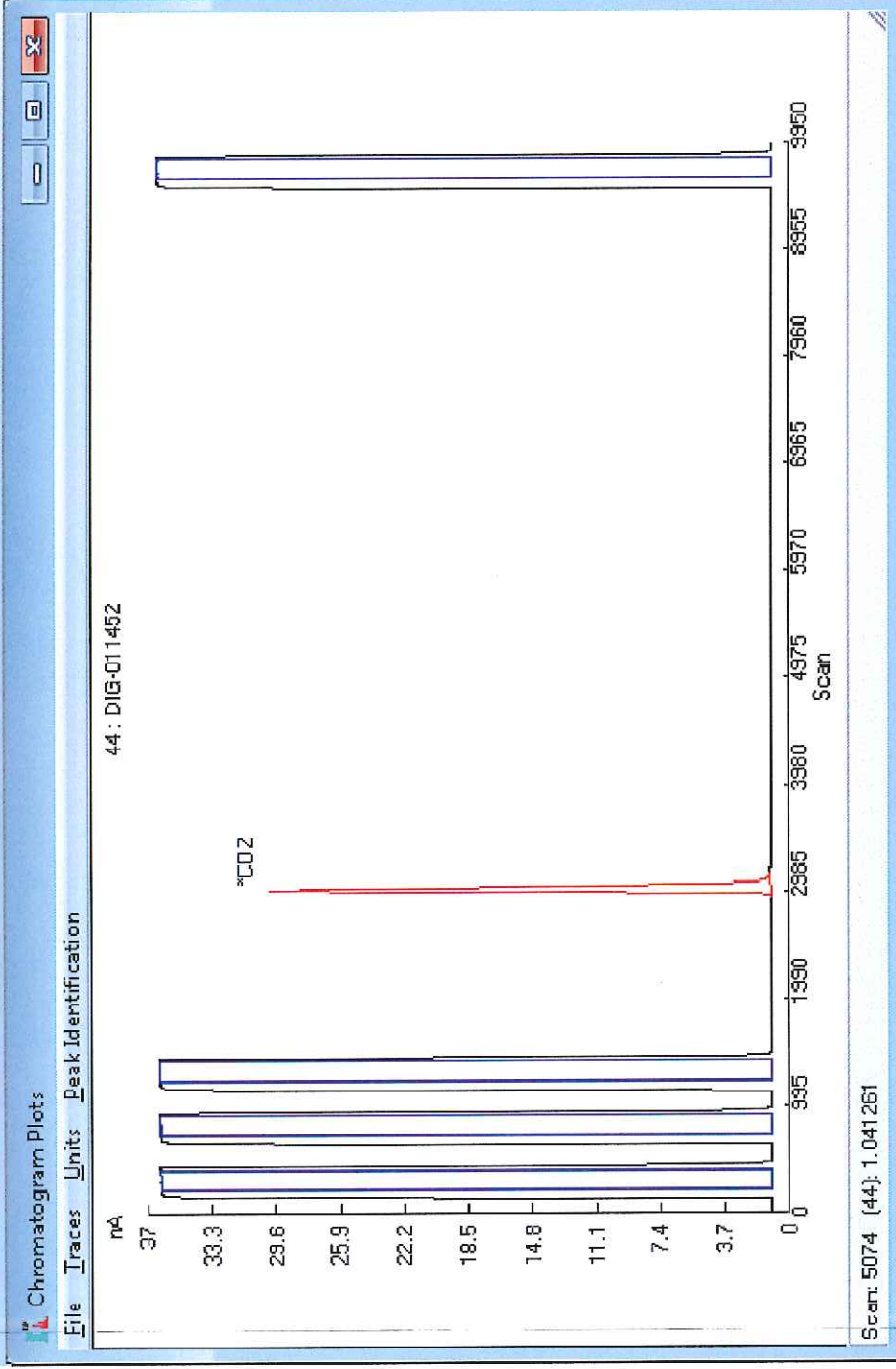


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011452.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011452.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

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Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060984  
**Lab #:** DIG-011455  
**Client:** Vista Geoscience  
**Sample Name(s):** VW280628171152

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011455  
 Client: Vista Geoscience  
 Sample Name: VW280628171152  
 Date Sampled: 06/28/17  
 Time Sampled: 11:52  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	779334	77.88	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	188945	18.88	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	32381	3.24	-	-22.6	-	
Carbon Monoxide ( $\text{CO}$ )	16	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	nd	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	nd	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	#DIV/0!
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



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Westminster, CO 80231  
p: 303.531.2030

JOB 1706484

NTG 06451-011458

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## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

A/E #:  
Report Ctr:  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

## Sample Description

Sample Description									
Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW200628171158	6-28-17	11:58	X		X	X	X	+D13C CO2
	VW170628171222	6-28-17	12:22	X		X	X	X	+D13C CO2
	VW20628171204	6-28-17	12:04	X		X	X	X	+D13C CO2
	VW170628171131	6-28-17	11:31	X		X	X	X	+D13C CO2
	VW280628171152	6-28-17	11:52	X		X	X	X	+D13C CO2
	VW010618171148	6-28-17	11:48	X		X	X	X	+D13C CO2
	VW080628171123	6-28-17	11:23	X		X	X	X	+D13C CO2
	VW030628171116	6-28-17	11:16	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	Vista GeoScience	6/28/17	14:22
Received by <u>[Signature]</u>	DIG	06/28/17	14:25
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

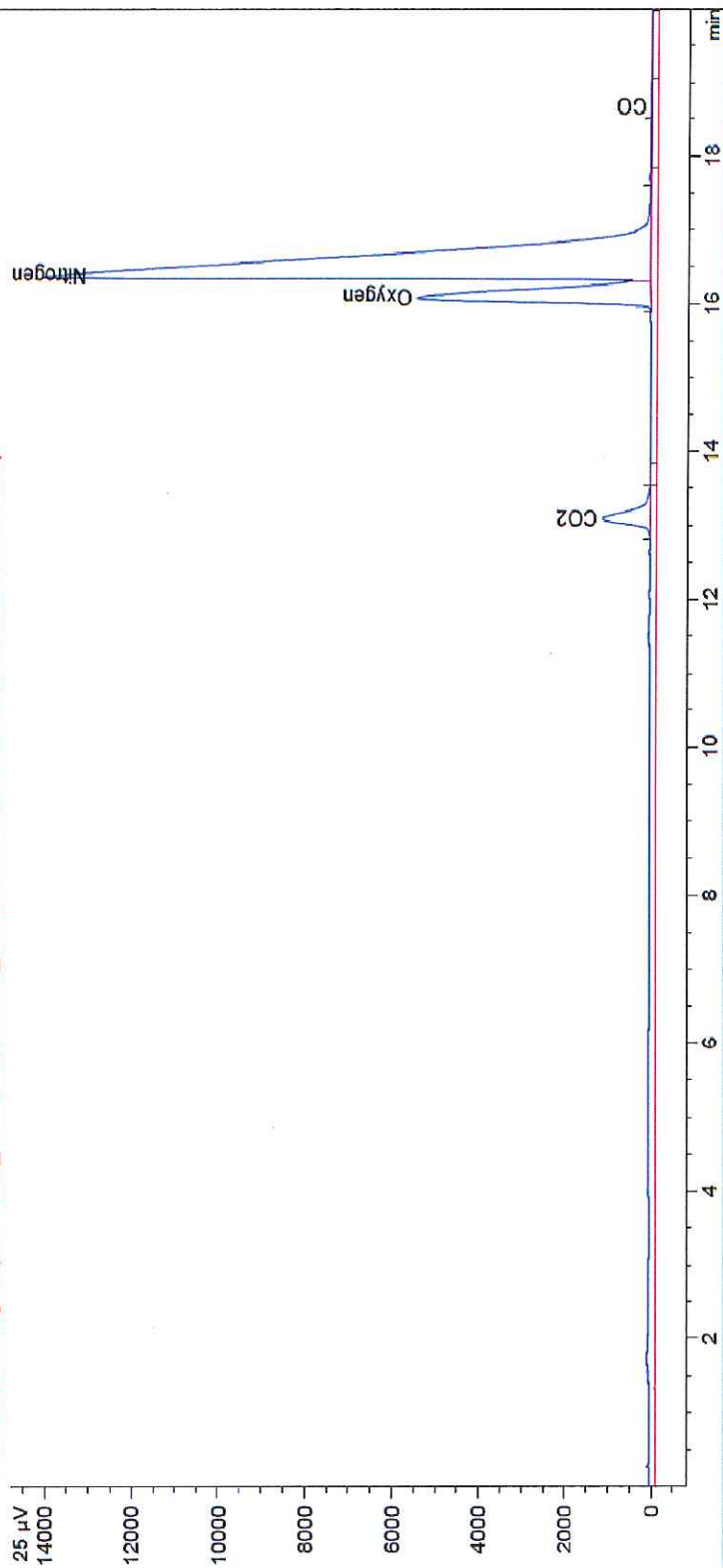


[illegible]

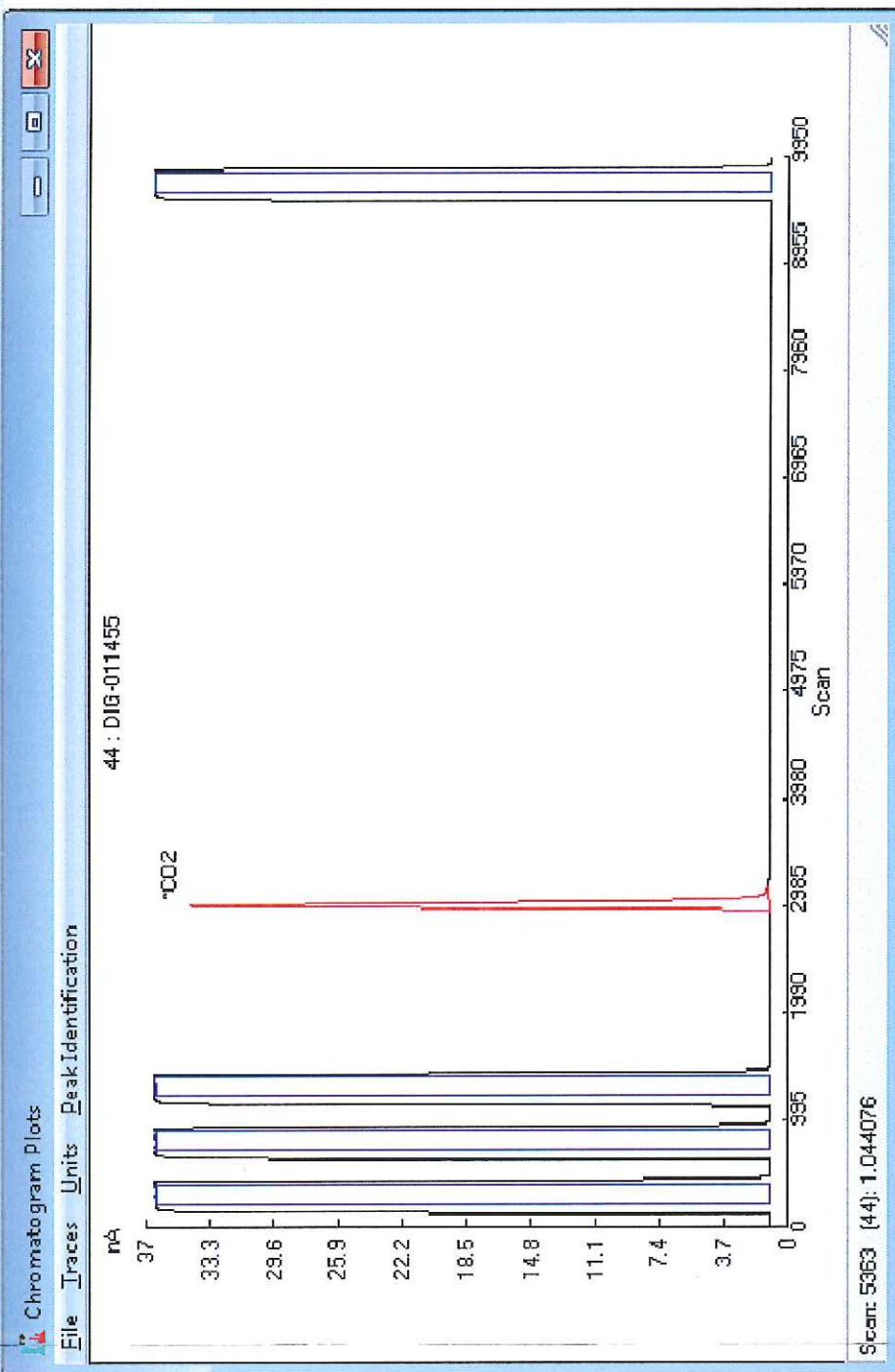


# Gas Chromatography (GC) Chromatogram

TCD1 A: Front Signal (20170626\_JOB982\20170119\_JOB785.JARS 2017-06-29 05-52-05) DIG-011455.D)  
TCD2 B: Back Signal (20170626\_JOB982\20170119\_JOB785.JARS 2017-06-29 05-52-05) DIG-011455.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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## Geochemistry for Energy

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Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011449  
**Client:** Vista Geoscience  
**Sample Name(s):** VW290627171504

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011449  
 Client: Vista Geoscience  
 Sample Name: VW290627171504  
 Date Sampled: 06/27/17  
 Time Sampled: 15:04  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/30/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	774583	77.78	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	149829	15.04	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	71504	7.18	-	-24.2	-	
Carbon Monoxide (CO)	12	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	#DIV/0!
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2930

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested						Comments
				Gas Composition * N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> H <sub>8</sub> , C <sub>4</sub> H <sub>10</sub> , C <sub>5</sub> H <sub>12</sub> , C <sub>6</sub> H <sub>14</sub> , C <sub>7</sub> H <sub>16</sub> , C <sub>8</sub> H <sub>18</sub> , C <sub>9</sub> H <sub>20</sub> , C <sub>10</sub> H <sub>22</sub> , C <sub>11</sub> H <sub>24</sub> , C <sub>12</sub> H <sub>26</sub> , C <sub>13</sub> H <sub>28</sub> , C <sub>14</sub> H <sub>30</sub> , C <sub>15</sub> H <sub>32</sub> , C <sub>16</sub> H <sub>34</sub> , C <sub>17</sub> H <sub>36</sub> , C <sub>18</sub> H <sub>38</sub> , C <sub>19</sub> H <sub>40</sub> , C <sub>20</sub> H <sub>42</sub> , C <sub>21</sub> H <sub>44</sub> , C <sub>22</sub> H <sub>46</sub> , C <sub>23</sub> H <sub>48</sub> , C <sub>24</sub> H <sub>50</sub> , C <sub>25</sub> H <sub>52</sub> , C <sub>26</sub> H <sub>54</sub> , C <sub>27</sub> H <sub>56</sub> , C <sub>28</sub> H <sub>58</sub> , C <sub>29</sub> H <sub>60</sub> , C <sub>30</sub> H <sub>62</sub> , C <sub>31</sub> H <sub>64</sub> , C <sub>32</sub> H <sub>66</sub> , C <sub>33</sub> H <sub>68</sub> , C <sub>34</sub> H <sub>70</sub> , C <sub>35</sub> H <sub>72</sub> , C <sub>36</sub> H <sub>74</sub> , C <sub>37</sub> H <sub>76</sub> , C <sub>38</sub> H <sub>78</sub> , C <sub>39</sub> H <sub>80</sub> , C <sub>40</sub> H <sub>82</sub> , C <sub>41</sub> H <sub>84</sub> , C <sub>42</sub> H <sub>86</sub> , C <sub>43</sub> H <sub>88</sub> , C <sub>44</sub> H <sub>90</sub> , C <sub>45</sub> H <sub>92</sub> , C <sub>46</sub> H <sub>94</sub> , C <sub>47</sub> H <sub>96</sub> , C <sub>48</sub> H <sub>98</sub> , C <sub>49</sub> H <sub>100</sub> , C <sub>50</sub> H <sub>102</sub> , C <sub>51</sub> H <sub>104</sub> , C <sub>52</sub> H <sub>106</sub> , C <sub>53</sub> H <sub>108</sub> , C <sub>54</sub> H <sub>110</sub> , C <sub>55</sub> H <sub>112</sub> , C <sub>56</sub> H <sub>114</sub> , C <sub>57</sub> H 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<sub>834</sub> , C <sub>417</sub> H <sub>836</sub> , C <sub>418</sub> H <sub>838</sub> , C <sub>419</sub> H <sub>840</sub> , C <sub>420</sub> H <sub>842</sub> , C <sub>421</sub> H <sub>844</sub> , C <sub>422</sub> H <sub>846</sub> , C <sub>423</sub> H <sub>848</sub> , C <sub>424</sub> H <sub>850</sub> , C <sub>425</sub> H <sub>852</sub> , C <sub>426</sub> H <sub>854</sub> , C <sub>427</sub> H <sub>856</sub> , C <sub>428</sub> H <sub>858</sub> , C <sub>429</sub> H <sub>860</sub> , C <sub>430</sub> H <sub>862</sub> , C <sub>431</sub> H <sub>864</sub> , C <sub>432</sub> H <sub>866</sub> , C <sub>433</sub> H <sub>868</sub> , C <sub>434</sub> H <sub>870</sub> , C <sub>435</sub> H <sub>872</sub> , C <sub>436</sub> H <sub>874</sub> , C <sub>437</sub> H <sub>876</sub> , C <sub>438</sub> H <sub>878</sub> , C <sub>439</sub> H <sub>880</sub> , C <sub>440</sub> H <sub>882</sub> , C <sub>441</sub> H <sub>884</sub> , C <sub>442</sub> H <sub>886</sub> , C <sub>443</sub> H <sub>888</sub> , C <sub>444</sub> H <sub>890</sub> , C <sub>445</sub> H <sub>892</sub> , C <sub>446</sub> H <sub>894</sub> , C <sub>447</sub> H <sub>896</sub> , C <sub>448</sub> H <sub>898</sub> , C <sub>449</sub> H <sub>900</sub> , C <sub>450</sub> H <sub>902</sub> , C <sub>451</sub> H <sub>904</sub> , C <sub>452</sub> H <sub>906</sub> , C <sub>453</sub> H <sub>908</sub> , C <sub>454</sub> H <sub>910</sub> , C <sub>455</sub> H <sub>912</sub> , C <sub>456</sub> H <sub>914</sub> , C <sub>457</sub> H <sub>916</sub> , C <sub>458</sub> H <sub>918</sub> , C <sub>459</sub> H <sub>920</sub> , C <sub>460</sub> H <sub>922</sub> , C <sub>461</sub> H <sub>924</sub> , C <sub>462</sub> H <sub>926</sub> , C <sub>463</sub> H <sub>928</sub> , C <sub>464</sub> H <sub>930</sub> , C <sub>465</sub> H <sub>932</sub> , C <sub>466</sub> H <sub>934</sub> , C <sub>467</sub> H <sub>936</sub> , C <sub>468</sub> H <sub>938</sub> , C <sub>469</sub> H <sub>940</sub> , C <sub>470</sub> H <sub>942</sub> , C <sub>471</sub> H <sub>944</sub> , C <sub>472</sub> H <sub>946</sub> , C <sub>473</sub> H <sub>948</sub> , C <sub>474</sub> H <sub>950</sub> , C <sub>475</sub> H <sub>952</sub> , C <sub>476</sub> H <sub>954</sub> , C <sub>477</sub> H <sub>956</sub> , C <sub>478</sub> H <sub>958</sub> , C <sub>479</sub> H <sub>960</sub> , C <sub>480</sub> H <sub>962</sub> , C <sub>481</sub> H <sub>964</sub> , C <sub>482</sub> H <sub>966</sub> , C <sub>483</sub> H <sub>968</sub> , C <sub>484</sub> H <sub>970</sub> , C <sub>485</sub> H <sub>972</sub> , C <sub>486</sub> H <sub>974</sub> , C <sub>487</sub> H <sub>976</sub> , C <sub>488</sub> H <sub>978</sub> , C <sub>489</sub> H <sub>980</sub> , C <sub>490</sub> H <sub>982</sub> , C <sub>491</sub> H <sub>984</sub> , C <sub>492</sub> H <sub>986</sub> , C <sub>493</sub> H <sub>988</sub> , C <sub>494</sub> H <sub>990</sub> , C <sub>495</sub> H <sub>992</sub> , C <sub>496</sub> H <sub>994</sub> , C <sub>497</sub> H <sub>996</sub> , C <sub>498</sub> H <sub>998</sub> , C <sub>499</sub> H <sub>1000</sub> , C <sub>500</sub> H <sub>1002</sub> , C <sub>501</sub> H <sub>1004</sub> , C <sub>502</sub> H <sub>1006</sub> , C <sub>503</sub> H <sub>1008</sub> , C <sub>504</sub> H <sub>1010</sub> , C <sub>505</sub> H <sub>1012</sub> , C <sub>506</sub> H <sub>1014</sub> , C <sub>507</sub> H <sub>1016</sub> , C <sub>508</sub> H <sub>1018</sub> , C <sub>509</sub> H <sub>1020</sub> , C <sub>510</sub> H <sub>1022</sub> , C <sub>511</sub> H <sub>1024</sub> , C <sub>512</sub> H <sub>1026</sub> , C <sub>513</sub> H <sub>1028</sub> , C <sub>514</sub> H <sub>1030</sub> , C <sub>515</sub> H <sub>1032</sub> , C <sub>516</sub> H <sub>1034</sub> , C <sub>517</sub> H <sub>1036</sub> , C <sub>518</sub> H <sub>1038</sub> , C <sub>519</sub> H <sub>1040</sub> , C <sub>520</sub> H <sub>1042</sub> , C <sub>521</sub> H <sub>1044</sub> , C <sub>522</sub> H <sub>1046</sub> , C <sub>523</sub> H <sub>1048</sub> , C <sub>524</sub> H <sub>1050</sub> , C <sub>525</sub> H <sub>1052</sub> , C <sub>526</sub> H <sub>1054</sub> , C <sub>527</sub> H <sub>1056</sub> , C <sub>528</sub> H <sub>1058</sub> , C <sub>529</sub> H <sub>1060</sub> , C <sub>530</sub> H <sub>1062</sub> , C <sub>531</sub> H <sub>1064</sub> , C <sub>532</sub> H <sub>1066</sub> , C <sub>533</sub> H <sub>1068</sub> , C <sub>534</sub> H <sub>1070</sub> , C <sub>535</sub> H <sub>1072</sub> , C <sub>536</sub> H <sub>1074</sub> , C <sub>537</sub> H <sub>1076</sub> , C <sub>538</sub> H <sub>1078</sub> , C <sub>539</sub> H <sub>1080</sub> , C <sub>540</sub> H <sub>1082</sub> , C <sub>541</sub> H <sub>1084</sub> , C <sub>542</sub> H <sub>1086</sub> , C <sub>543</sub> H <sub>1088</sub> , C <sub>544</sub> H <sub>1090</sub> , C <sub>545</sub> H <sub>1092</sub> , C <sub>546</sub> H <sub>1094</sub> , C <sub>547</sub> H <sub>1096</sub> , C <sub>548</sub> H <sub>1098</sub> , C <sub>549</sub> H <sub>1100</sub> , C <sub>550</sub> H <sub>1102</sub> , C <sub>551</sub> H <sub>1104</sub> , C <sub>552</sub> H <sub>1106</sub> , C <sub>553</sub> H <sub>1108</sub> , C <sub>554</sub> H <sub>1110</sub> , C <sub>555</sub> H <sub>1112</sub> , C <sub>556</sub> H <sub>1114</sub> , C <sub>557</sub> H <sub>1116</sub> , C <sub>558</sub> H <sub>1118</sub> , C <sub>559</sub> H <sub>1120</sub> , C <sub>560</sub> H <sub>1122</sub> , C <sub>561</sub> H <sub>1124</sub> , C <sub>562</sub> H <sub>1126</sub> , C <sub>563</sub> H <sub>1128</sub> , C <sub>564</sub> H <sub>1130</sub> , C <sub>565</sub> H <sub>1132</sub> , C <sub>566</sub> H <sub>1134</sub> , C <sub>567</sub> H <sub>1136</sub> , C <sub>568</sub> H <sub>1138</sub> , C <sub>569</sub> H <sub>1140</sub> , C <sub>570</sub> H <sub>1142</sub> , C <sub>571</sub> H <sub>1144</sub> , C <sub>572</sub> H <sub>1146</sub> , C <sub>573</sub> H <sub>1148</sub> , C <sub>574</sub> H <sub>1150</sub> , C <sub>575</sub> H <sub>1152</sub> , C <sub>576</sub> H <sub>1154</sub> , C <sub>577</sub> H <sub>1156</sub> , C <sub>578</sub> H <sub>1158</sub> , C <sub>579</sub> H <sub>1160</sub> , C <sub>580</sub> H <sub>1162</sub> , C <sub>581</sub> H <sub>1164</sub> , C <sub>582</sub> H <sub>1166</sub> , C <sub>583</sub> H <sub>1168</sub> , C <sub>584</sub> H <sub>1170</sub> , C <sub>585</sub> H <sub>1172</sub> , C <sub>586</sub> H <sub>1174</sub> , C <sub>587</sub> H <sub>1176</sub> , C <sub>588</sub> H <sub>1178</sub> , C <sub>589</sub> H <sub>1180</sub> , C <sub>590</sub> H <sub>1182</sub> , C <sub>591</sub> H <sub>1184</sub> , C <sub>592</sub> H <sub>1186</sub> , C <sub>593</sub> H <sub>1188</sub> , C <sub>594</sub> H <sub>1190</sub> , C <sub>595</sub> H <sub>1192</sub> , C <sub>596</sub> H <sub>1194</sub> , C <sub>597</sub> H <sub>1196</sub> , C <sub>598</sub> H <sub>1198</sub> , C <sub>599</sub> H <sub>1200</sub> , C <sub>600</sub> H <sub>1202</sub> , C <sub>601</sub> H <sub>1204</sub> , C <sub>602</sub> H <sub>1206</sub> , C <sub>603</sub> H <sub>1208</sub> , C <sub>604</sub> H <sub>1210</sub> , C <sub>605</sub> H <sub>1212</sub> , C <sub>606</sub> H <sub>1214</sub> , C <sub>607</sub> H <sub>1216</sub> , C <sub>6</sub>						

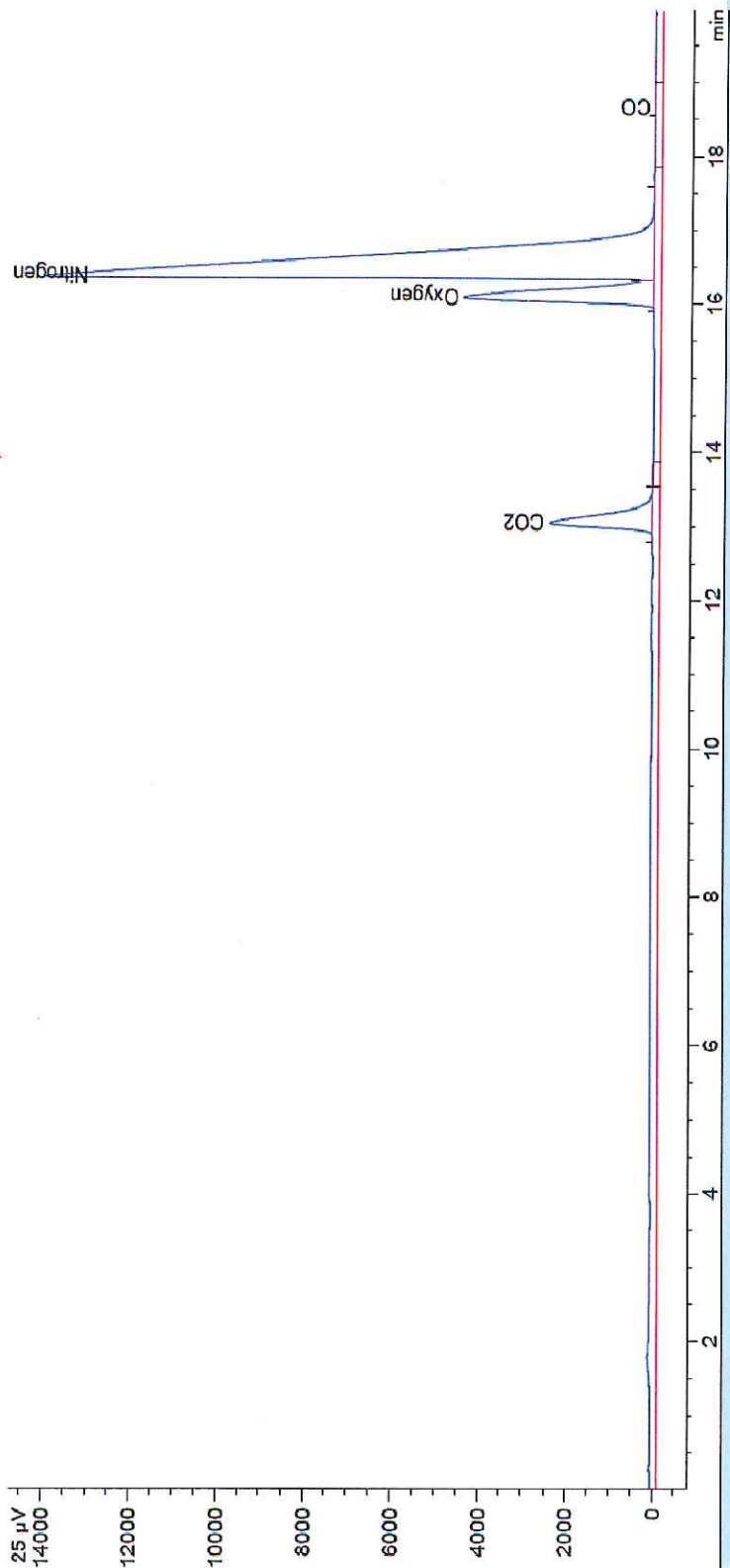
[illegible]



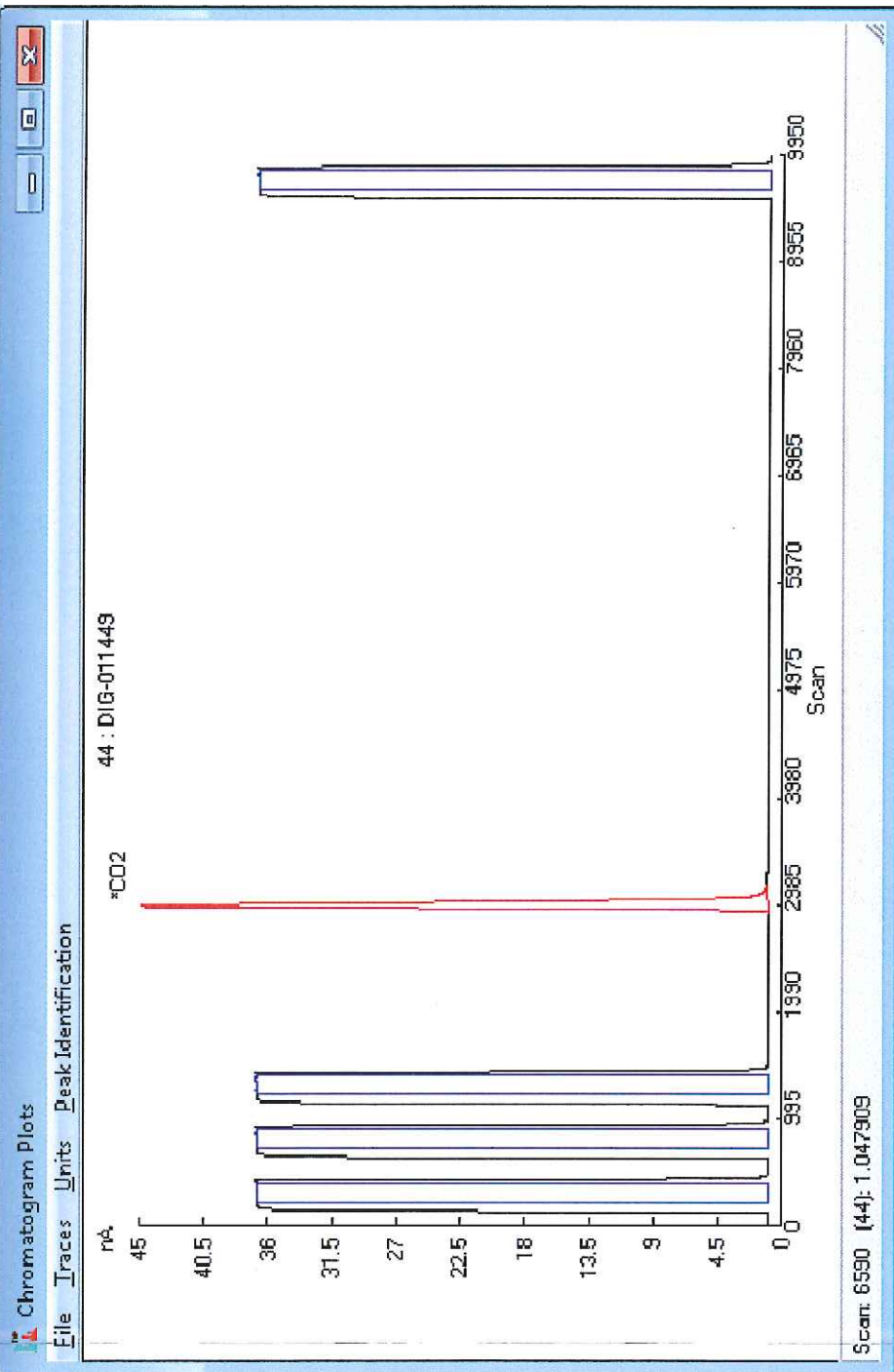


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05)DIG-011449.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05)DIG-011449.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011443  
**Client:** Vista Geoscience  
**Sample Name(s):** VW300627171253

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011443  
 Client: Vista Geoscience  
 Sample Name: VW300627171253  
 Date Sampled: 06/27/17  
 Time Sampled: 12:53  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/30/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	774923	77.82	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	207080	20.80	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	13746	1.38	-	-14.7	-	
Carbon Monoxide ( $\text{CO}$ )	20	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	#DIV/0!
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰

# Chain of Custody Form



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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

### Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>4</sub> +	RSK-175 <sup>†</sup> N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>4</sub> +, with dissolved C <sub>2</sub> , C <sub>3</sub> & C <sub>4</sub>	gpc Methane (Carbon)	gpc Methane (Hydrogen)	gpc Ethane-Pentane (C <sub>3</sub> +, if present)	
	VW 31	06/27/17	1428	X		X	X	X	
	VW 60	06/27/17	1307	X		X	X	X	+D13C CO2
	VW 30	06/27/17	1253	X		X	X	X	+D13C CO2
	VW 40	06/27/17	1159	X		X	X	X	+D13C CO2
	VW 58	06/27/17	1155	X		X	X	X	+D13C CO2
	VW 34	06/27/17	1328	X		X	X	X	+D13C CO2
	VW 48	06/27/17	1123	X		X	X	X	+D13C CO2
	VW 44	06/27/17	1038	X		X	X	X	+D13C CO2

### Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

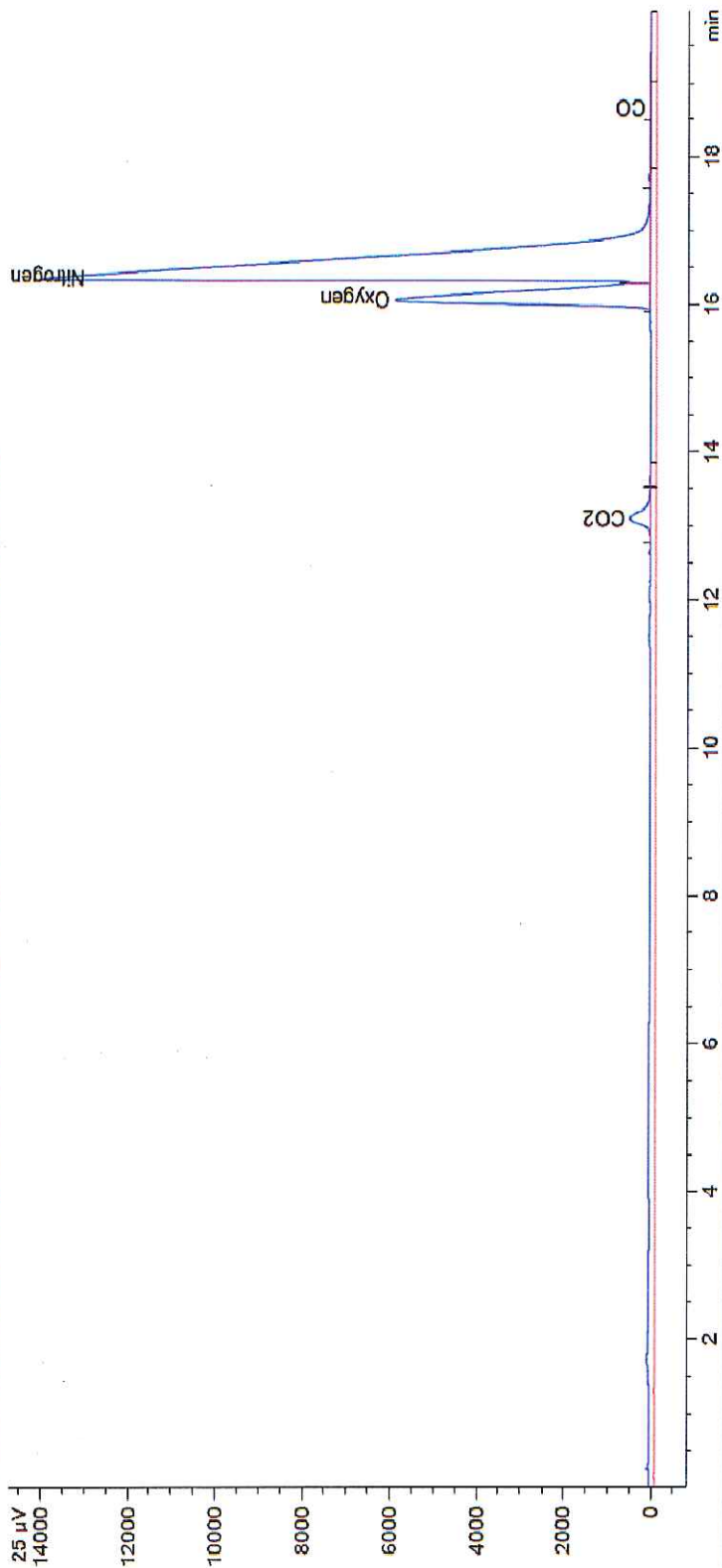




# Gas Chromatography (GC) Chromatogram

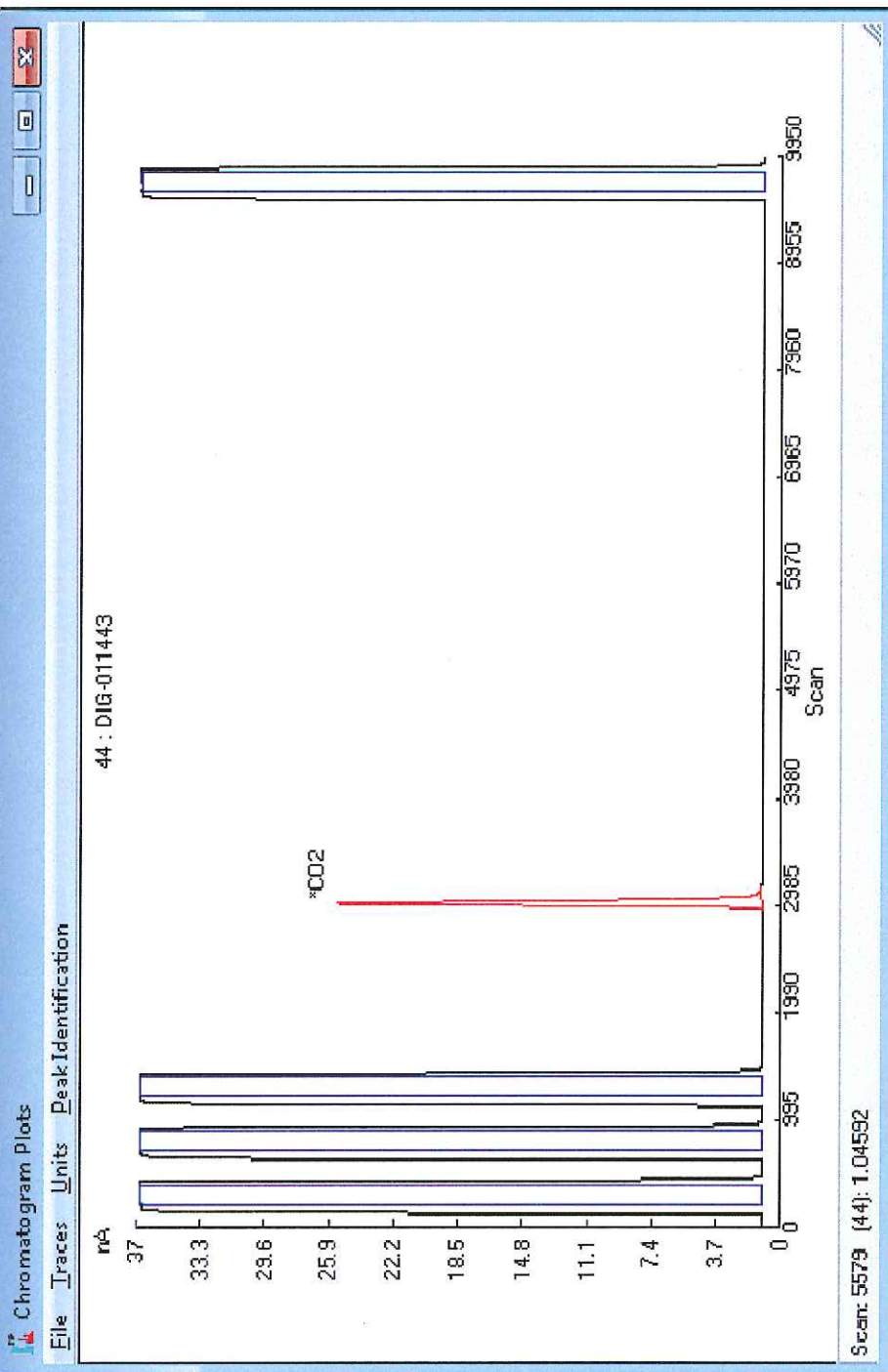


TCD1 A, Front Signal (20170626\_JOB882\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011443.D)  
TCD2 B, Back Signal (20170626\_JOB882\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011443.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011441  
**Client:** Vista Geoscience  
**Sample Name(s):** VW310627171428

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011441  
 Client: Vista Geoscience  
 Sample Name: VW310627171428  
 Date Sampled: 06/27/17  
 Time Sampled: 14:28  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/30/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	777869	78.65	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	186396	18.85	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	24734	2.50	-	-18.7	-	
Carbon Monoxide (CO)	16	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	#DIV/0!
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

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Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175 <sup>®</sup> (for composition) H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> with dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	gpc Methane (Carbon)	gpc Methane (Hydrogen)	gpc Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	
	VW 31	06/27/17	1428	X		X	X	X	
	VW 60	06/27/17	1307	X		X	X	X	+D13C CO2
	VW 30	06/27/17	1253	X		X	X	X	+D13C CO2
	VW 40	06/27/17	1159	X		X	X	X	+D13C CO2
	VW 58	06/27/17	1155	X		X	X	X	+D13C CO2
	VW 34	06/27/17	1328	X		X	X	X	+D13C CO2
	VW 48	06/27/17	1123	X		X	X	X	+D13C CO2
	VW 44	06/27/17	1038	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

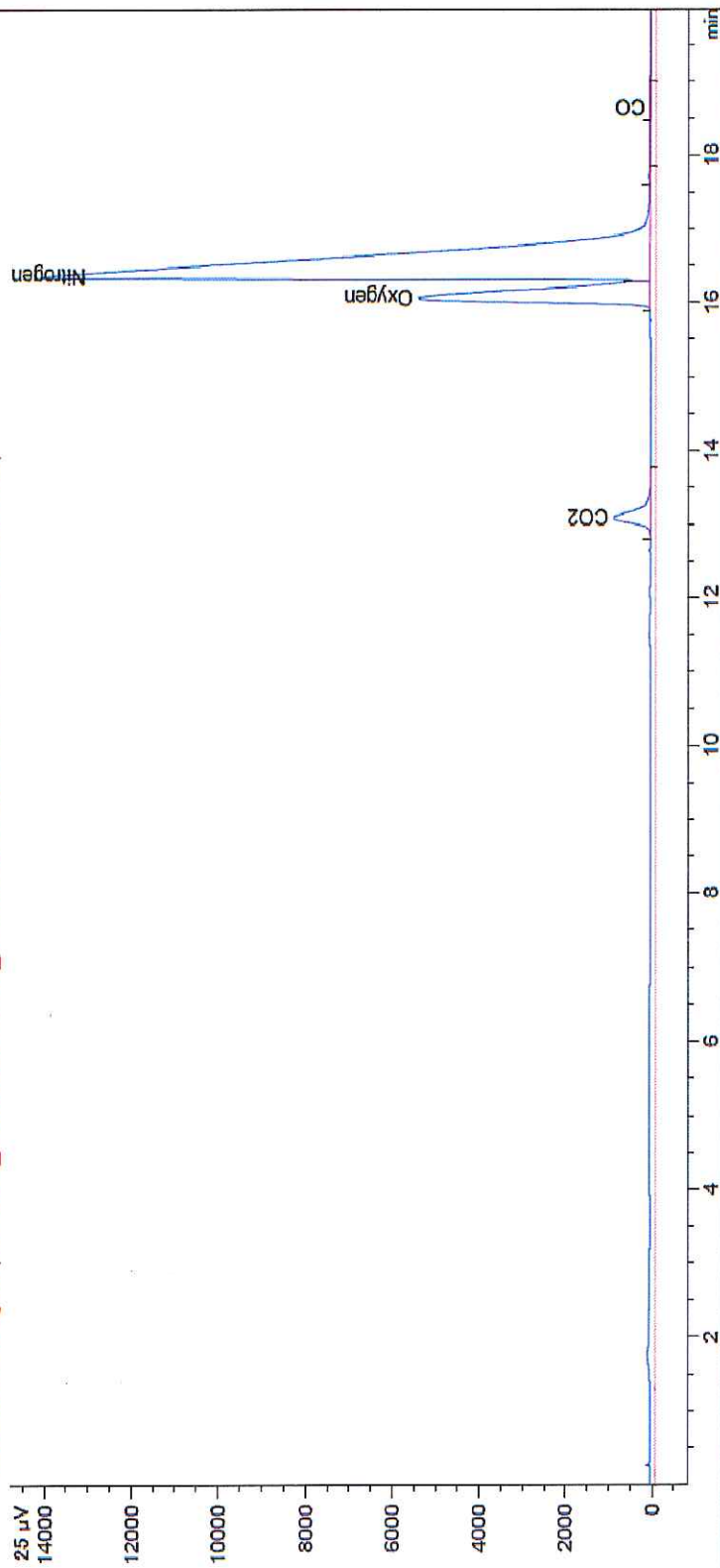
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030



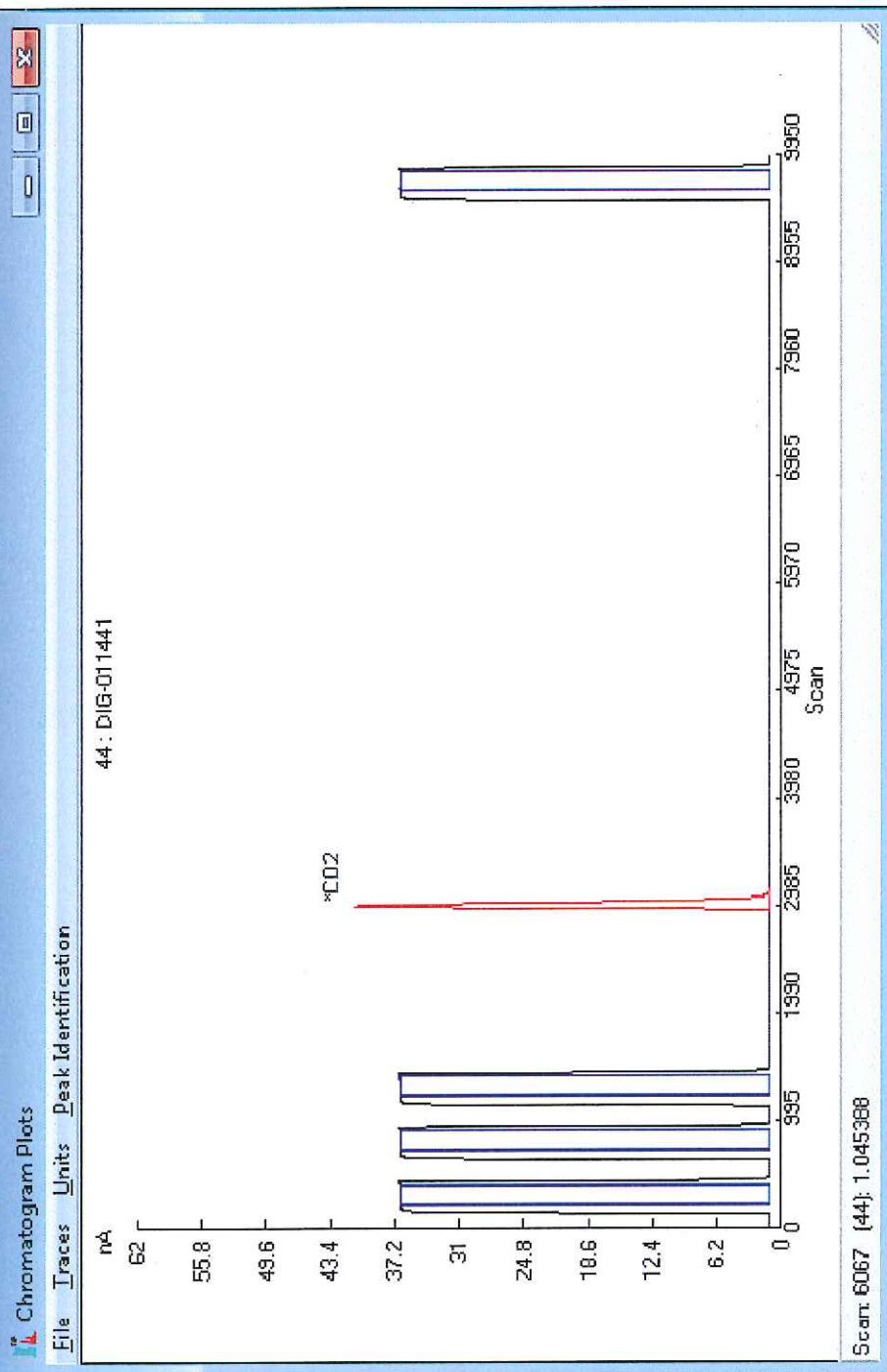
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011441.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011441.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011411  
**Client:** Vista Geoscience  
**Sample Name(s):** VW320627171356

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011411  
 Client: Vista Geoscience  
 Sample Name: VW320627171356  
 Date Sampled: 06/27/17  
 Time Sampled: 13:56  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition:6/28/17  $\delta^{13}\text{C}$ :6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	770024	78.30	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	196932	20.03	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	16461	1.67	-	-17.9	-	
Carbon Monoxide (CO)	16	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested						Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>6</sub> +	RSK-175* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>6</sub> +	with dissolved Cl <sub>2</sub> , CO <sub>2</sub> & O <sub>2</sub>	δ <sup>13</sup> C Methane (Carbon)	δ <sup>13</sup> C Methane (Hydrogen)	δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	
	VW 51	062717	1102	X			X	X	X	
	VW 55	062717	1342	X			X	X	X	+D13C CO2
	VW 32	062717	1356	X			X	X	X	+D13C CO2
	VW 24	062717	1258	X			X	X	X	+D13C CO2
	VW 35	062717	1458	X			X	X	X	+D13C CO2
	VW 22	062717	1451	X			X	X	X	+D13C CO2
	VW 52	062717	1108	X			X	X	X	+D13C CO2
	VW 50	062717	1056	X			X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DTG</u>	<u>6/27/17</u>	<u>15:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

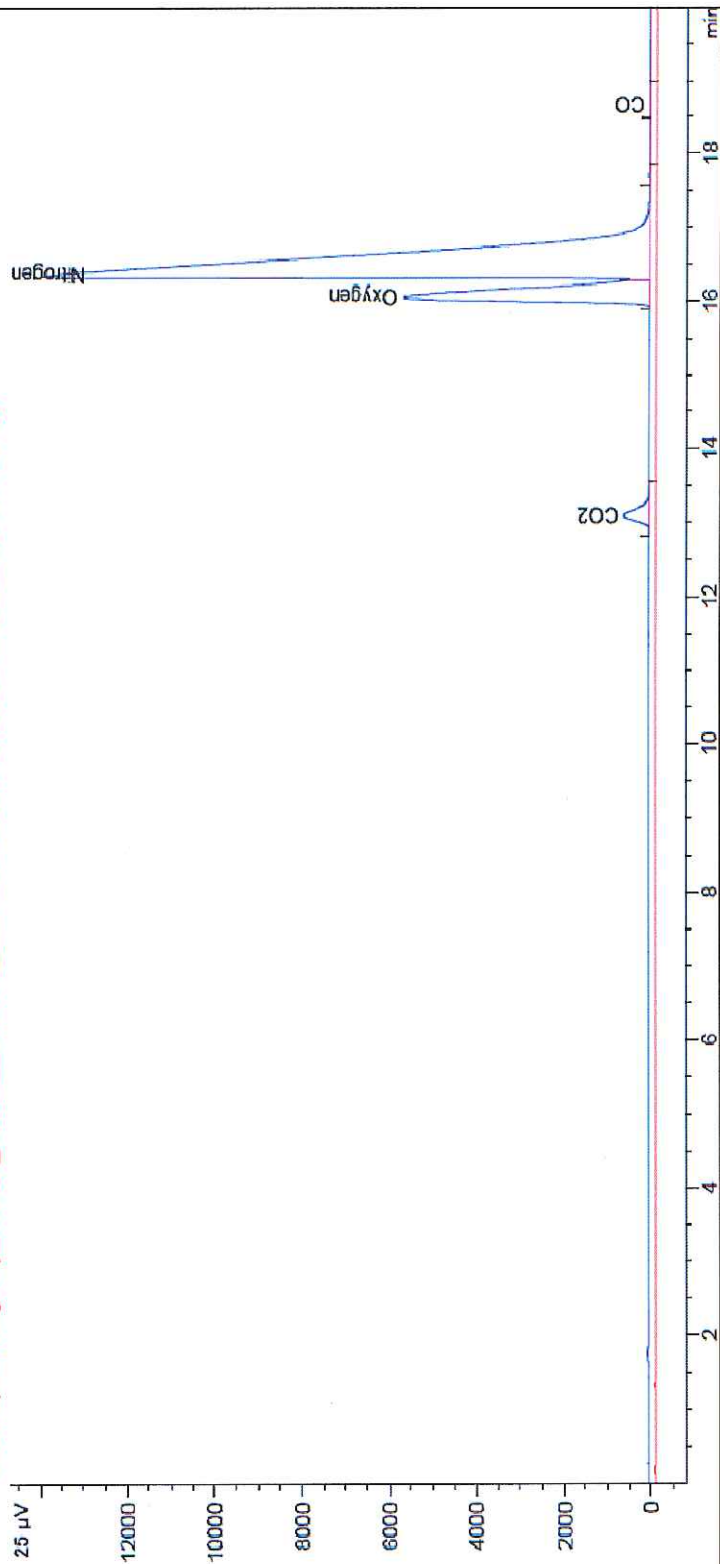


[illegible]

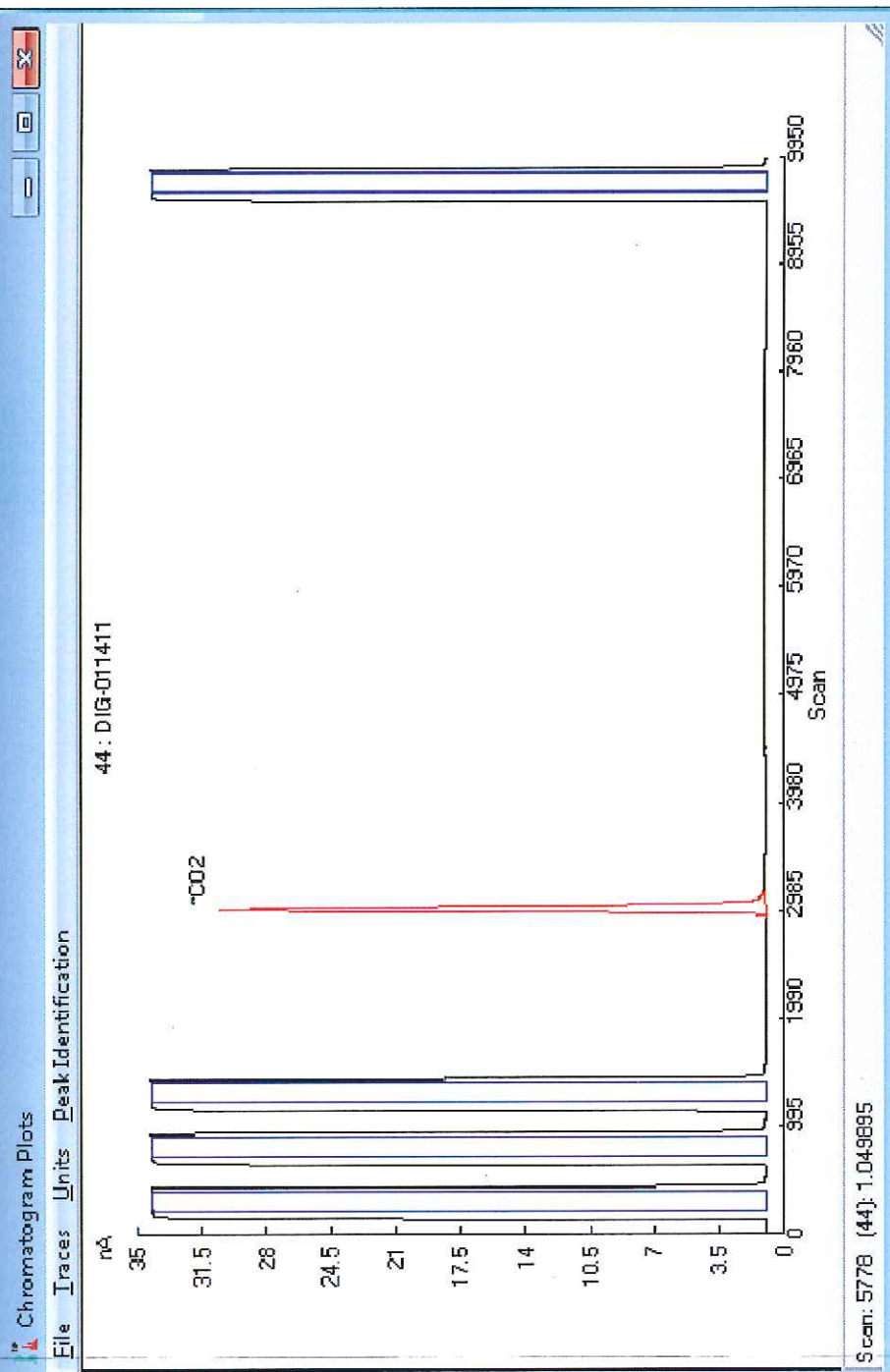


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS\_2017-06-28 07-53-26\DIG-011411REP.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS\_2017-06-28 07-53-26\DIG-011411REP.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011427  
**Client:** Vista Geoscience  
**Sample Name(s):** VW330627171334

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011427  
 Client: Vista Geoscience  
 Sample Name: VW330627171334  
 Date Sampled: 06/27/17  
 Time Sampled: 13:34  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	766047	77.80	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	201175	20.43	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	17407	1.77	-	-17.0	-	
Carbon Monoxide ( $\text{CO}$ )	14	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + / \text{C}_1 +$ )	
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Geochemistry for Energy

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Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>-C<sub>6</sub>+

RSK-175\* (see composition)  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>-C<sub>6</sub>+,  
with dissolved Cl<sub>2</sub>, Cl<sub>2</sub> & C<sub>3</sub>

δ<sup>13</sup>C Methane (Carbon)

δ<sup>13</sup>C Methane (Hydrogen)

δ<sup>13</sup>C Ethane-Pentane  
(C<sub>2</sub>-C<sub>5</sub>, if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X	X	X	X	Comments
	VW 42	062717	1030	X	X	X	X	+D13C CO2
	VW 23	062717	1439	X	X	X	X	+D13C CO2
	VW 33	062717	1334	X	X	X	X	+D13C CO2
	VW 40	062717	1204	X	X	X	X	+D13C CO2
	VW 14	062717	1444	X	X	X	X	+D13C CO2
	VW 25	062717	1258	X	X	X	X	+D13C CO2
	VW 38	062717	1132	X	X	X	X	+D13C CO2
	VW 61	062717	1314	X	X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista GED</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175: Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

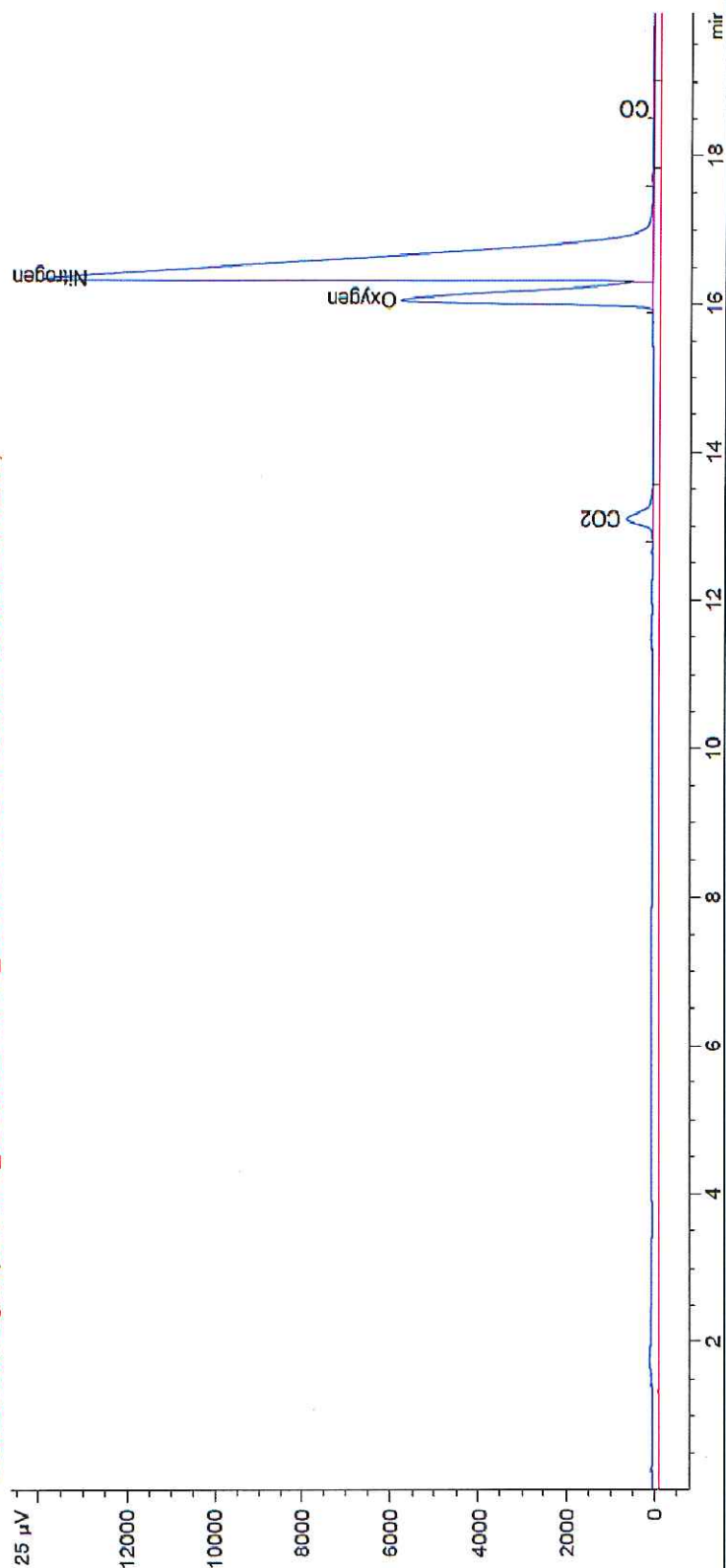




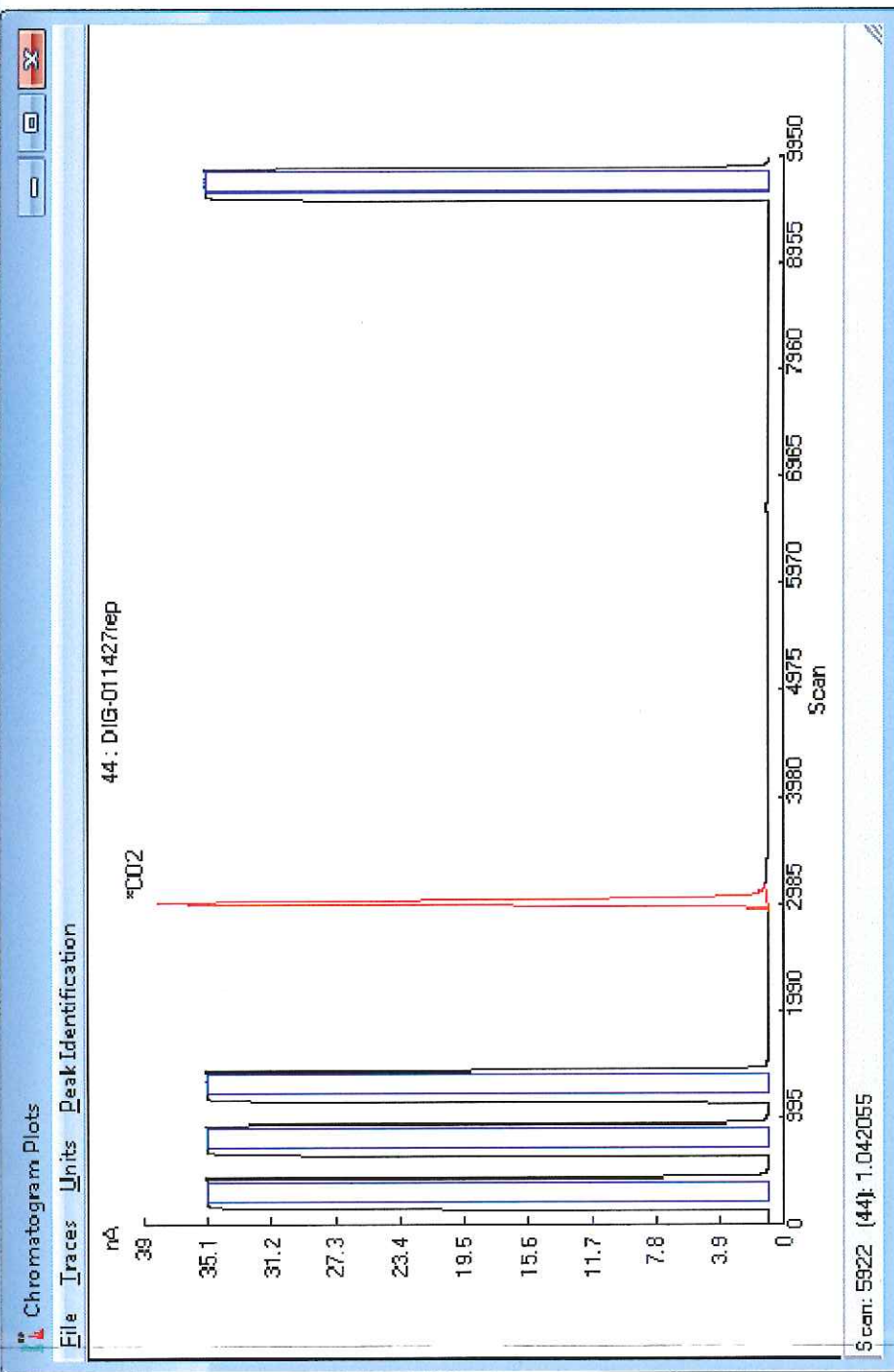


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26DIG-011427.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26DIG-011427.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

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Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011446  
**Client:** Vista Geoscience  
**Sample Name(s):** VW340627171328

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011446  
 Client: Vista Geoscience  
 Sample Name: VW340627171328  
 Date Sampled: 06/27/17  
 Time Sampled: 13:28  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/30/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	773853	77.82	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	212016	21.32	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	8569	0.86	-	-17.4	-	
Carbon Monoxide ( $\text{CO}$ )	19	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	#DIV/0!
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰

# Chain of Custody Form



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Dolan Integration Group

## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

### Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>4</sub> +	RSK-175* (gas composition) H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>4</sub> +, with dissolved Cl <sub>2</sub> , Cl <sub>2</sub> & C <sub>3</sub>	gTC Methane (Carbon)	SD Methane (Hydrogen)	gTC Ethane-Pentane (G <sub>2</sub> & If Present)	
	VW 31	06/27/17	1428	X		X	X	X	
	VW 60	06/27/17	1307	X		X	X	X	+D13C CO2
	VW 30	06/27/17	1253	X		X	X	X	+D13C CO2
	VW 40	06/27/17	1159	X		X	X	X	+D13C CO2
	VW 58	06/27/17	1155	X		X	X	X	+D13C CO2
	VW 34	06/27/17	1328	X		X	X	X	+D13C CO2
	VW 48	06/27/17	1123	X		X	X	X	+D13C CO2
	VW 44	06/27/17	1038	X		X	X	X	+D13C CO2

### Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

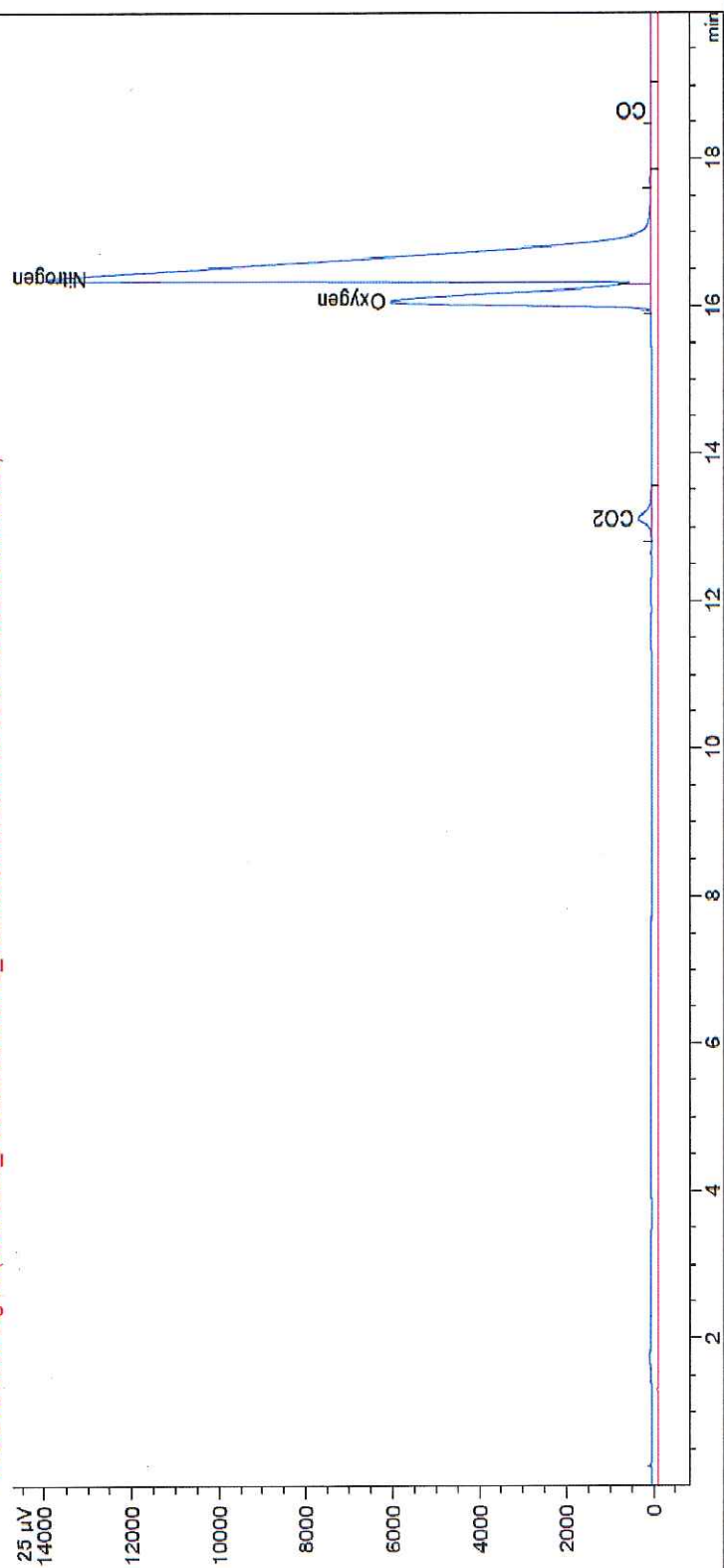
[illegible]



# Gas Chromatography (GC) Chromatogram

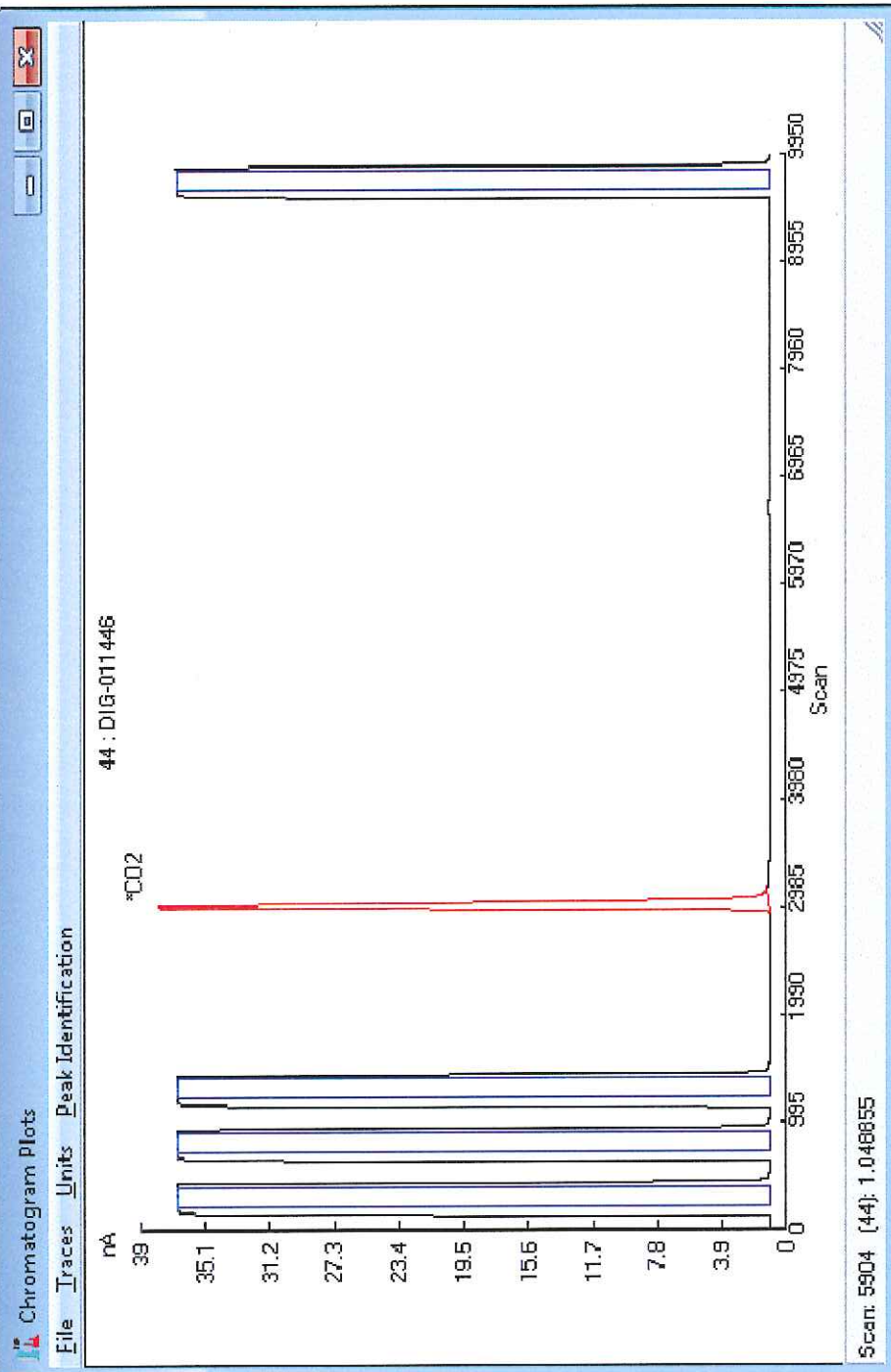


TCD1 A: Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011446.D)  
TCD2 B: Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011446.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011413  
**Client:** Vista Geoscience  
**Sample Name(s):** VW350627171458

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011413  
 Client: Vista Geoscience  
 Sample Name: VW350627171458  
 Date Sampled: 06/27/17  
 Time Sampled: 14:58  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	755868	76.79	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	165561	16.82	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	62870	6.39	-	-21.7	-	
Carbon Monoxide (CO)	14	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Dolan Integration Group

## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

### Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175* (see composition) H <sub>2</sub> O, CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> with dissolved Cl <sub>2</sub> , C <sub>2</sub> H <sub>4</sub> & C <sub>3</sub> H <sub>8</sub>	80°C Methane (Carbon)	80°C Methane (Hydrogen)	80°C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	
	VW 51	062717	1102	X		X	X	X	
	VW 55	062717	1342	X		X	X	X	+D13C CO2
	VW 32	062717	1356	X		X	X	X	+D13C CO2
	VW 24	062717	1258	X		X	X	X	+D13C CO2
	VW 35	062717	1458	X		X	X	X	+D13C CO2
	VW 22	062717	1451	X		X	X	X	+D13C CO2
	VW 52	062717	1108	X		X	X	X	+D13C CO2
	VW 50	062717	1056	X		X	X	X	+D13C CO2

### Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>15:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175. Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

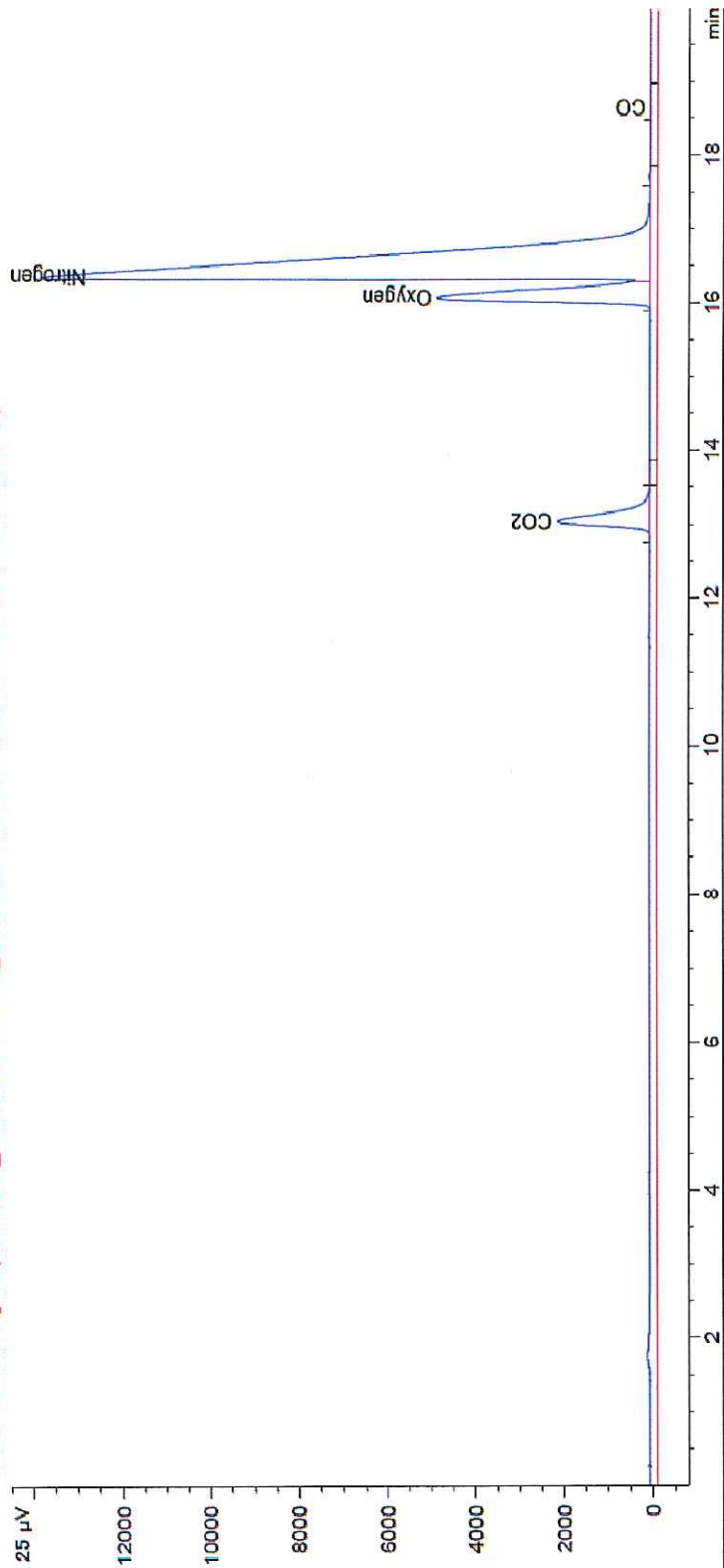
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

[illegible]

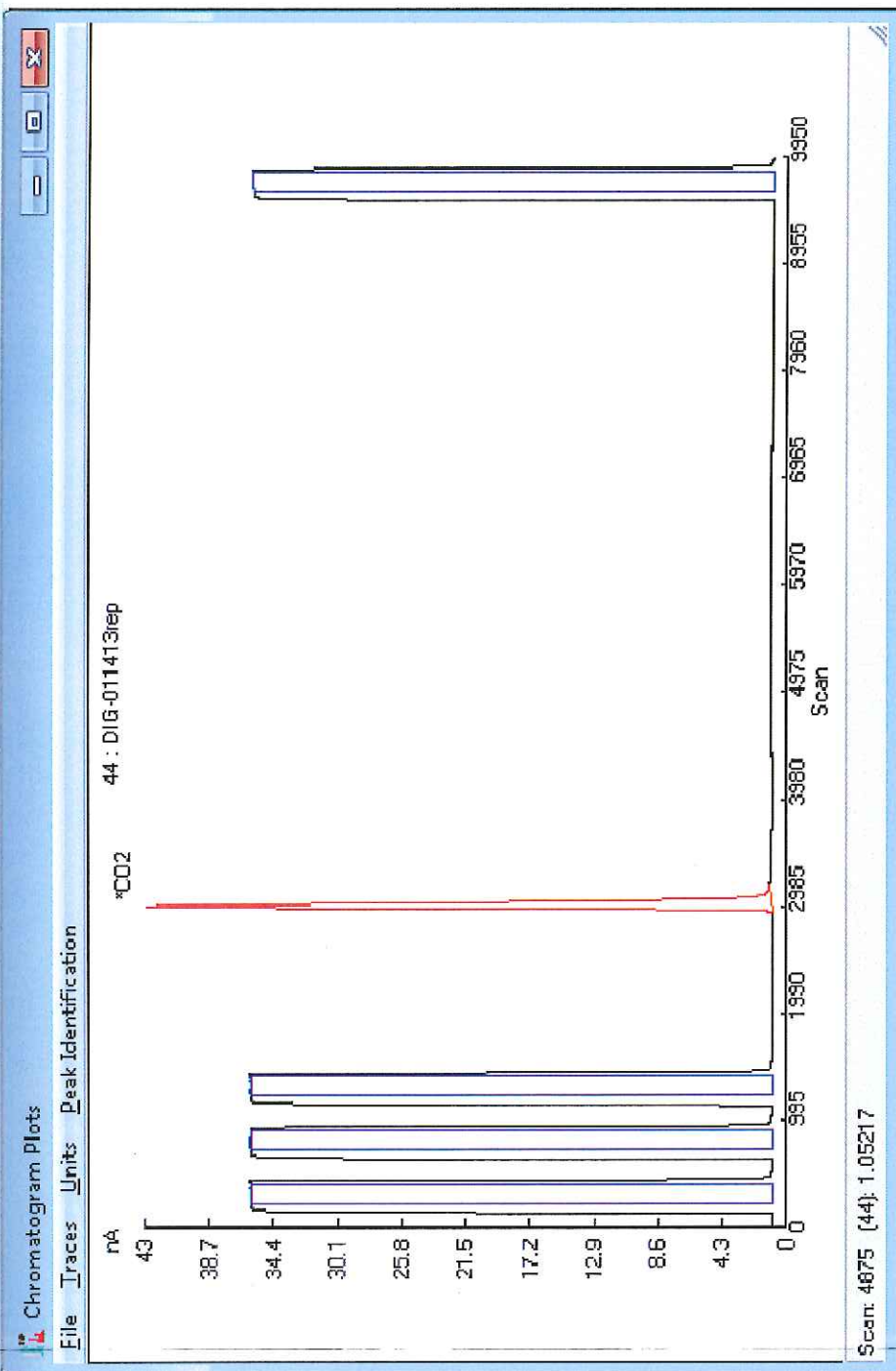


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011413REP.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011413REP.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011439  
**Client:** Vista Geoscience  
**Sample Name(s):** VW360627171322

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011439  
 Client: Vista Geoscience  
 Sample Name: VW360627171322  
 Date Sampled: 06/27/17  
 Time Sampled: 13:22  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	782418	78.20	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	190880	19.08	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	27200	2.72	-	-17.7	-	
Carbon Monoxide ( $\text{CO}$ )	15	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	#DIV/0!
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: WOODWARD

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, C<sub>2</sub>, C<sub>3</sub>+

ASK-175\* (see comments)  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, C<sub>2</sub>, C<sub>3</sub> +  
with dissolved C<sub>1</sub>, C<sub>2</sub> & C<sub>3</sub>

gTC Methane (Carbon)

gTC Methane (Hydrogen)

gTC Ethane-Pentane  
(C<sub>2</sub> - C<sub>5</sub>, if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time						Comments
	VW 59	062717	1148	X		X	X	X	
	VW 42	062717	1024	X		X	X	X	+D13C CO2
	VW 53	062717	1106	X		X	X	X	+D13C CO2
	VW 62	062717	1349	X		X	X	X	+D13C CO2
	VW 41	062717	1207	X		X	X	X	+D13C CO2
	VW 37	062717	1128	X		X	X	X	+D13C CO2
	VW 36	062717	1322	X		X	X	X	+D13C CO2
	VW 39	062717	1145	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>14:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

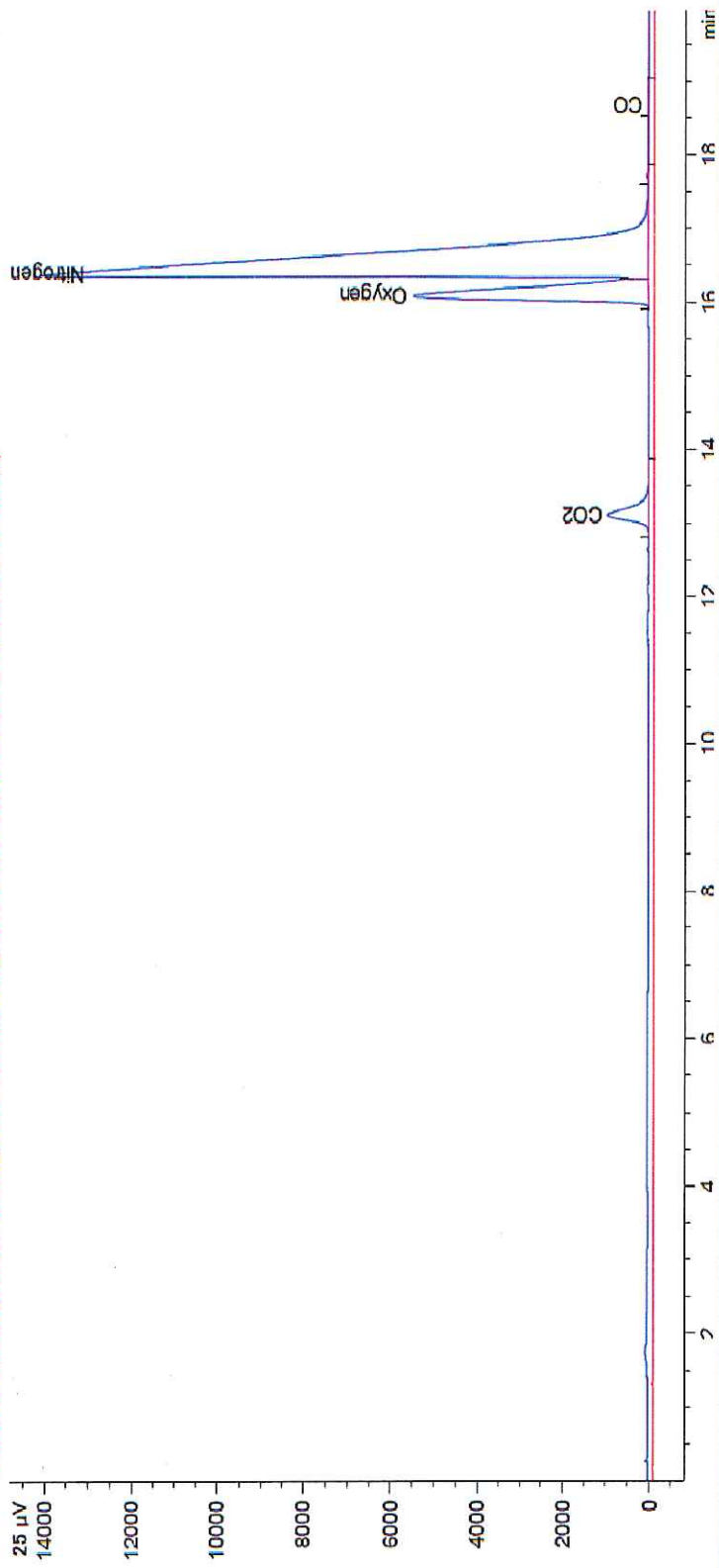


[illegible]

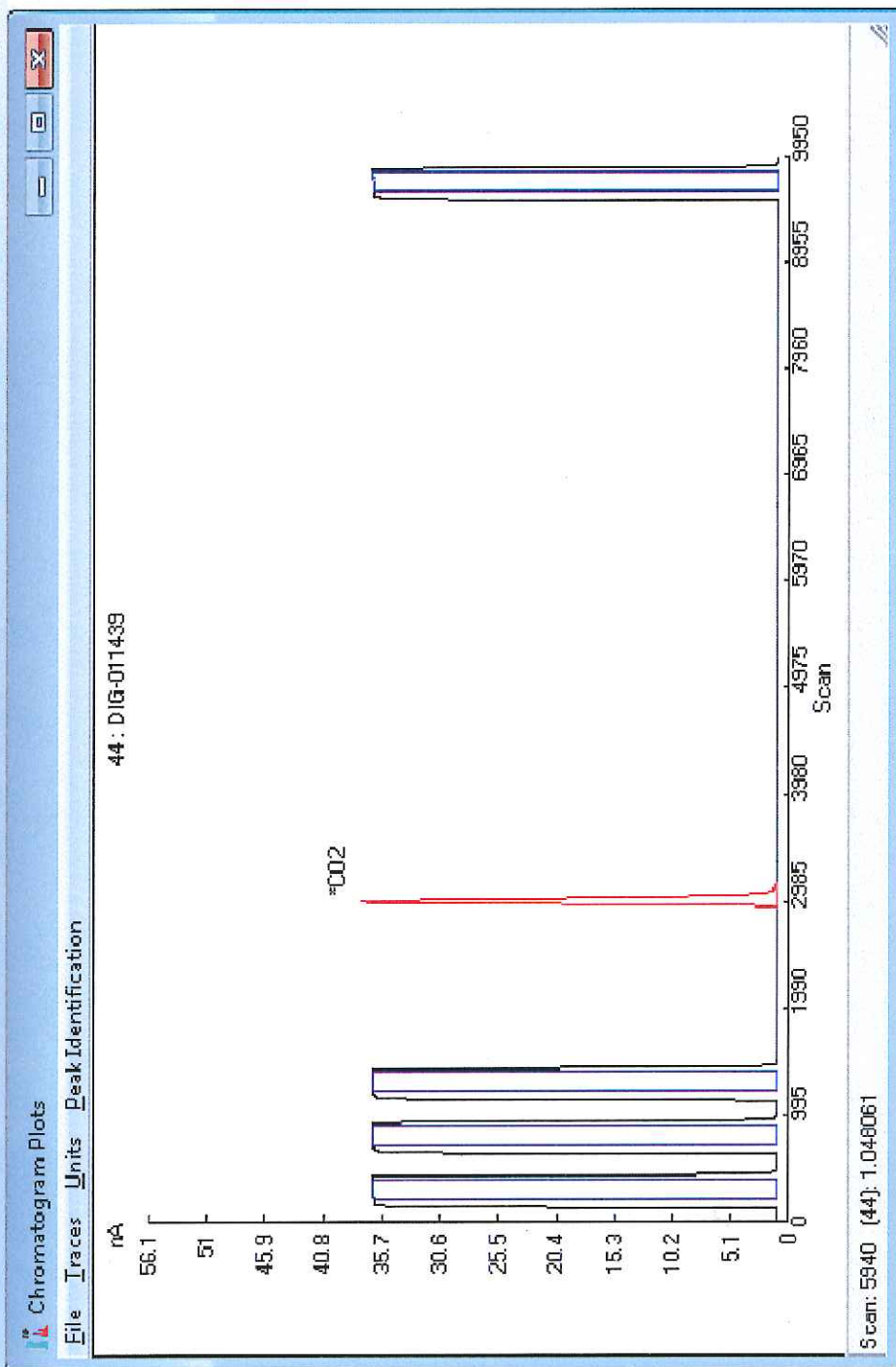


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05)DIG-011439.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05)DIG-011439.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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## Geochemistry for Energy

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Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011438  
**Client:** Vista Geoscience  
**Sample Name(s):** VW370627171128

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011438  
 Client: Vista Geoscience  
 Sample Name: VW370627171128  
 Date Sampled: 06/27/17  
 Time Sampled: 11:28  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	843705	83.67	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	147050	14.58	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	17645	1.75	-	-33.8	-	
Carbon Monoxide ( $\text{CO}$ )	nd	nd	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	#DIV/0!
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



**dig**  
Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
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Address: 130 Capital Dr. Ste C  
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Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested				
Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>4</sub>	RSK-175* (see composition) with dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	gTC, Methane (Carbon)	gTC, Methane (Hydrogen)	gTC, Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> , if present)

## Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 59	062717	1148	X		X	X	X	+D13C CO2
	VW 42	062717	1024	X		X	X	X	+D13C CO2
	VW 53	062717	1106	X		X	X	X	+D13C CO2
	VW 62	062717	1349	X		X	X	X	+D13C CO2
	VW 41	062717	1207	X		X	X	X	+D13C CO2
	VW 37	062717	1128	X		X	X	X	+D13C CO2
	VW 36	062717	1322	X		X	X	X	+D13C CO2
	VW 39	062717	1145	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>14:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

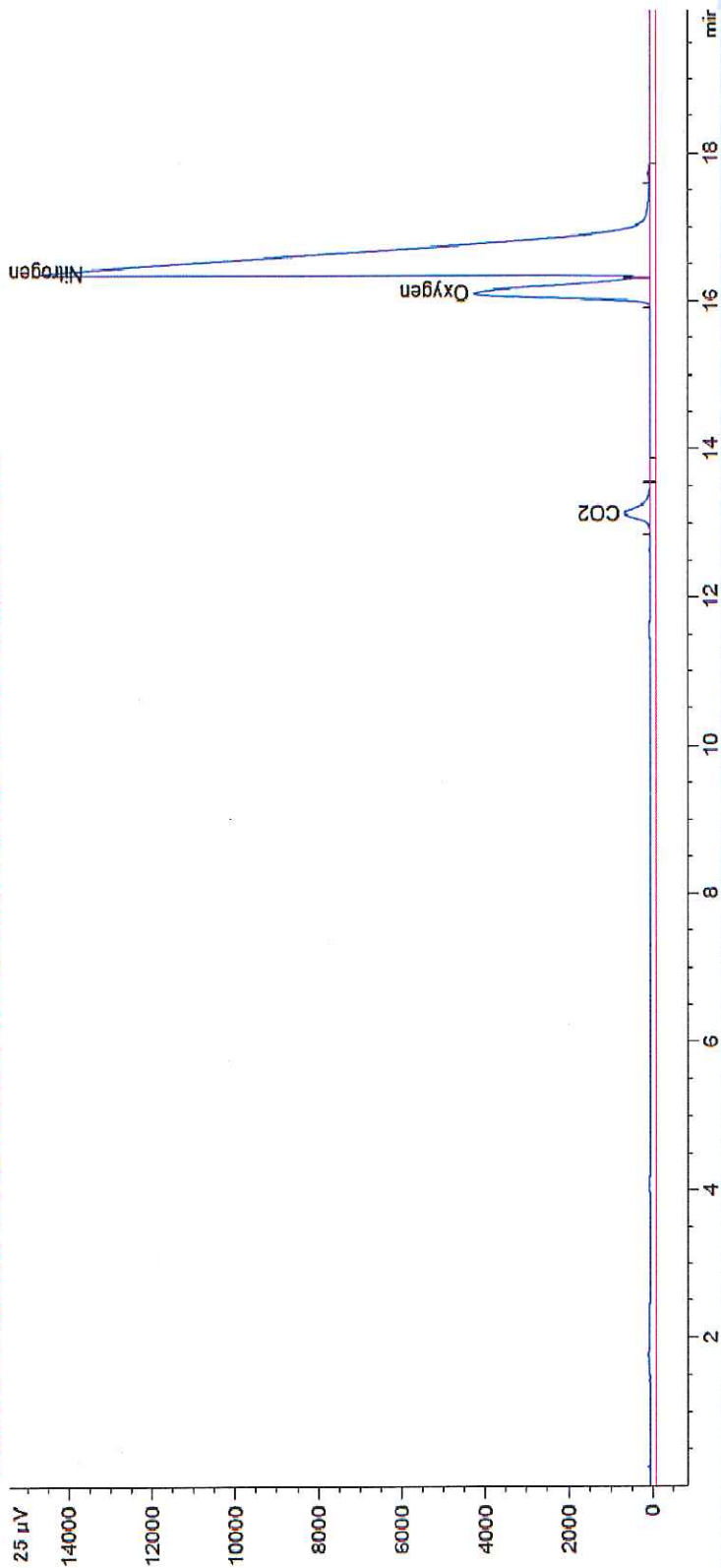
[illegible]



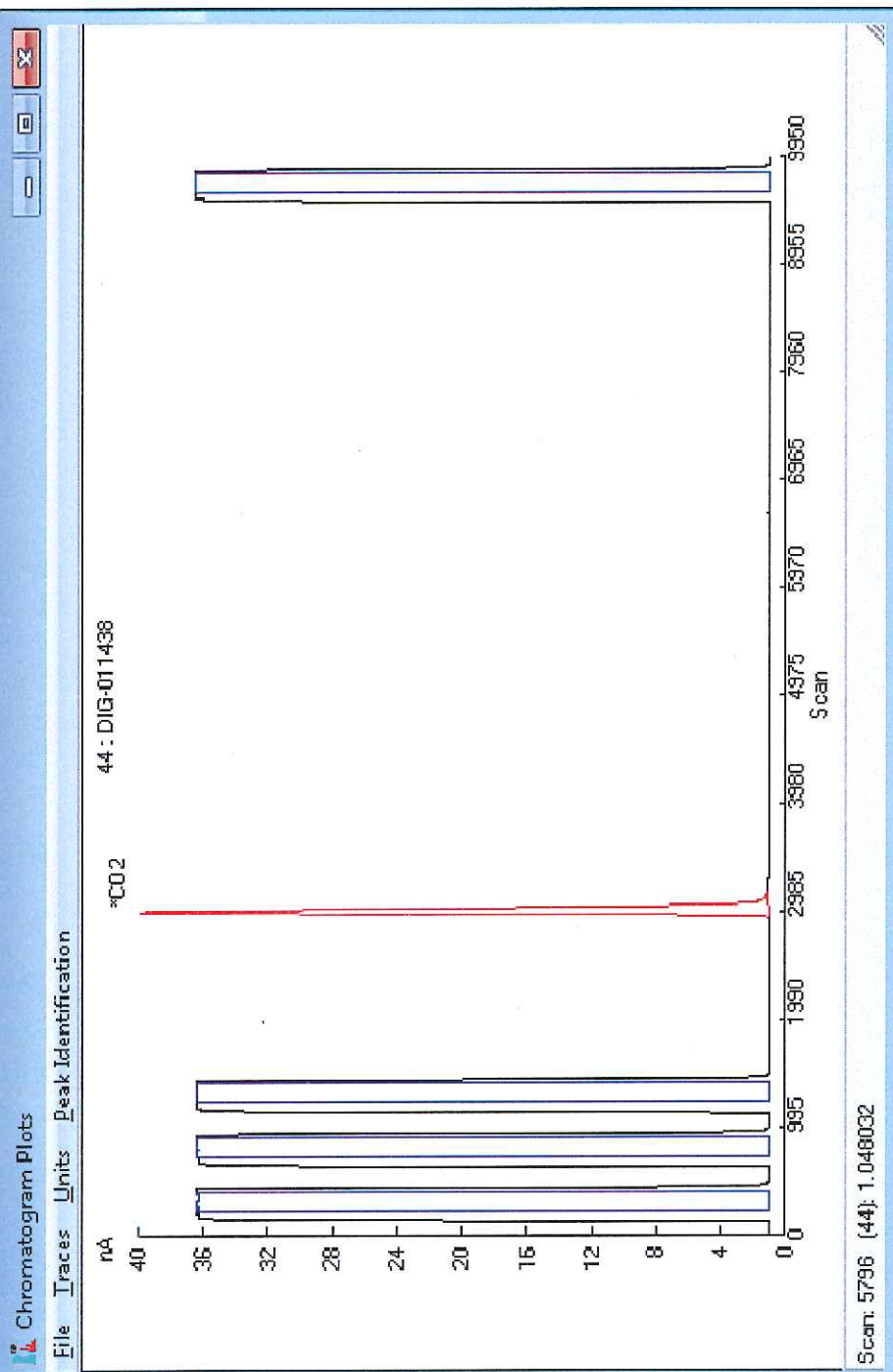
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011438.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011438.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011431  
**Client:** Vista Geoscience  
**Sample Name(s):** VW380627171132

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011431  
 Client: Vista Geoscience  
 Sample Name: VW380627171132  
 Date Sampled: 06/27/17  
 Time Sampled: 11:32  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	798569	80.63	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	178892	18.06	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	12968	1.31	-	-27.3	-	
Carbon Monoxide ( $\text{CO}$ )	13	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	#DIV/0!
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰

# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>-C<sub>4</sub>  
RSK-175\* Gas Composition  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>-C<sub>4</sub>  
with dissolved C<sub>1</sub>, C<sub>2</sub> & C<sub>3</sub>  
gTC Methane (Carbon)  
gTC Methane (Hydrogen)  
gTC Ethane-Pentane  
(C<sub>2</sub>-C<sub>5</sub> if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 42	062717	1030	X		X	X	X	+D13C CO2
	VW 23	062717	1439	X		X	X	X	+D13C CO2
	VW 33	062717	1334	X		X	X	X	+D13C CO2
	VW 40	062717	1204	X		X	X	X	+D13C CO2
	VW 14	062717	1444	X		X	X	X	+D13C CO2
	VW 25	062717	1258	X		X	X	X	+D13C CO2
	VW 38	062717	1132	X		X	X	X	+D13C CO2
	VW 61	062717	1314	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

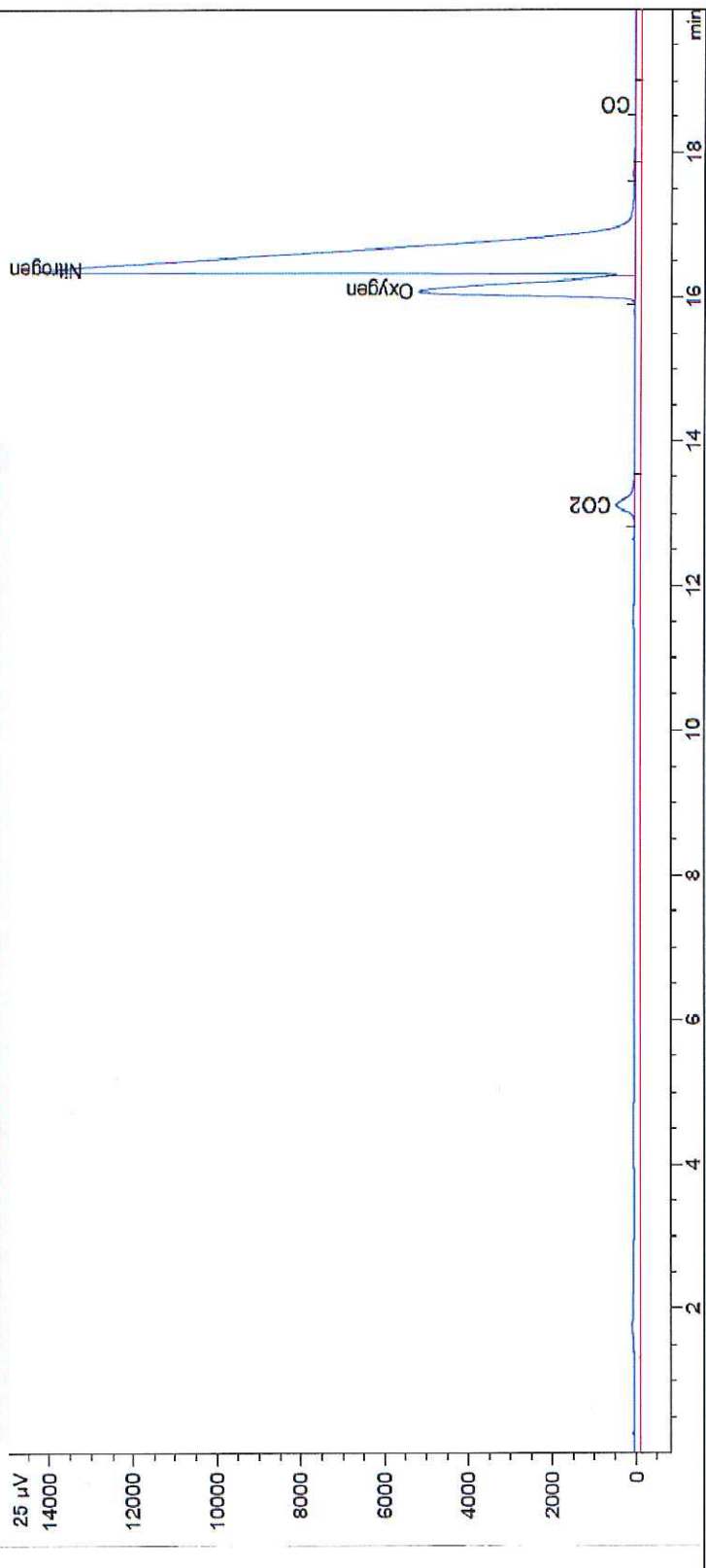
[illegible]





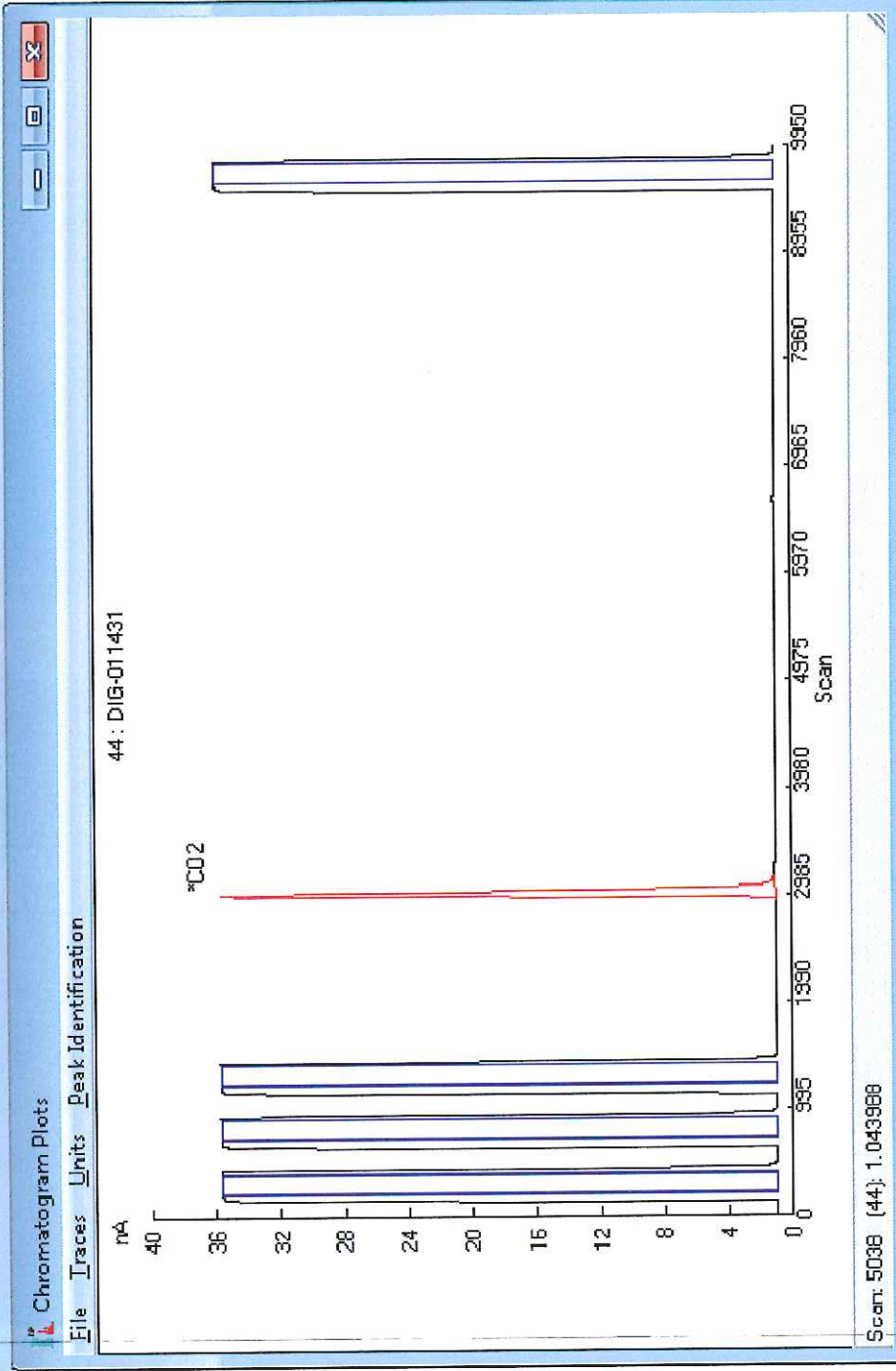
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07:53:26\DIG-011431.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07:53:26\DIG-011431.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

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Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

Job #: 17060983  
Lab #: DIG-011440  
Client: Vista Geoscience  
Sample Name(s): VW390627171145

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011440  
 Client: Vista Geoscience  
 Sample Name: VW390627171145  
 Date Sampled: 06/27/17  
 Time Sampled: 11:45  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	784777	78.91	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	201383	20.25	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	8345	0.84	-	-30.8	-	
Carbon Monoxide ( $\text{CO}$ )	14	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	#DIV/0!
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, H<sub>2</sub>C, C<sub>2</sub>H<sub>6</sub>

RSK-175<sup>†</sup> (see composition)  
with dissolved Cl<sup>-</sup>, Cl<sup>-</sup> & Ca

δ<sup>13</sup>C Methane (Carbon)

δD Methane (Hydrogen)

δ<sup>13</sup>C Ethane/Pentane  
(C<sub>2</sub>, C<sub>5</sub>, if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 59	062717	1148	X		X	X	X	+D13C CO2
	VW 42	062717	1024	X		X	X	X	+D13C CO2
	VW 53	062717	1106	X		X	X	X	+D13C CO2
	VW 62	062717	1349	X		X	X	X	+D13C CO2
	VW 41	062717	1207	X		X	X	X	+D13C CO2
	VW 37	062717	1128	X		X	X	X	+D13C CO2
	VW 36	062717	1322	X		X	X	X	+D13C CO2
	VW 39	062717	1145	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>14:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175: Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

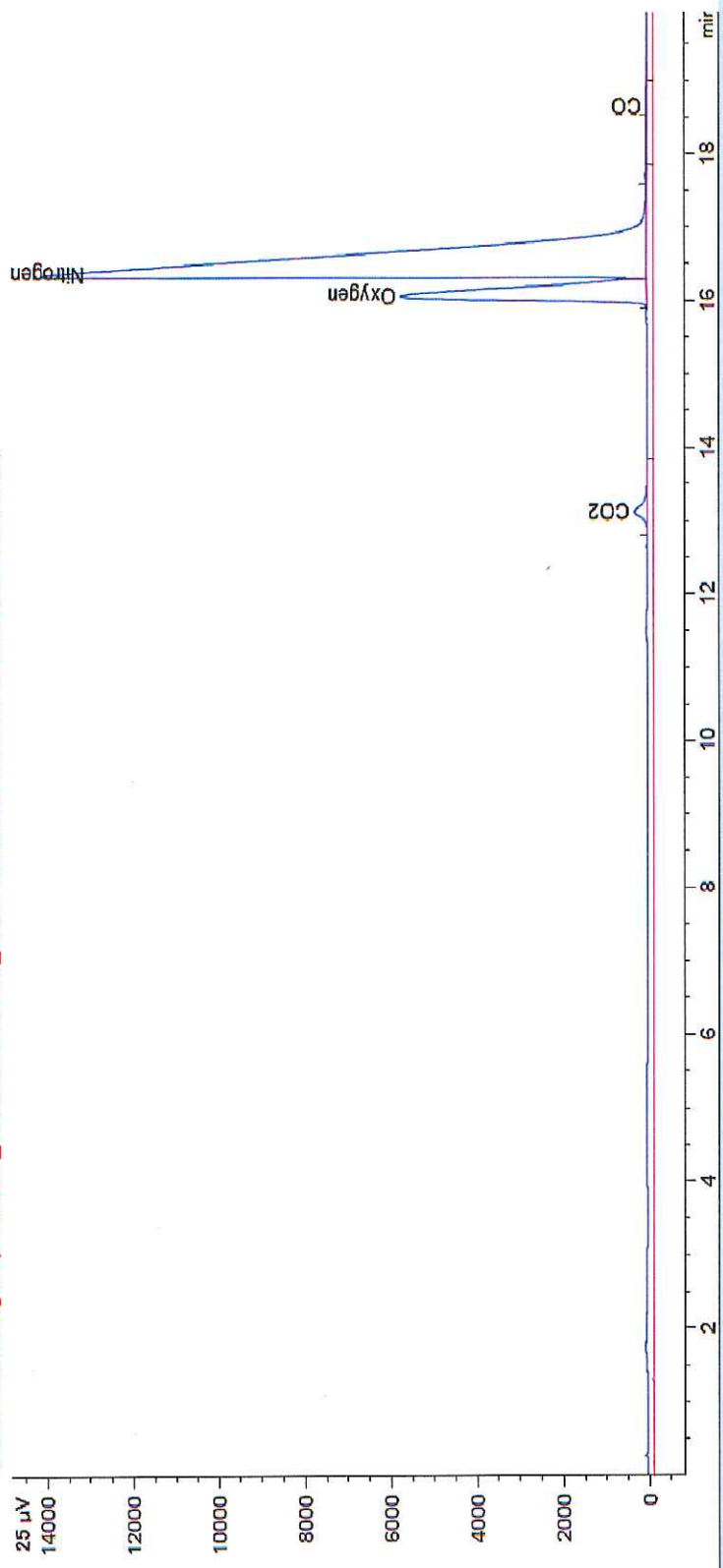
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

[illegible]

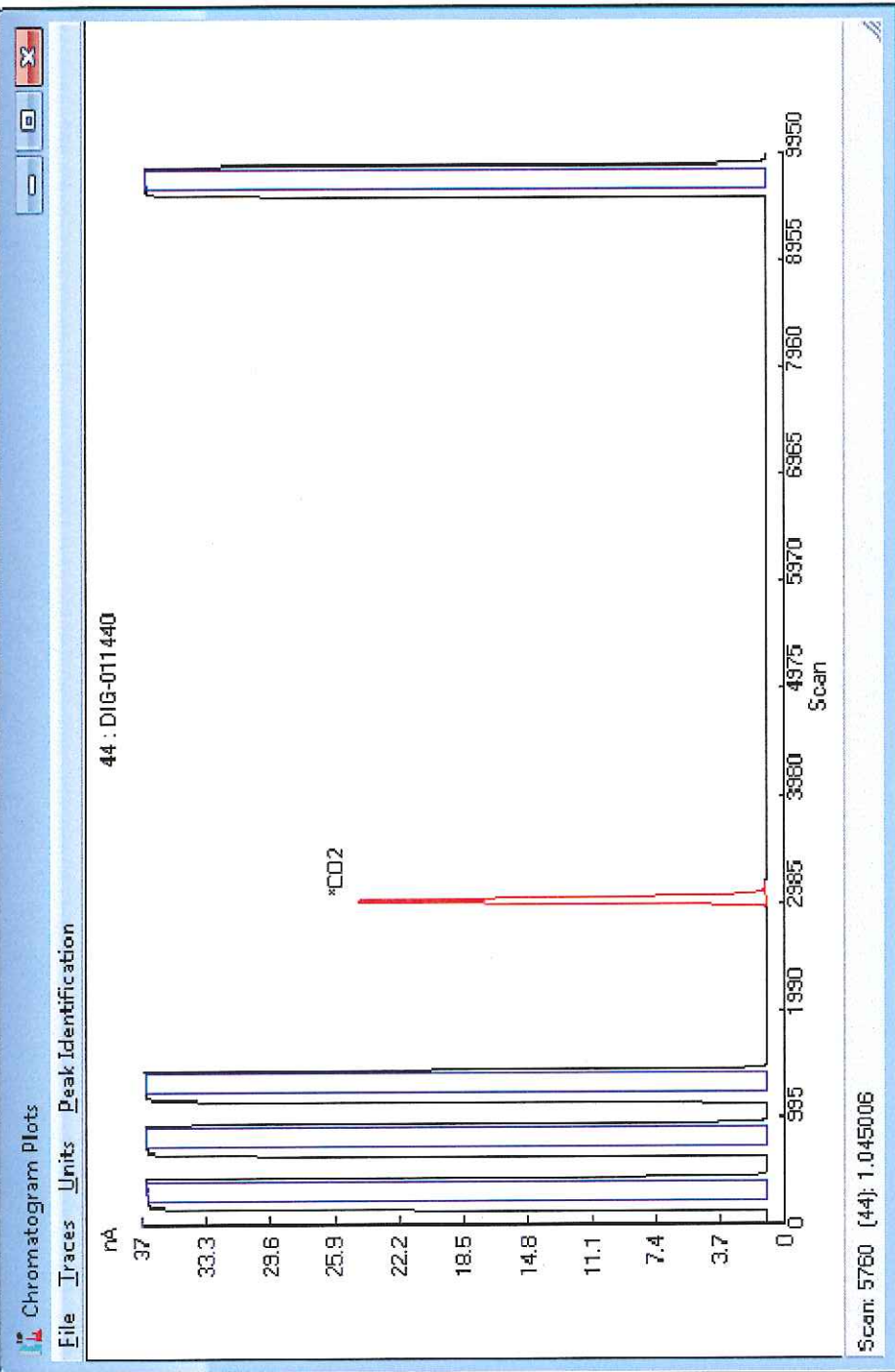


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011440.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011440.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

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Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011428  
**Client:** Vista Geoscience  
**Sample Name(s):** VW400627171204

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011428  
 Client: Vista Geoscience  
 Sample Name: VW400627171204  
 Date Sampled: 06/27/17  
 Time Sampled: 12:04  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	796656	80.58	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	174291	17.63	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	17700	1.79	-	-31.1	-	
Carbon Monoxide (CO)	15	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



**dig**  
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Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
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Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>6</sub> +	RSK-175* (for composition) H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>6</sub> +, with dissolved Cl <sub>2</sub> , CO <sub>2</sub> & O <sub>2</sub>	8°C Methane (Carbon)	8°C Methane (Hydrogen)	8°C Ethane-Pentane (C <sub>5</sub> +, if present)	
	VW 42	062717	1030	X		X	X	X	
	VW 23	062717	1439	X		X	X	X	+D13C CO2
	VW 33	062717	1334	X		X	X	X	+D13C CO2
	VW 40	062717	1204	X		X	X	X	+D13C CO2
	VW 14	062717	1444	X		X	X	X	+D13C CO2
	VW 25	062717	1258	X		X	X	X	+D13C CO2
	VW 38	062717	1132	X		X	X	X	+D13C CO2
	VW 61	062717	1314	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

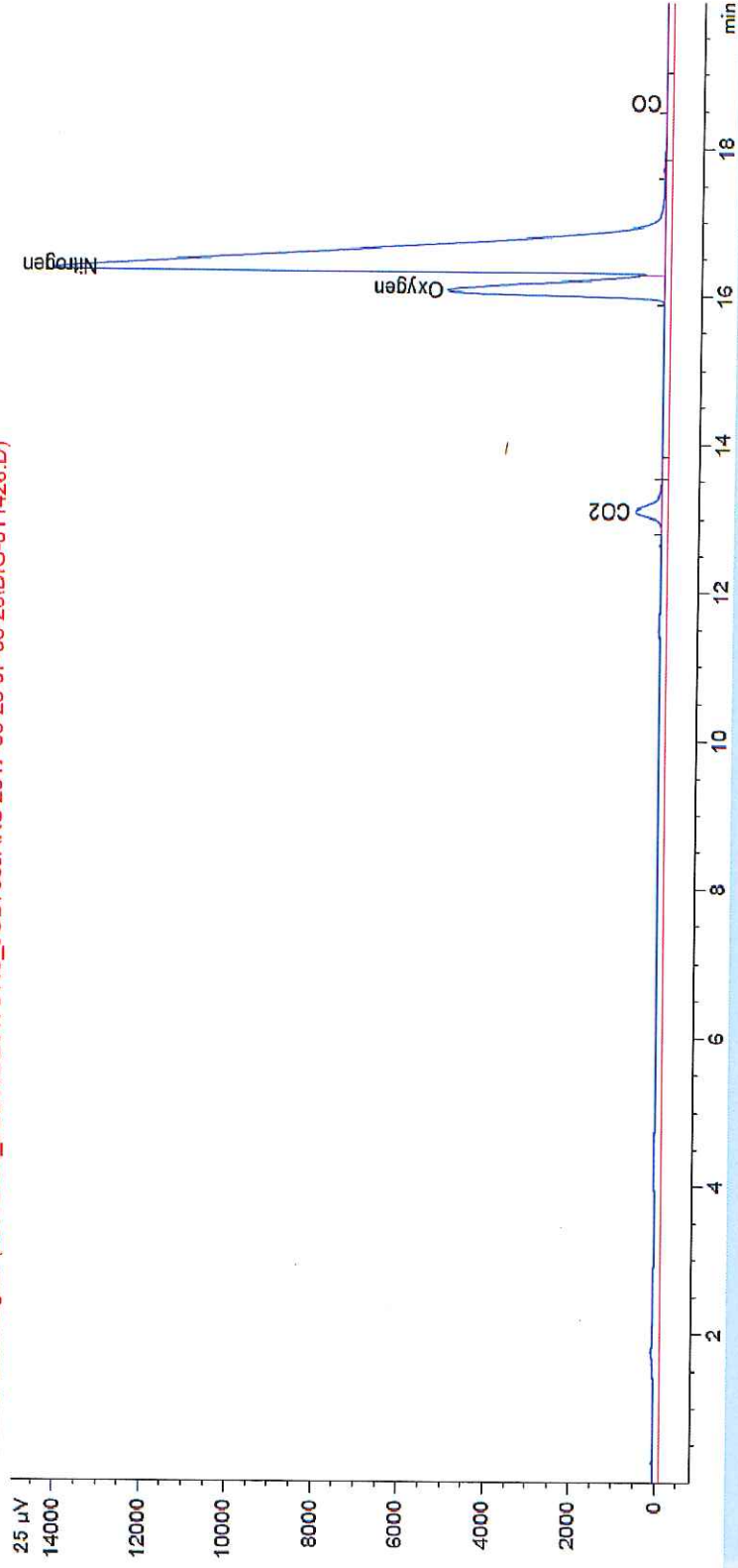


[illegible]

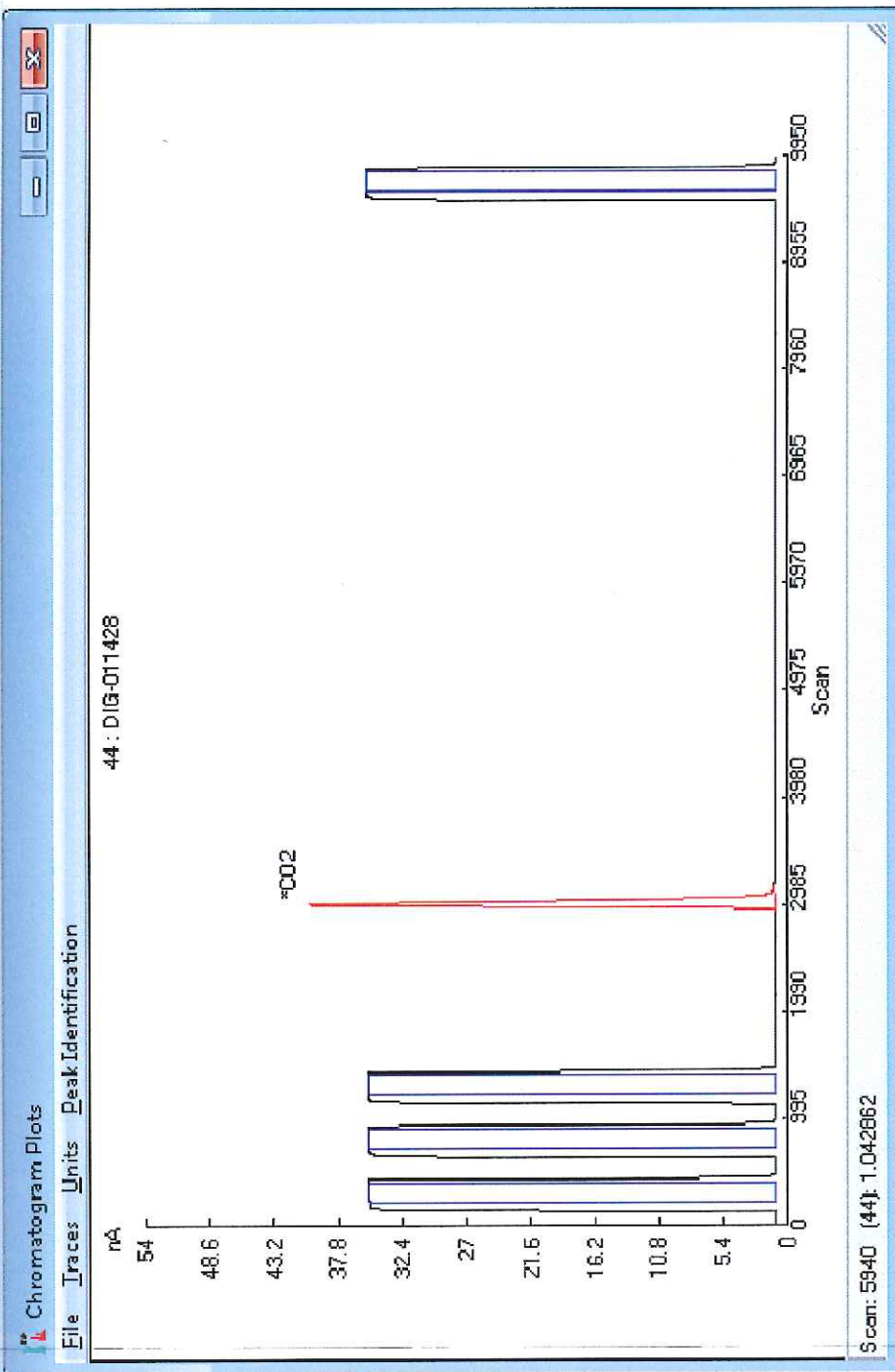
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011428.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011428.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011444  
**Client:** Vista Geoscience  
**Sample Name(s):** VW400627171159

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011444  
 Client: Vista Geoscience  
 Sample Name: VW400627171159  
 Date Sampled: 06/27/17  
 Time Sampled: 11:59  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/30/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	797495	80.59	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	174025	17.59	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	18081	1.83	-	-31.3	-	
Carbon Monoxide ( $\text{CO}$ )	19	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	#DIV/0!
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Sample Description				Analysis Requested					
Container #	Sample Identification	Date Sampled	Time	Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175* Gas composition N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> with dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	δ <sup>13</sup> C Methane (Carbon)	δ <sup>13</sup> C Methane (Hydrogen)	δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> to C <sub>5</sub> if present)	Comments
	VW 31	062717	1428	X		X	X	X	
	VW 60	062717	1307	X		X	X	X	+D13C CO2
	VW 30	062717	1253	X		X	X	X	+D13C CO2
	VW 40	062717	1159	X		X	X	X	+D13C CO2
	VW 58	062717	1155	X		X	X	X	+D13C CO2
	VW 34	062717	1328	X		X	X	X	+D13C CO2
	VW 48	062717	1123	X		X	X	X	+D13C CO2
	VW 44	062717	1038	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by:			
Received by:			

<sup>\*</sup>Gas composition vs RSK-175: Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

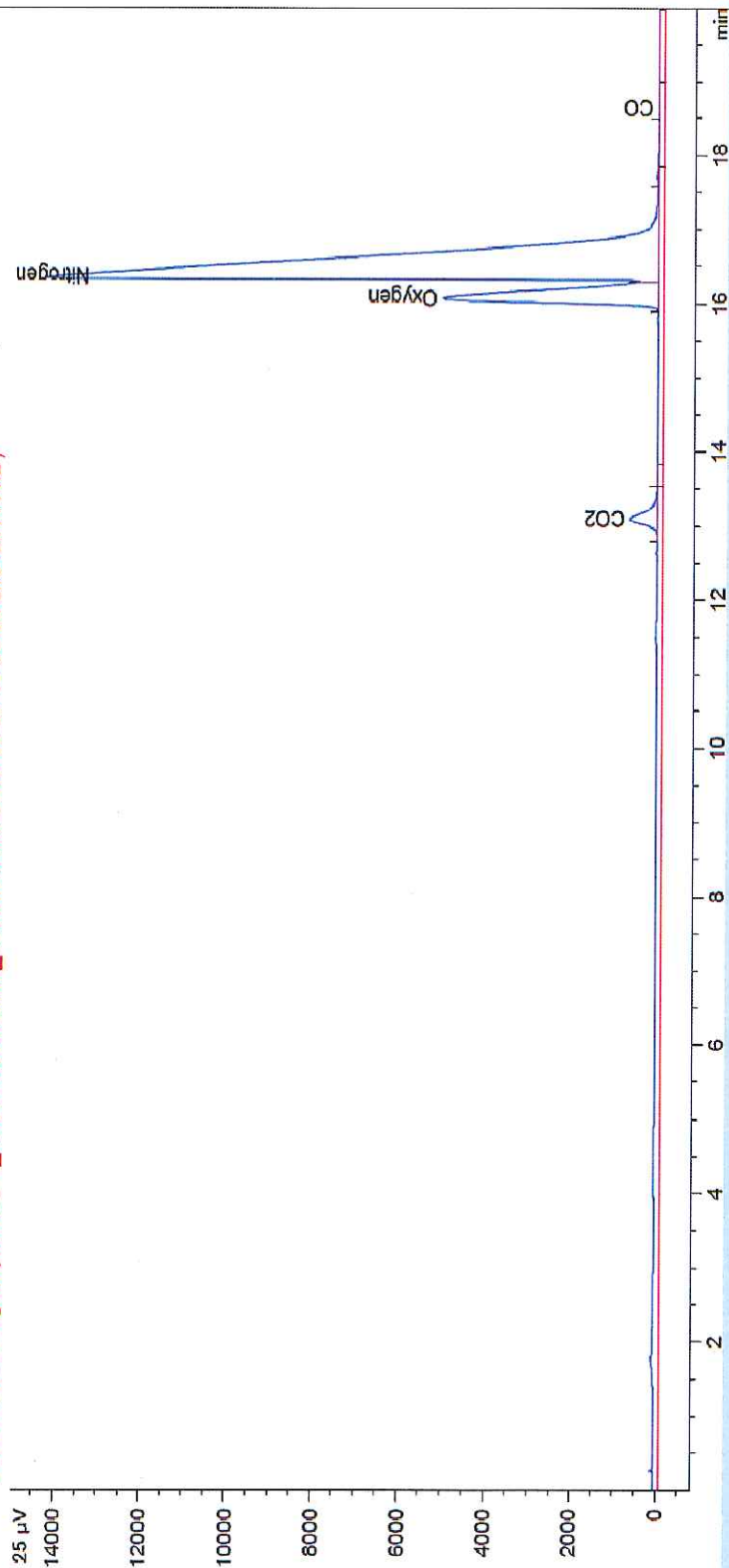
Organization	Reporting Organization	Reporting Organization Name	Order Number	Project	Purpose	Matrix	Project Number	Chain of Custody ID	Date Received by Lab	Comments	Conc Method	Init Vol	Test Type	Result Text	Final Vol	Final Vol Units	Analysis Date and Time	Report Basis	Comments	File Name	Rejection Limit	Instrument Detection Limit	Marked Detection Limit	Analysis Batch ID
Sample	COSCC Facility No.	Sample Date and Time	APF	Lab Sample ID	Lab Sample ID	Sample Type	Project Number	Chain of Custody ID	Date Received by Lab	Comments	Conc Method	Init Vol	Test Type	Result Text	Final Vol	Final Vol Units	Analysis Date and Time	Report Basis	Comments	File Name	Rejection Limit	Instrument Detection Limit	Marked Detection Limit	Analysis Batch ID
Batch	Lab Batch Identifier	Sample Date and Time	APF	Lab Sample ID	Lab Sample ID	Sample Type	Project Number	Chain of Custody ID	Date Received by Lab	Comments	Conc Method	Init Vol	Test Type	Result Text	Final Vol	Final Vol Units	Analysis Date and Time	Report Basis	Comments	File Name	Rejection Limit	Instrument Detection Limit	Marked Detection Limit	Analysis Batch ID
Result	CAS Number	Analyte Name	Analytic Method	Unit	Result Value	Qualifier	Test Type	Result Text	Final Vol	Final Vol Units	Analysis Date and Time	Report Basis	Comments	File Name	Rejection Limit	Instrument Detection Limit	Marked Detection Limit	Analysis Batch ID	Comments	File Name	Rejection Limit	Instrument Detection Limit	Marked Detection Limit	Analysis Batch ID
	134-38-9	CARBON DIOXIDE	SOP	MDL %	17.59	ND	MDL %	ND	17.59	MDL %	17.59	MDL %	ND	17.59	MDL %	17.59	MDL %	17.59	MDL %	17.59	MDL %	17.59	MDL %	17.59
	7727-37-9	NITROGEN (N2)	SOP	MDL %	85.99	ND	MDL %	ND	85.99	MDL %	85.99	MDL %	ND	85.99	MDL %	85.99	MDL %	85.99	MDL %	85.99	MDL %	85.99	MDL %	85.99
	7440-39-0	HYDROGEN MONOXIDE	SOP	MDL %	0.01	ND	MDL %	ND	0.01	MDL %	0.01	MDL %	ND	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01
	7440-39-0	HYDROGEN	SOP	MDL %	0.01	ND	MDL %	ND	0.01	MDL %	0.01	MDL %	ND	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01
	7440-39-0	METHANE	SOP	MDL %	0.01	ND	MDL %	ND	0.01	MDL %	0.01	MDL %	ND	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01
	7440-39-0	ETHANE	SOP	MDL %	0.01	ND	MDL %	ND	0.01	MDL %	0.01	MDL %	ND	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01
	7440-39-0	PROPANE	SOP	MDL %	0.01	ND	MDL %	ND	0.01	MDL %	0.01	MDL %	ND	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01
	115-07-1	ISOBUTANE	SOP	MDL %	0.01	ND	MDL %	ND	0.01	MDL %	0.01	MDL %	ND	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01
	75-28-5	ISOBUTANE	SOP	MDL %	0.01	ND	MDL %	ND	0.01	MDL %	0.01	MDL %	ND	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01
	106-97-8	ISOBUTANE	SOP	MDL %	0.01	ND	MDL %	ND	0.01	MDL %	0.01	MDL %	ND	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01
	106-97-8	ISOBUTANE	SOP	MDL %	0.01	ND	MDL %	ND	0.01	MDL %	0.01	MDL %	ND	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01
	9212-89-1	ISOBUTANE	SOP	MDL %	0.01	ND	MDL %	ND	0.01	MDL %	0.01	MDL %	ND	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01	MDL %	0.01
	delta13C_C1	DETA 13C C1	SOP	per ml	nd	ND	per ml	nd	nd	per ml	nd	per ml	nd	nd	per ml	nd	nd	nd	nd	nd	per ml	nd	nd	nd
	delta13C_C2	DETA 13C C2	SOP	per ml	nd	ND	per ml	nd	nd	per ml	nd	per ml	nd	nd	per ml	nd	nd	nd	nd	nd	per ml	nd	nd	nd
	delta13C_C3	DETA 13C C3	SOP	per ml	nd	ND	per ml	nd	nd	per ml	nd	per ml	nd	nd	per ml	nd	nd	nd	nd	nd	per ml	nd	nd	nd
	delta13C_C4	DETA 13C C4	SOP	per ml	nd	ND	per ml	nd	nd	per ml	nd	per ml	nd	nd	per ml	nd	nd	nd	nd	nd	per ml	nd	nd	nd
	delta13C_C5	DETA 13C C5	SOP	per ml	nd	ND	per ml	nd	nd	per ml	nd	per ml	nd	nd	per ml	nd	nd	nd	nd	nd	per ml	nd	nd	nd
	delta13C_C6	DETA 13C C6	SOP	per ml	nd	ND	per ml	nd	nd	per ml	nd	per ml	nd	nd	per ml	nd	nd	nd	nd	nd	per ml	nd	nd	nd
	delta13C_C7	DETA 13C C7	SOP	per ml	nd	ND	per ml	nd	nd	per ml	nd	per ml	nd	nd	per ml	nd	nd	nd	nd	nd	per ml	nd	nd	nd
	delta13C_C8	DETA 13C C8	SOP	per ml	nd	ND	per ml	nd	nd	per ml	nd	per ml	nd	nd	per ml	nd	nd	nd	nd	nd	per ml	nd	nd	nd



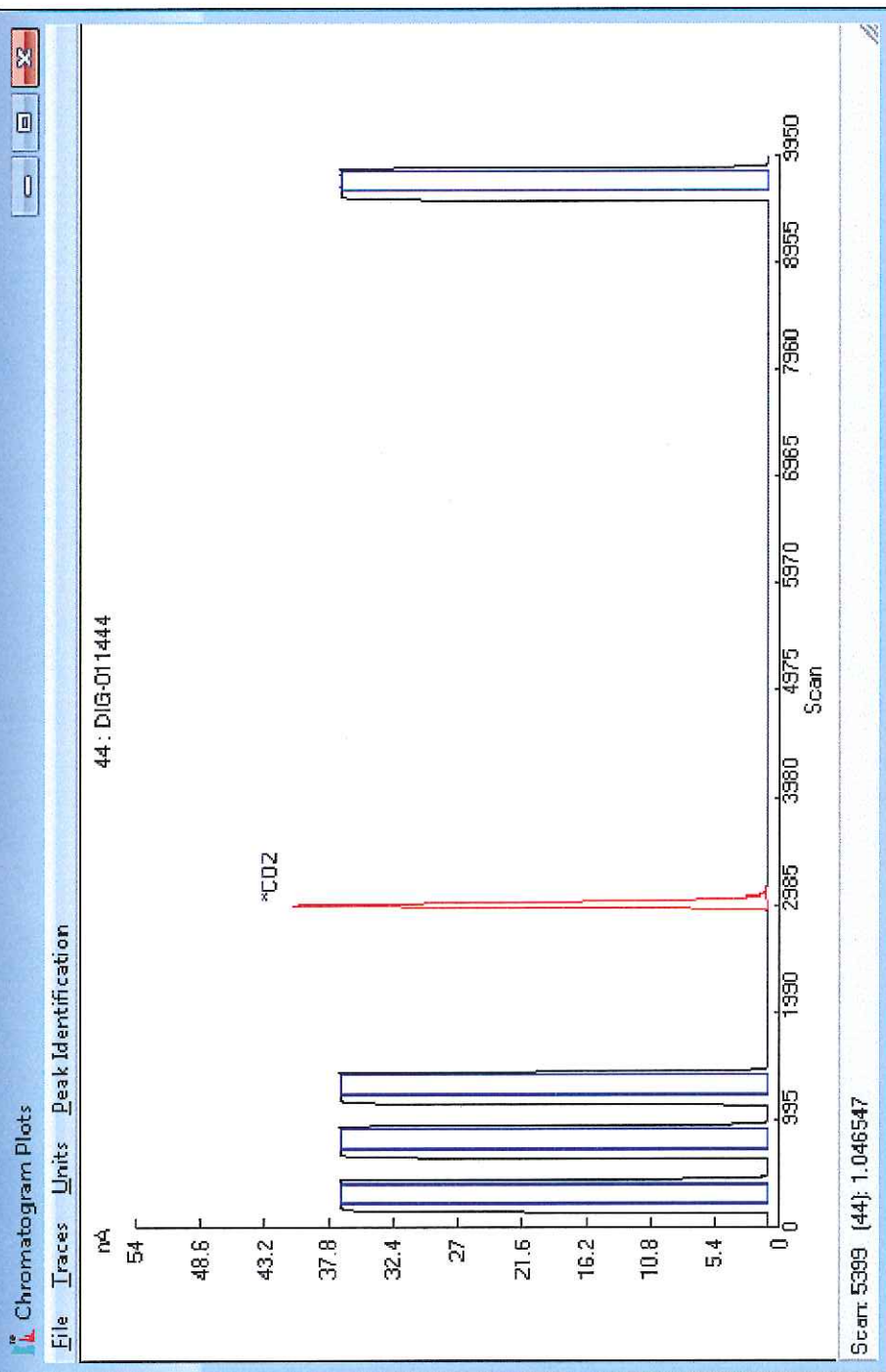


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982)20170119\_JOB785JARS 2017-06-29 05-52-05DIG-011444.D)  
TCD2 B, Back Signal (20170626\_JOB982)20170119\_JOB785JARS 2017-06-29 05-52-05DIG-011444.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011437  
**Client:** Vista Geoscience  
**Sample Name(s):** VW410627171207

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011437  
 Client: Vista Geoscience  
 Sample Name: VW410627171207  
 Date Sampled: 06/27/17  
 Time Sampled: 12:07  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	812235	80.92	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	179547	17.89	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	11911	1.19	-	-29.4	-	
Carbon Monoxide ( $\text{CO}$ )	14	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	#DIV/0!
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰

# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, H<sub>2</sub>S, C<sub>2</sub>H<sub>6</sub>

RSK-175\* for composition  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, H<sub>2</sub>S, C<sub>2</sub>H<sub>6</sub>  
with dissolved Cl<sup>-</sup>, Cl<sup>-</sup> & C<sub>3</sub>

δ<sup>13</sup>C Methane (Carbon)

δ<sup>13</sup>C Methane (Hydrogen)

δ<sup>13</sup>C Ethane-Pentane  
(C<sub>2</sub>, C<sub>3</sub>, if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 59	062717	1148	X		X	X	X	+D13C CO2
	VW 42	062717	1024	X		X	X	X	+D13C CO2
	VW 53	062717	1106	X		X	X	X	+D13C CO2
	VW 62	062717	1349	X		X	X	X	+D13C CO2
	VW 41	062717	1207	X		X	X	X	+D13C CO2
	VW 37	062717	1128	X		X	X	X	+D13C CO2
	VW 36	062717	1322	X		X	X	X	+D13C CO2
	VW 39	062717	1145	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>14:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

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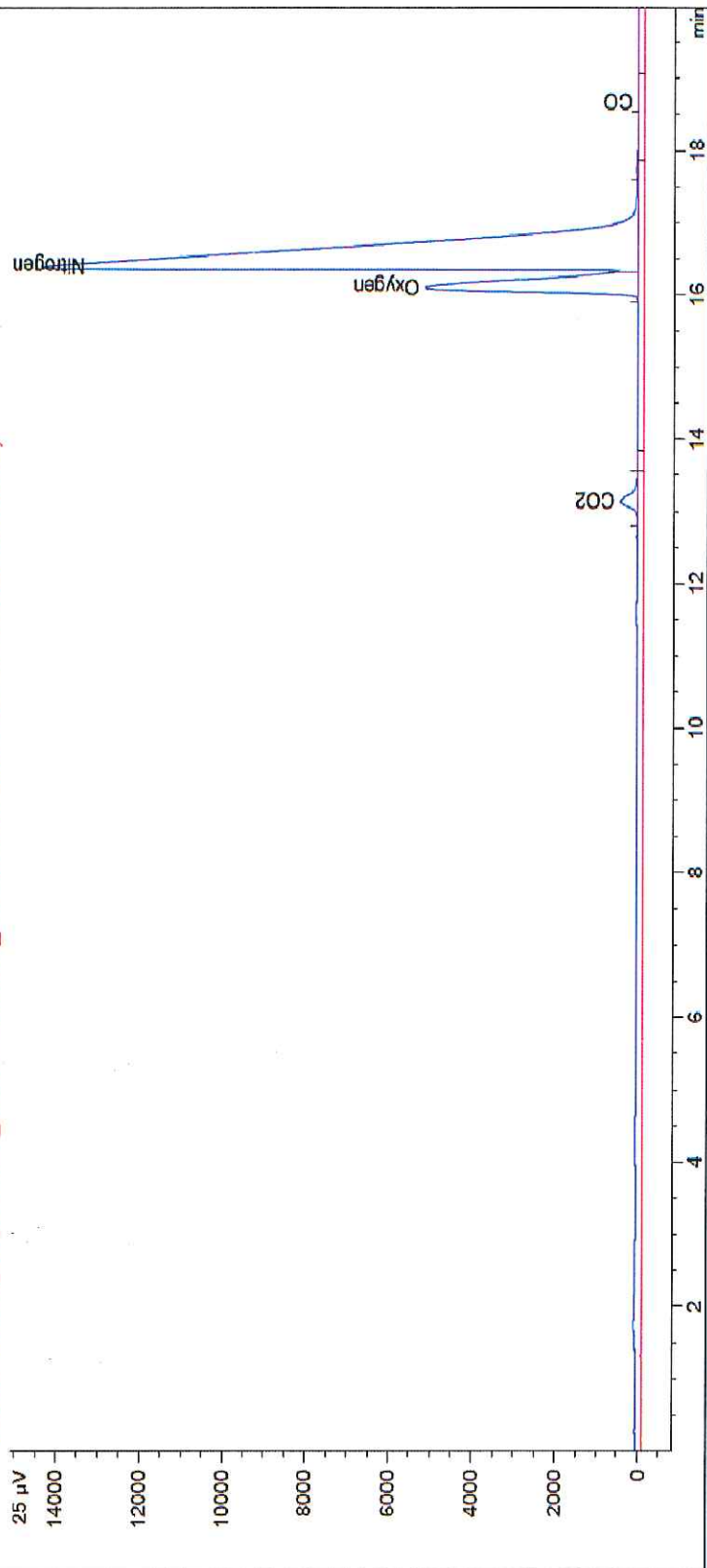




# Gas Chromatography (GC) Chromatogram

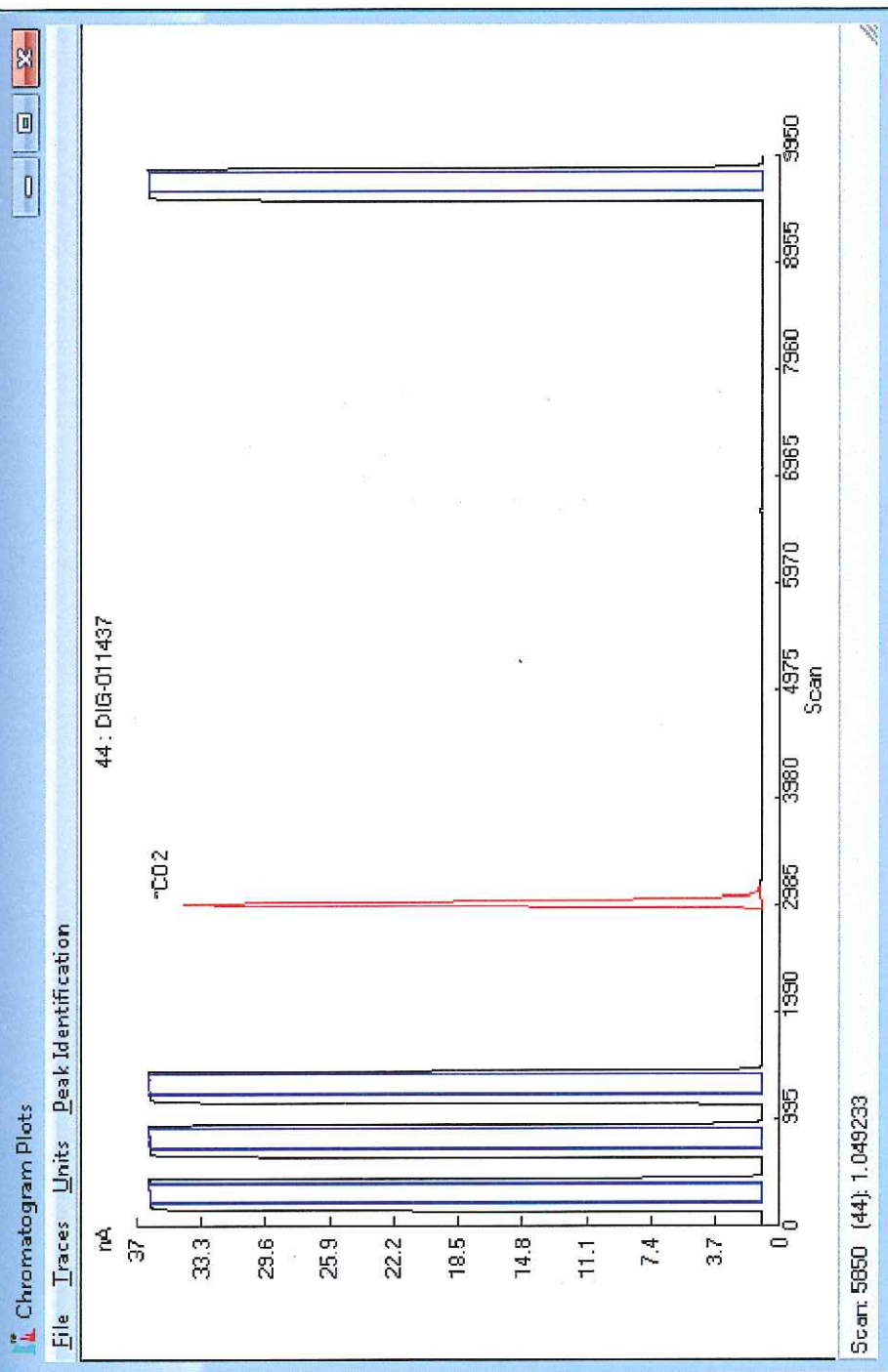


TCD1 A, Front Signal (20170626\_JOB982)20170119\_JOB785JARS 2017-06-29 05-52-05(DIG-011437.D)  
TCD2 B, Back Signal (20170626\_JOB982)20170119\_JOB785JARS 2017-06-29 05-52-05(DIG-011437.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011434  
**Client:** Vista Geoscience  
**Sample Name(s):** VW420627171024

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011434  
 Client: Vista Geoscience  
 Sample Name: VW420627171024  
 Date Sampled: 06/27/17  
 Time Sampled: 10:24  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	783916	77.95	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	196535	19.54	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	25236	2.51	-	-18.2	-	
Carbon Monoxide ( $\text{CO}$ )	18	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	#DIV/0!
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>, C<sub>3</sub>H<sub>8</sub>

RSK-175\* Gas composition  
with dissolved C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>

8°C Methane (Carbon)

20°C Methane (Hydrogen)

8°C Ethane-Pentane  
(C<sub>5</sub>+, if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 59	062717	1148	X		X	X	X	
	VW 42	062717	1024	X		X	X	X	+D13C CO2
	VW 53	062717	1106	X		X	X	X	+D13C CO2
	VW 62	062717	1349	X		X	X	X	+D13C CO2
	VW 41	062717	1207	X		X	X	X	+D13C CO2
	VW 37	062717	1128	X		X	X	X	+D13C CO2
	VW 36	062717	1322	X		X	X	X	+D13C CO2
	VW 39	062717	1145	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>14:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by:			
Received by:			

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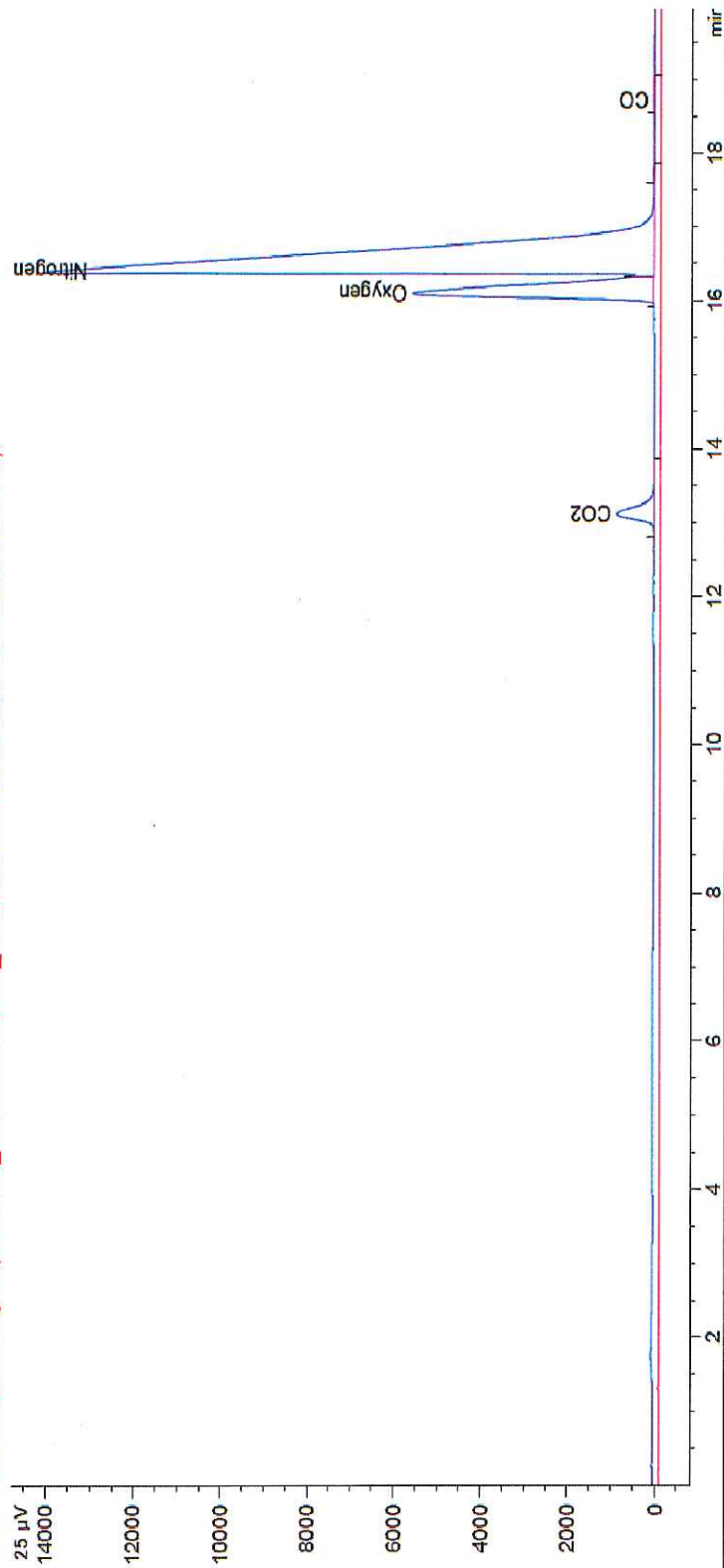
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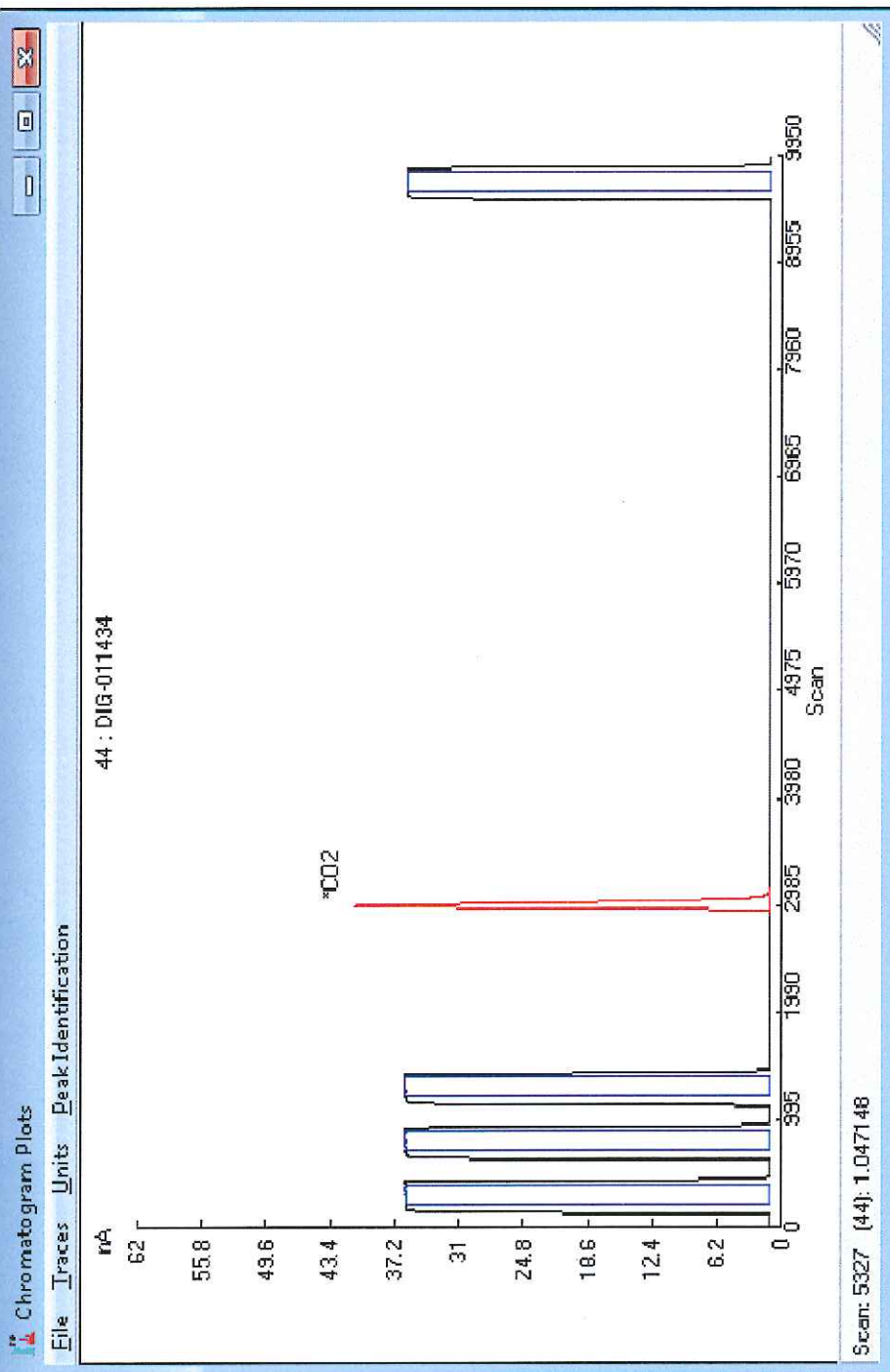
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011434.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011434.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011425  
**Client:** Vista Geoscience  
**Sample Name(s):** VW420627171030

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011425  
 Client: Vista Geoscience  
 Sample Name: VW420627171030  
 Date Sampled: 06/27/17  
 Time Sampled: 10:30  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	767943	77.92	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	195520	19.84	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	22130	2.25	-	-18.0	-	
Carbon Monoxide ( $\text{CO}$ )	15	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

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HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

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Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* No. O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>4</sub> +	RSK-175* Gas Composition No. O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>4</sub> +, with dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	8°C Methane (Carbon)	80°C Methane (Hydrogen)	8°C Ethane-Pentane (C <sub>2</sub> +, if present)	
	VW 42	062717	1030	X		X	X	X	
	VW 23	062717	1439	X		X	X	X	+D13C CO2
	VW 33	062717	1334	X		X	X	X	+D13C CO2
	VW 40	062717	1204	X		X	X	X	+D13C CO2
	VW 14	062717	1444	X		X	X	X	+D13C CO2
	VW 25	062717	1258	X		X	X	X	+D13C CO2
	VW 38	062717	1132	X		X	X	X	+D13C CO2
	VW 61	062717	1314	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
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Relinquished by			
Received by			

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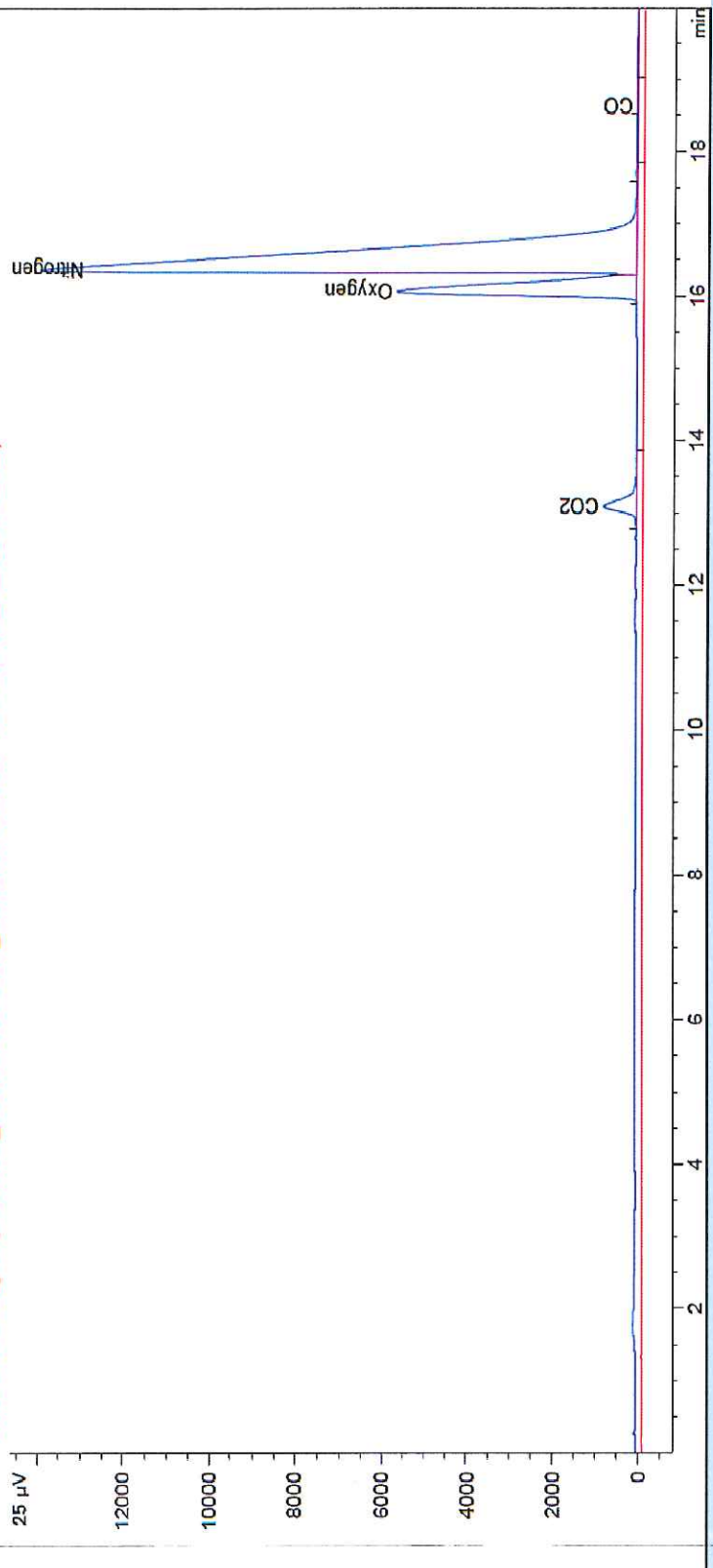


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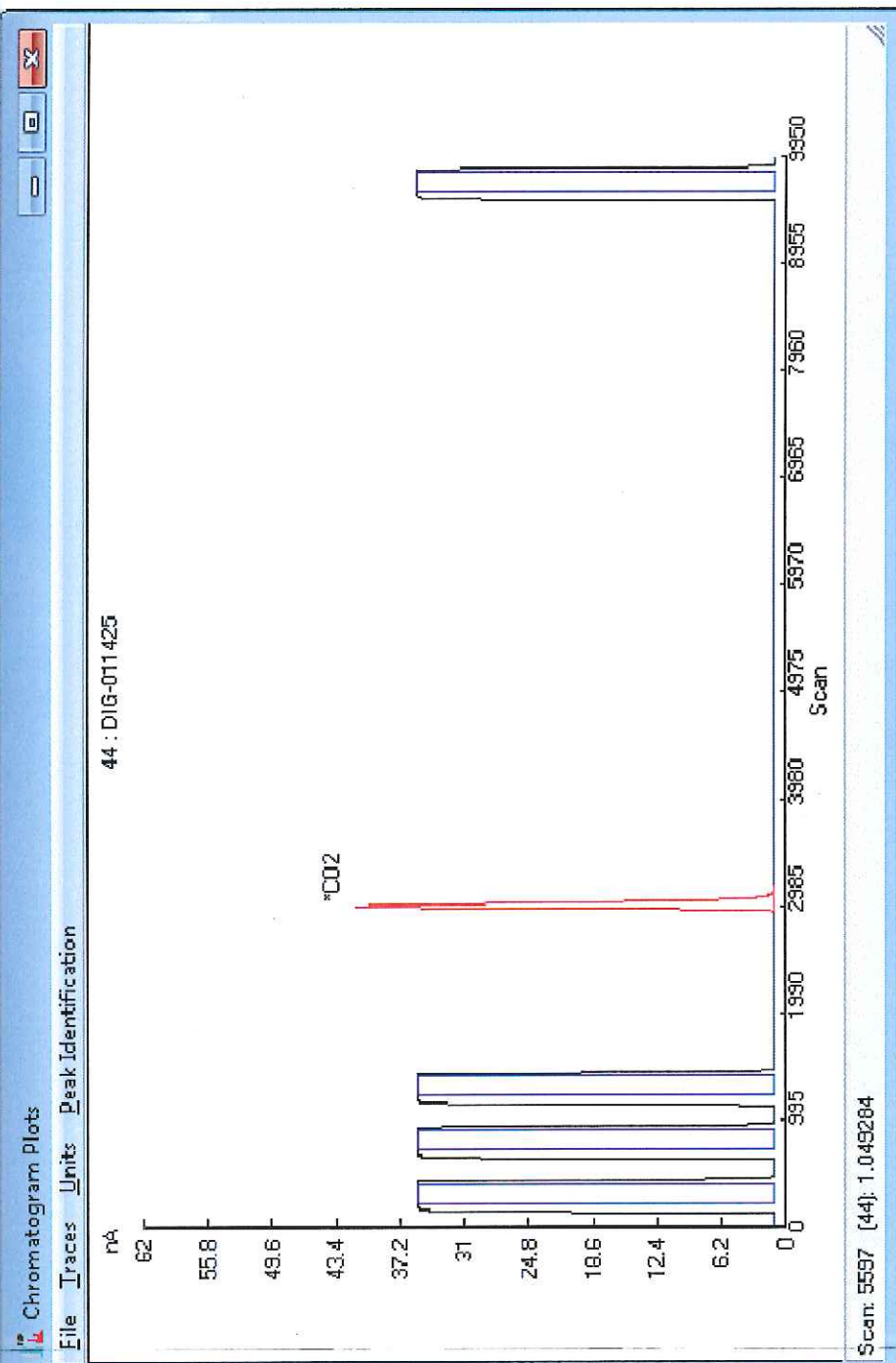


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982) 20170119\_JOB785JARS 2017-06-28 07-53-26 (DIG-011425.D)  
TCD2 B, Back Signal (20170626\_JOB982) 20170119\_JOB785JARS 2017-06-28 07-53-26 (DIG-011425.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011420  
**Client:** Vista Geoscience  
**Sample Name(s):** VW430627171043

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011420  
 Client: Vista Geoscience  
 Sample Name: VW430627171043  
 Date Sampled: 06/27/17  
 Time Sampled: 10:43  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	790048	79.28	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	184026	18.47	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	22484	2.26	-	-21.4	-	
Carbon Monoxide (CO)	13	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy  
1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>2</sub>, C<sub>3</sub>

RSK-175<sup>®</sup> (see composition)  
with dissolved C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>

gC<sub>2</sub> Methane (Carbon)

gC<sub>2</sub> Methane (Hydrogen)

gC<sub>2</sub> Ethane-Pentane  
(C<sub>2</sub> if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 54	062717	1032	X		X	X	X	+D13C CO2
	VW 49	062717	1117	X		X	X	X	+D13C CO2
	VW 18	062717	1246	X		X	X	X	+D13C CO2
	VW 43	062717	1043	X		X	X	X	+D13C CO2
	VW 13	062717	1241	X		X	X	X	+D13C CO2
	VW 55	062717	1343	X		X	X	X	+D13C CO2
	VW 47	062717	1210	X		X	X	X	+D13C CO2
	VW 24	062717	1401	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

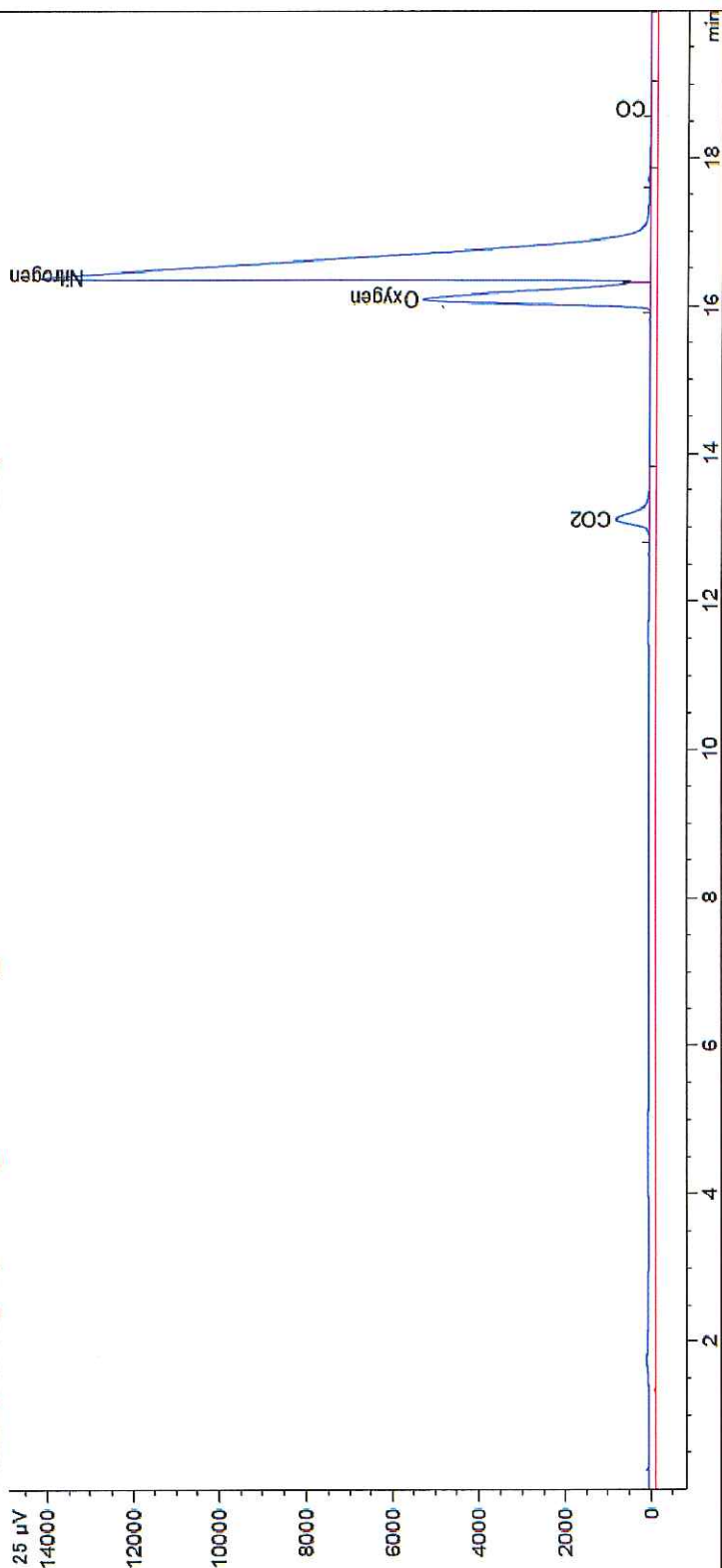
[illegible]



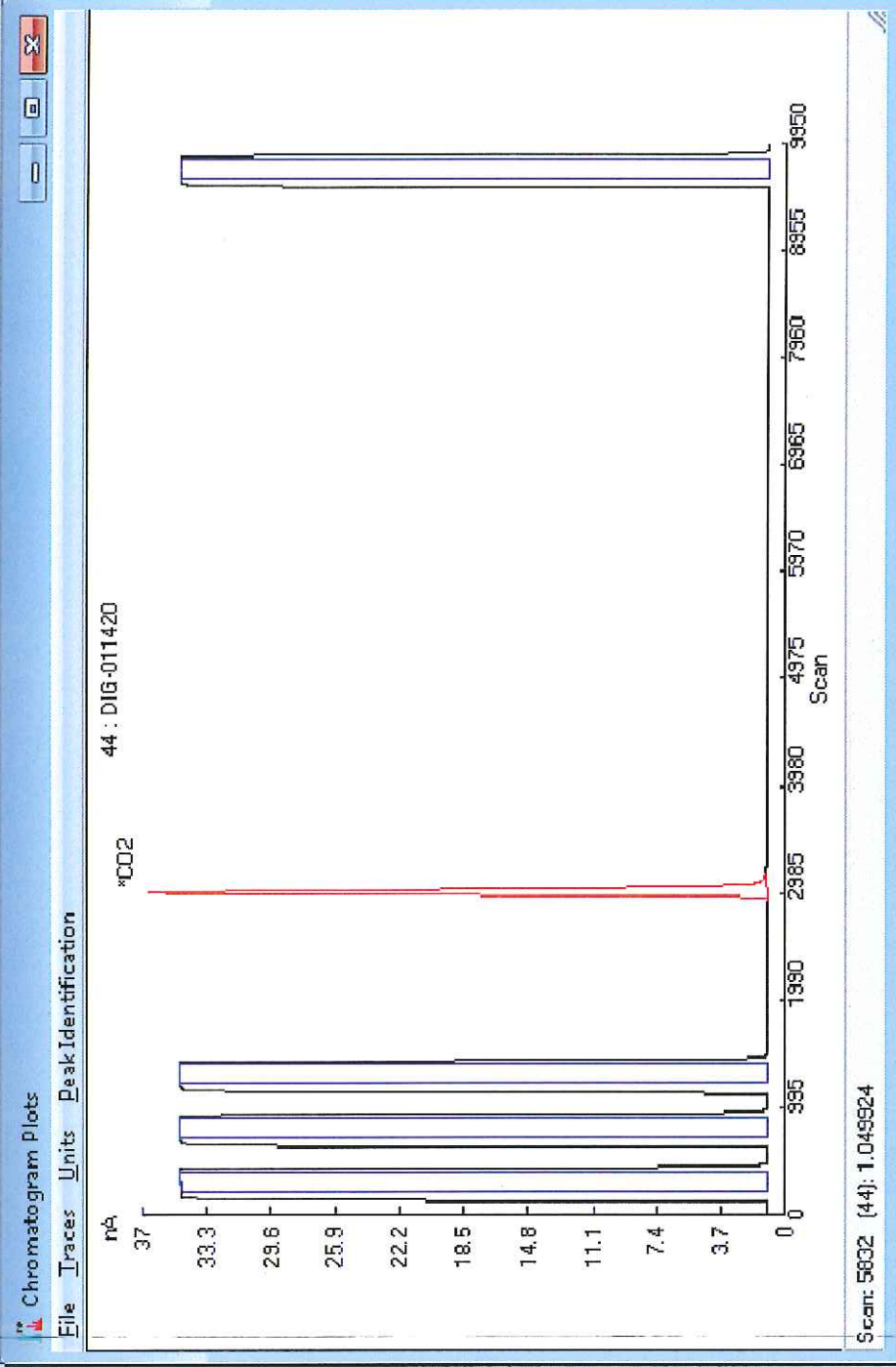


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07:53:26\DIG-011420.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07:53:26\DIG-011420.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

Job #: 17060983  
Lab #: DIG-011448  
Client: Vista Geoscience  
Sample Name(s): VW440627171038

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011448  
 Client: Vista Geoscience  
 Sample Name: VW440627171038  
 Date Sampled: 06/27/17  
 Time Sampled: 10:38  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/30/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	783550	78.62	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	191093	19.17	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	22001	2.21	-	-22.3	-	
Carbon Monoxide ( $\text{CO}$ )	13	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + / \text{C}_1 +$ )	#DIV/0!
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰

# Chain of Custody Form



**dig**  
Dolan Integration Group

## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

### Sample Description

agorody@gmail.com

Analysis Requested				
Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175* (gas composition) N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> with dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	gPC Methane (Carbon)	gPC Methane (Hydrogen)	gPC Ethane-pentane (C <sub>2</sub> to C <sub>5</sub> if present)

## Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 31	062717	1428	X		X	X	X	+D13C CO2
	VW 60	062717	1307	X		X	X	X	+D13C CO2
	VW 30	062717	1253	X		X	X	X	+D13C CO2
	VW 40	062717	1159	X		X	X	X	+D13C CO2
	VW 58	062717	1155	X		X	X	X	+D13C CO2
	VW 34	062717	1328	X		X	X	X	+D13C CO2
	VW 48	062717	1123	X		X	X	X	+D13C CO2
	VW 44	062717	1038	X		X	X	X	+D13C CO2

### Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

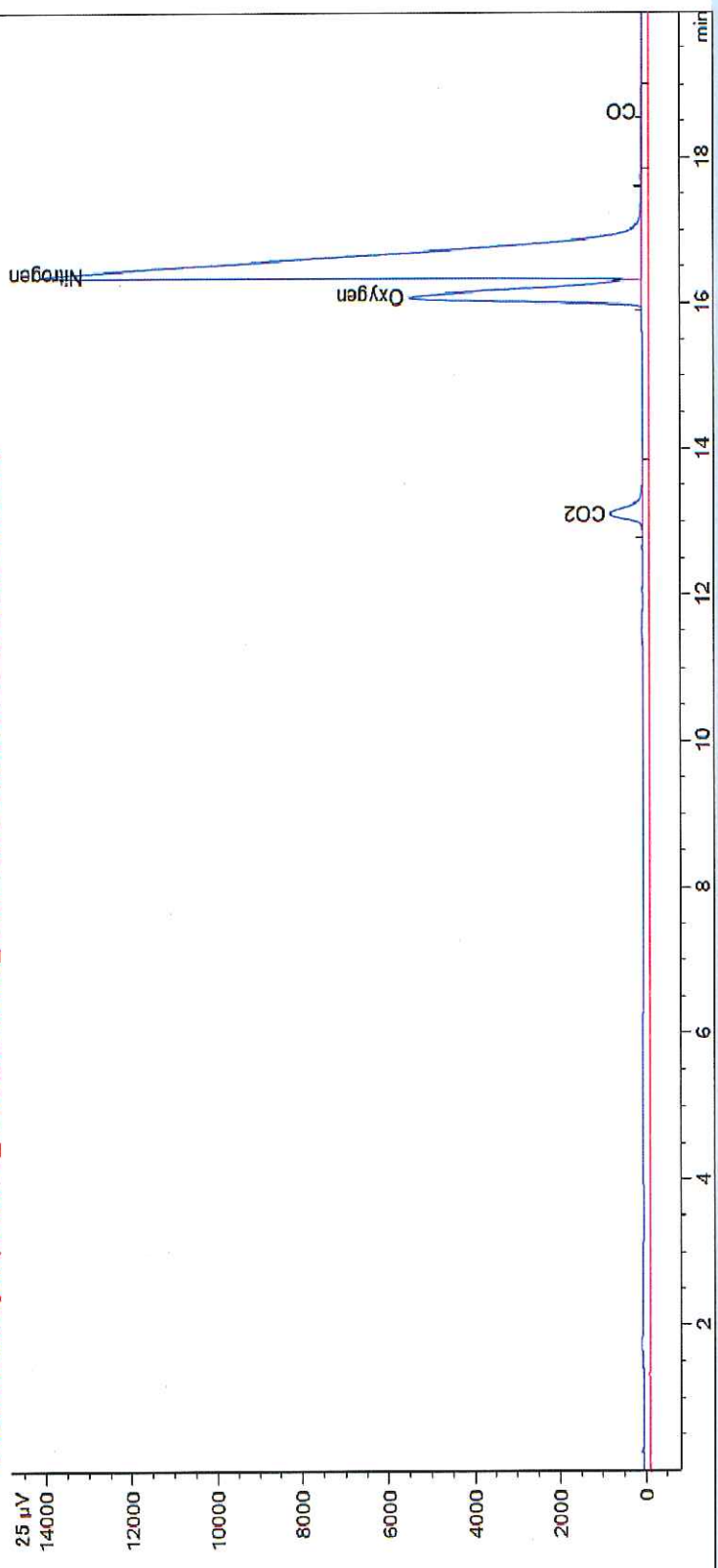
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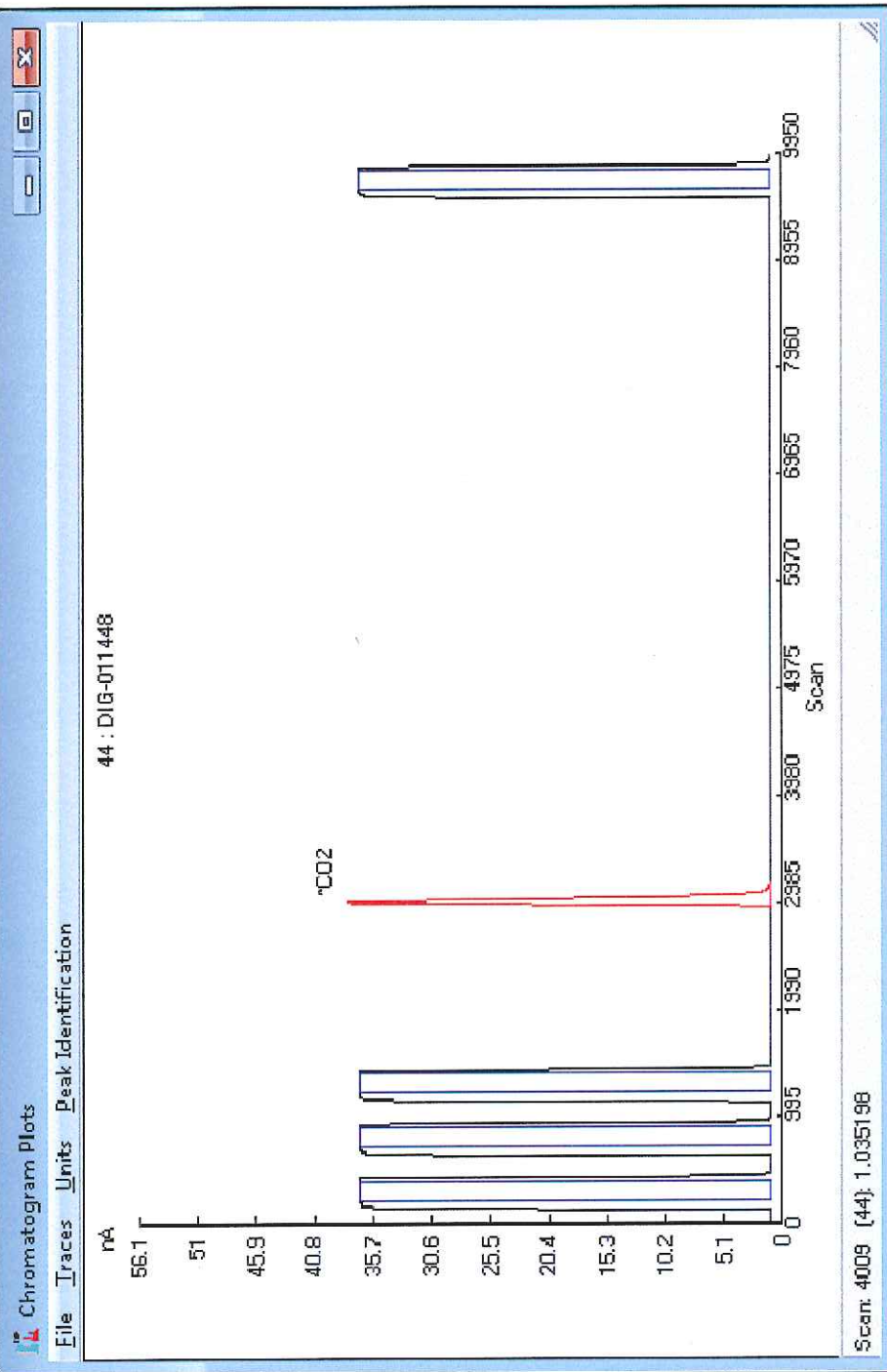
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011448.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011448.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

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Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060984  
**Lab #:** DIG-011476  
**Client:** Vista Geoscience  
**Sample Name(s):** VW450628171253

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011476  
 Client: Vista Geoscience  
 Sample Name: VW450628171253  
 Date Sampled: 06/28/17  
 Time Sampled: 12:53  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/30/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	798828	77.86	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	226491	22.07	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	701	0.07	-	-12.2	-	
Carbon Monoxide (CO)	20	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +/C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



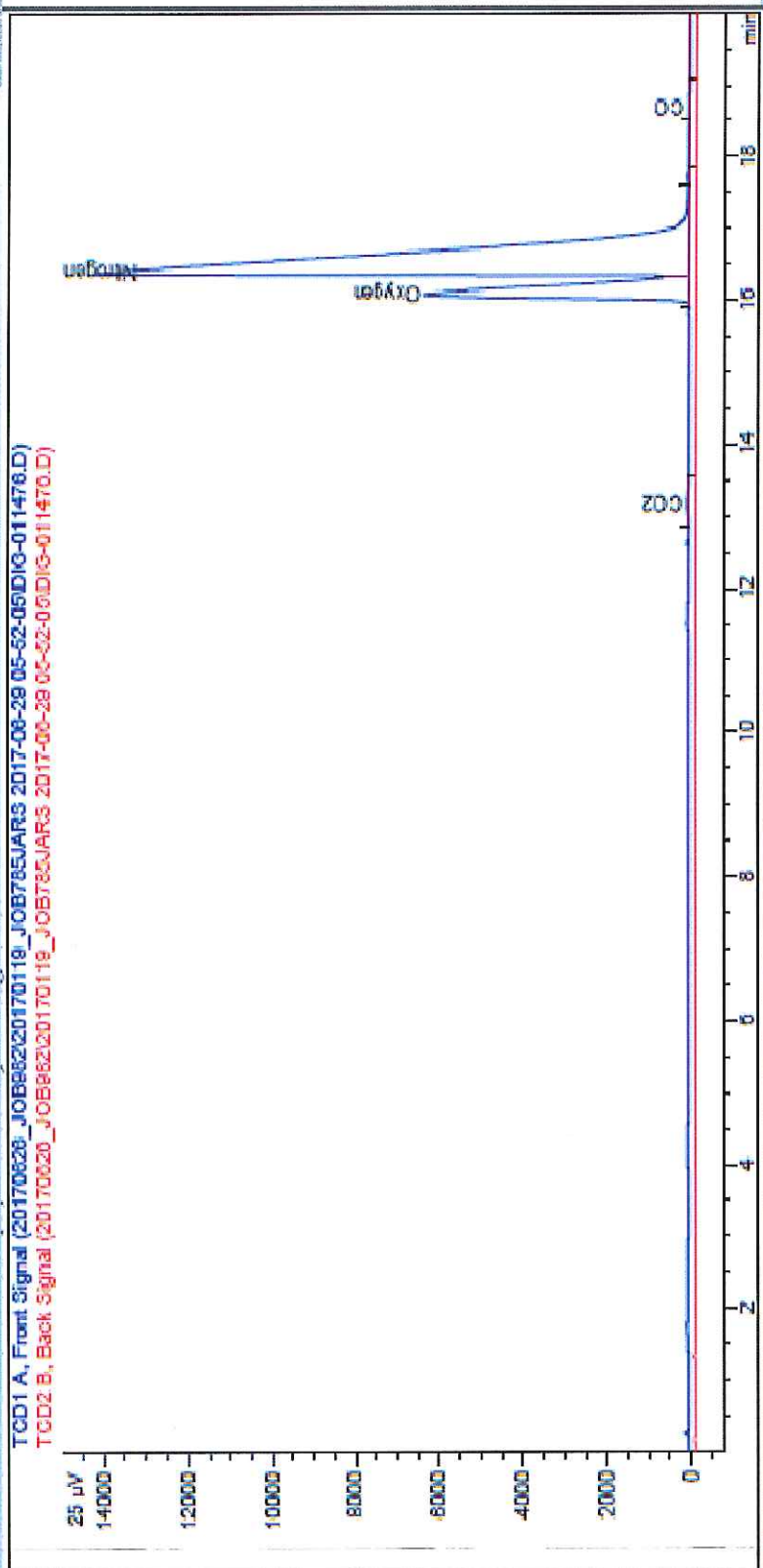


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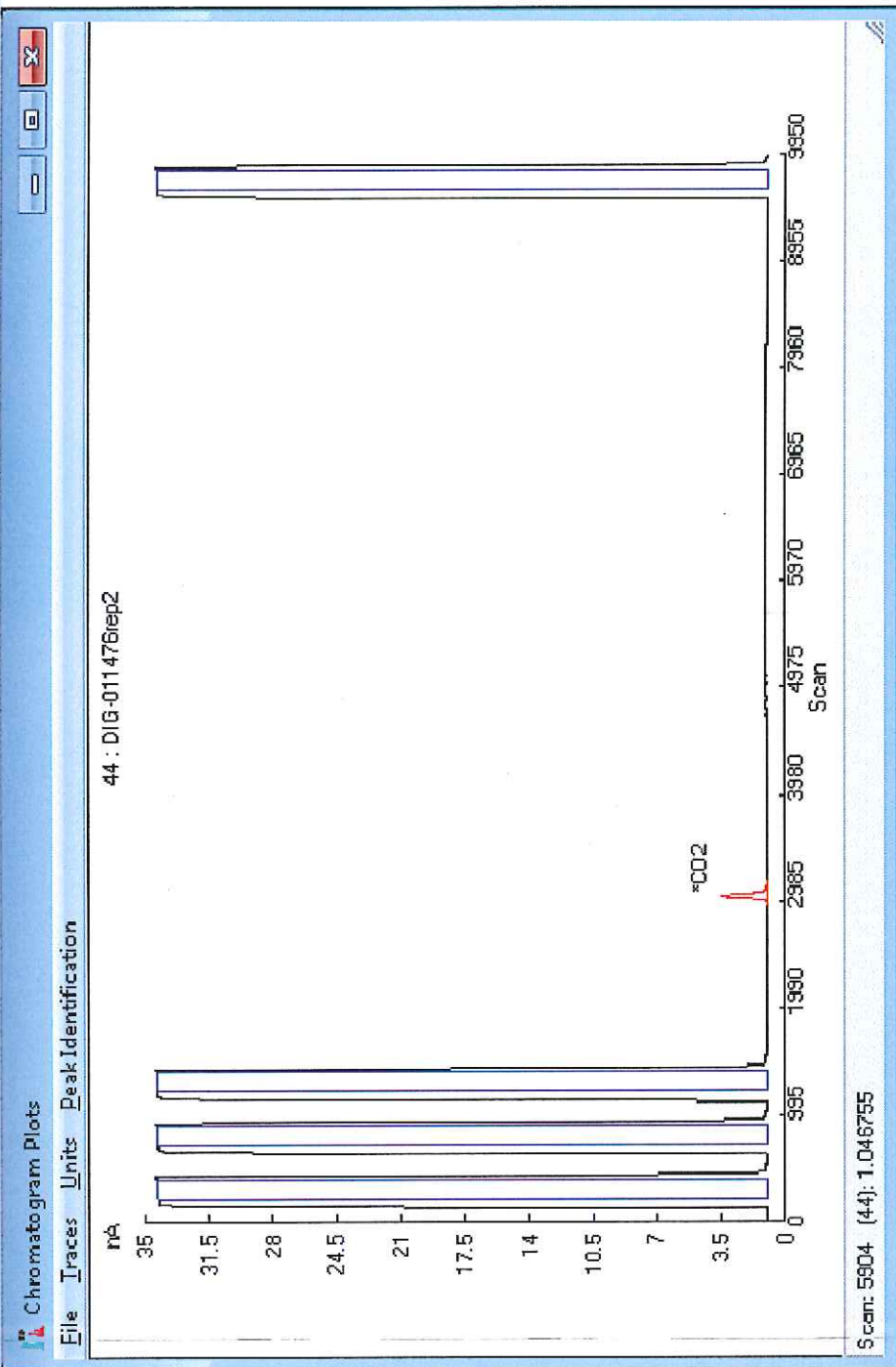


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170628\_JOB862120170119\_JOB785JARS 2017-08-28 05:52:05) DIG-011478.D)  
TCD2 B, Back Signal (20170628\_JOB862120170119\_JOB785JARS 2017-08-28 05:52:05) DIG-011470.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011450  
**Client:** Vista Geoscience  
**Sample Name(s):** VW460627171214

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011450  
 Client: Vista Geoscience  
 Sample Name: VW460627171214  
 Date Sampled: 06/27/17  
 Time Sampled: 12:14  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition:6/29/17  $\delta^{13}\text{C}$ :6/30/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	778673	78.23	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	189735	19.06	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	26963	2.71	-	-22.1	-	
Carbon Monoxide (CO)	14	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
Iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +/C <sub>1</sub> +) )	#DIV/0!
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition * N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub> +	RSK-175 <sup>+</sup> (see comments) N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub> +, with dissolved Cl <sup>-</sup> , C <sub>2</sub> & C <sub>3</sub>	δ <sup>13</sup> C <sub>1</sub> Methane (Carbon)	δ <sup>13</sup> C <sub>2</sub> Methane (Hydrogen)	δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> & C <sub>3</sub> if present)	
	VW 29	06/27/17	1504	X		X	X	X	
	VW 46	06/27/17	1214	X		X	X	X	+D13C CO2
				X		X	X	X	+D13C CO2
				X		X	X	X	+D13C CO2
				X		X	X	X	+D13C CO2
				X		X	X	X	+D13C CO2
				X		X	X	X	+D13C CO2
				X		X	X	X	+D13C CO2
				X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030



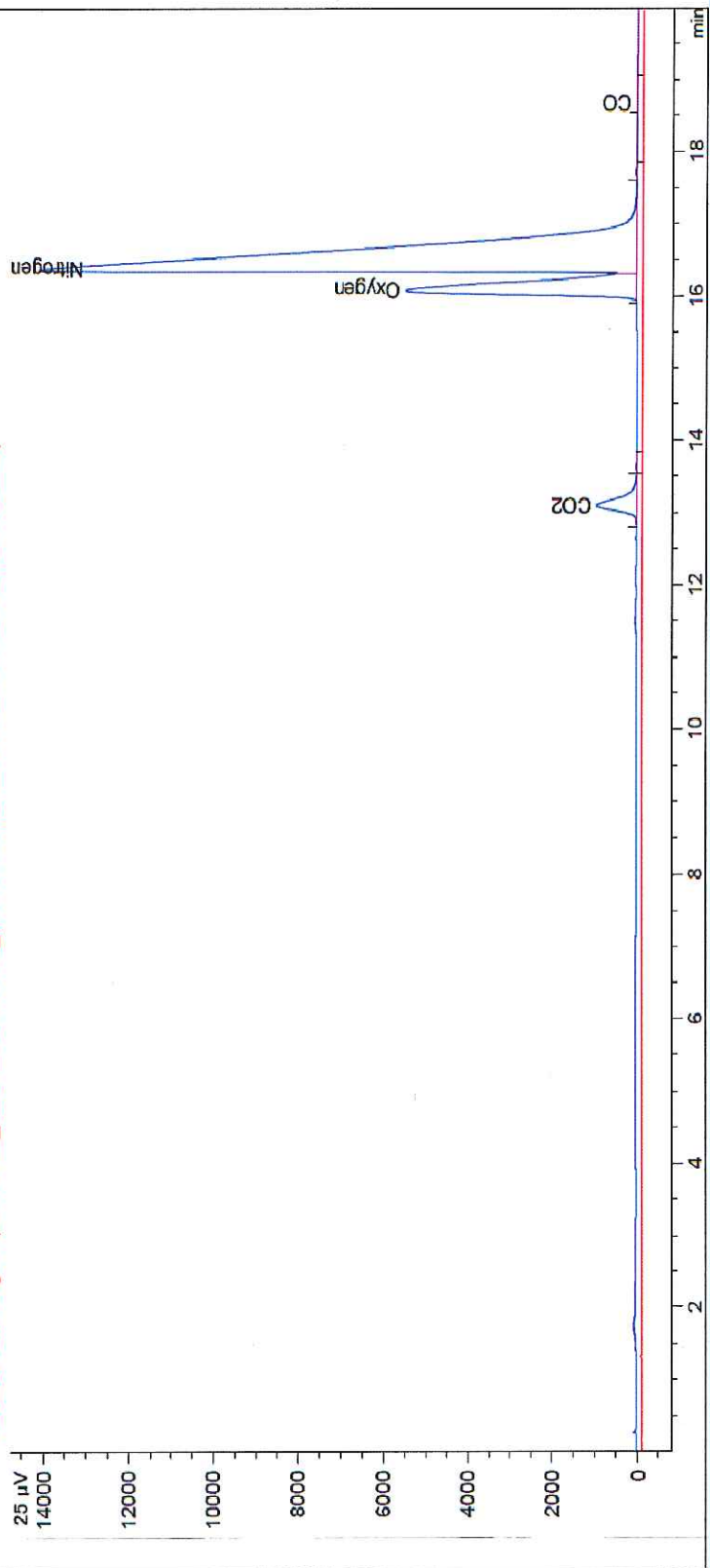
[illegible]



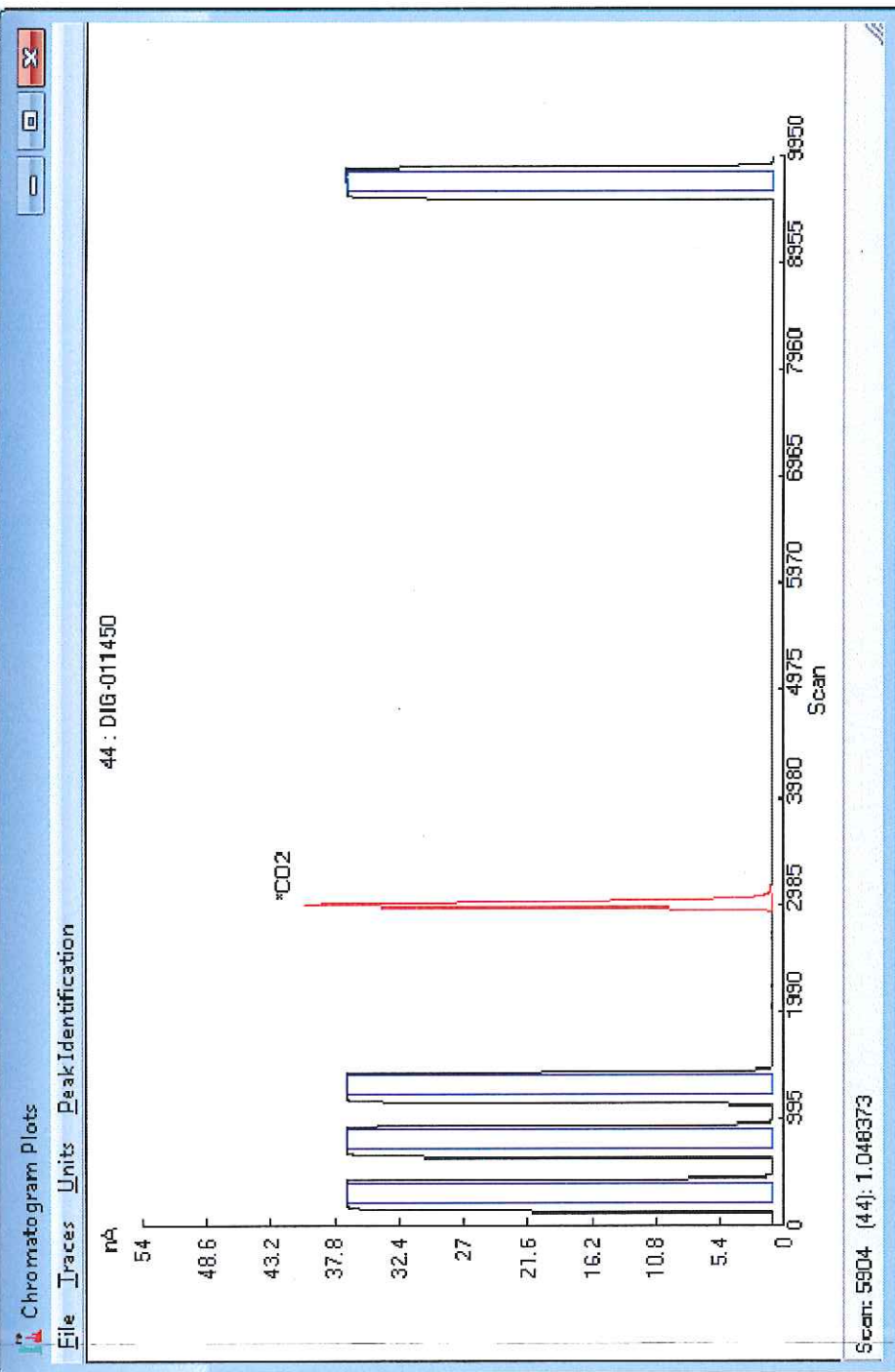
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011450.D)

TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011450.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011423  
**Client:** Vista Geoscience  
**Sample Name(s):** VW470627171210

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011423  
 Client: Vista Geoscience  
 Sample Name: VW470627171210  
 Date Sampled: 06/27/17  
 Time Sampled: 12:10  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	797649	81.29	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	170005	17.33	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	13533	1.38	-	-29.9	-	
Carbon Monoxide (CO)	11	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +/C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



**dig**  
Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, He, H<sub>2</sub>, C<sub>1</sub>-C<sub>4</sub><sup>h</sup>

RSK-175\* (gas composition)  
with dissolved C<sub>1</sub>, C<sub>2</sub> & C<sub>3</sub>

8°C Methane (Carbon)

80°C Methane (Carbon)

8°C Ethane-Pentane  
(C<sub>2</sub>-C<sub>5</sub> if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 54	062717	1032	X		X	X	X	+D13C CO2
	VW 49	062717	1117	X		X	X	X	+D13C CO2
	VW 18	062717	1246	X		X	X	X	+D13C CO2
	VW 43	062717	1043	X		X	X	X	+D13C CO2
	VW 13	062717	1241	X		X	X	X	+D13C CO2
	VW 55	062717	1343	X		X	X	X	+D13C CO2
	VW 47	062717	1210	X		X	X	X	+D13C CO2
	VW 24	062717	1401	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

Organization	Reporting Organization	Reporting Organization Name	Order Number	Entity Requesting Analysis	Purpose	Project	Matrix	Chain of Custody ID	Date Received by Lab	File Name	Instrument Detection Limit	Method Detection Limit	Comments											
Sample	Batch	LabID	COGCC Facility No.	AP#	Sample Date and Time	Lab Data Generator	Analysis Method	Analysis Name	Unit	Result Value	Qualifier	Test Type	Init Vol	Final Vol	Result Test	Data Flag	Dilution	Fraction Type	Report Basis	Comments	File Name	Instrument Detection Limit	Method Detection Limit	Comments
					6/27/17 11:10 PM	Lab Data Generator	Analysis Method	ANALYTICAL MODIFIER	Unit	Result Value	Qualifier	Test Type	Init Vol	Final Vol	Result Test	Data Flag	Dilution	Fraction Type	Report Basis	Comments	File Name	Instrument Detection Limit	Method Detection Limit	Comments
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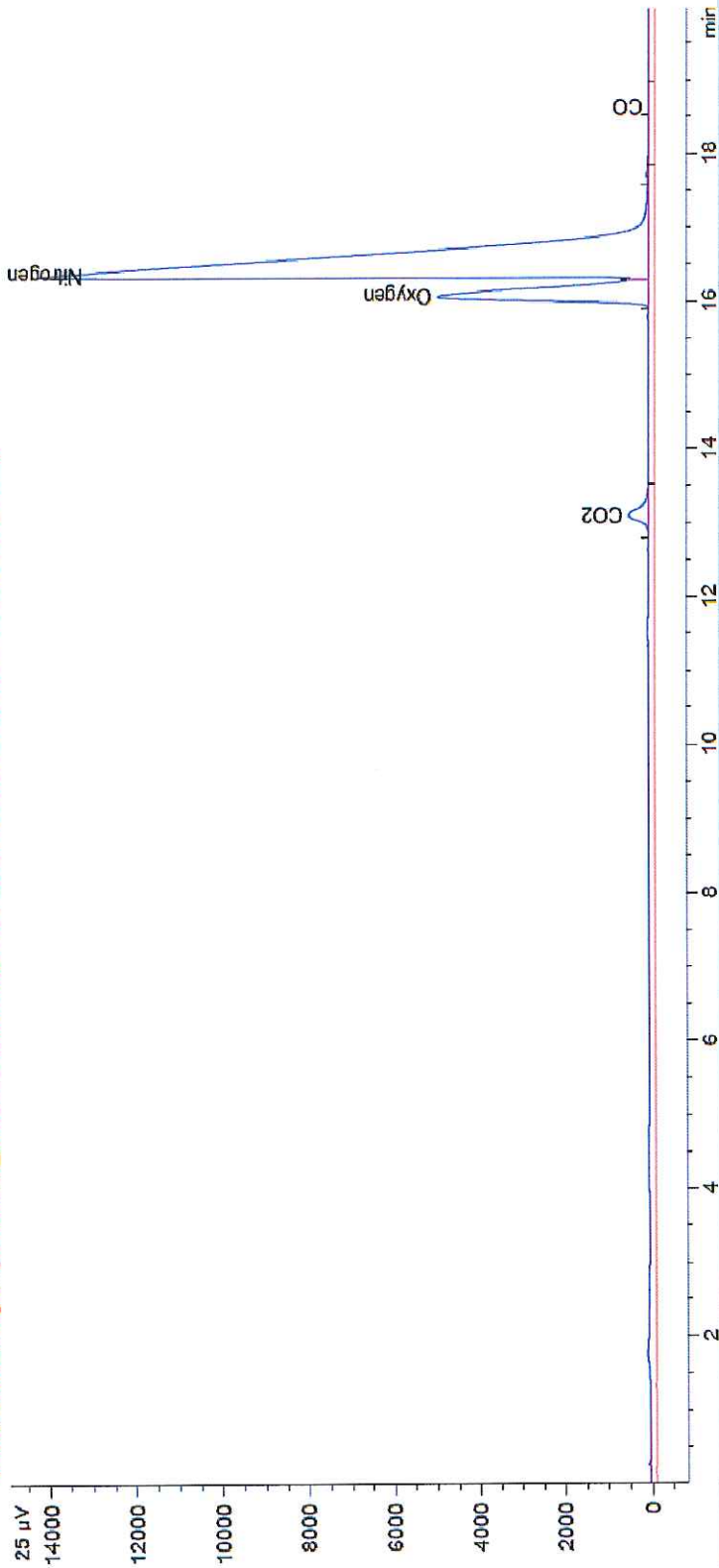




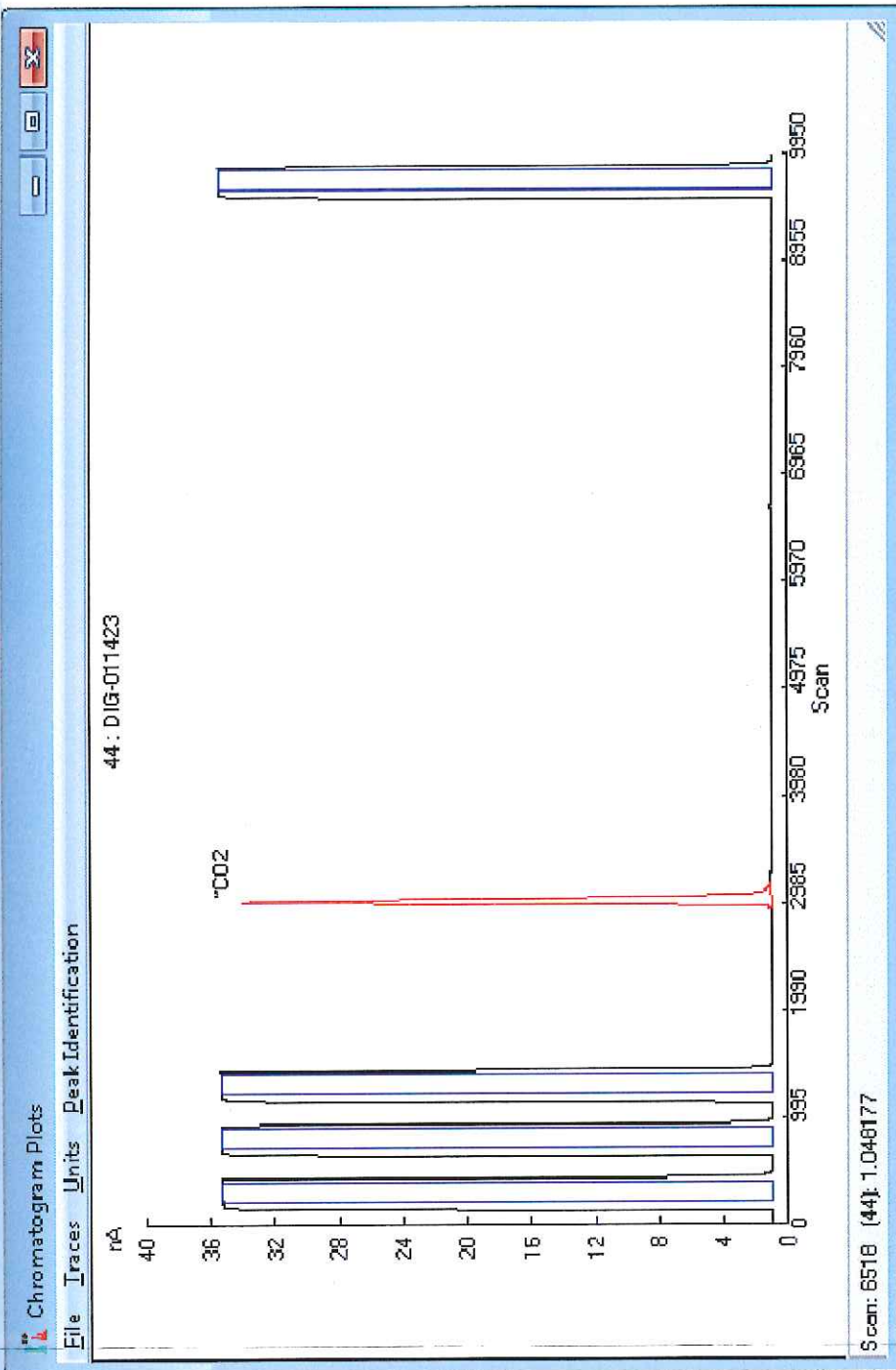
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011423.D)

TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011423.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



**dig**  
Dolan Integration Group

## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011447  
**Client:** Vista Geoscience  
**Sample Name(s):** VW480627171123

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

Dolan Integration Group shall use commercially reasonable efforts to maintain the Samples it receives from Customer in the condition in which same were initially received, and shall store, free of charge, any portion(s) of the Sample(s) not consumed or altered in the course of testing and analysis for a period of 90 days after their initial receipt, after which time the Samples will be destroyed. At Customer's written request and expense, Dolan Integration Group shall return unused Samples to Customer. At Customer's written request, Dolan Integration Group will also store and maintain Customer's Samples beyond the Free Storage Period for a monthly fee in accordance with Dolan Integration Group's the current storage rates. If Customer fails to timely pay any applicable storage charges, Dolan Integration Group shall



# Analytical Report



Job #: 17060983  
 Lab #: DIG-011447  
 Client: Vista Geoscience  
 Sample Name: VW480627171123  
 Date Sampled: 06/27/17  
 Time Sampled: 11:23  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/30/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	783337	78.78	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	184244	18.53	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	26729	2.69	-	-22.1	-	
Carbon Monoxide ( $\text{CO}$ )	18	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	#DIV/0!
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5 \text{ ‰}$

Error  $\delta\text{D} < 5.0 \text{ ‰}$

# Chain of Custody Form



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Dolan Integration Group

## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

### Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> H <sub>8</sub>	RSK-175* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> H <sub>8</sub> With dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	8°C Methane (Carbon)	80°C Methane (Hydrogen)	8°C Ethane-Propane (C <sub>2</sub> , C <sub>3</sub> if present)	
	VW 31	06/27/17	1428	X		X	X	X	
	VW 60	06/27/17	1307	X		X	X	X	+D13C CO2
	VW 30	06/27/17	1253	X		X	X	X	+D13C CO2
	VW 40	06/27/17	1159	X		X	X	X	+D13C CO2
	VW 58	06/27/17	1155	X		X	X	X	+D13C CO2
	VW 34	06/27/17	1328	X		X	X	X	+D13C CO2
	VW 48	06/27/17	1123	X		X	X	X	+D13C CO2
	VW 44	06/27/17	1038	X		X	X	X	+D13C CO2

### Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

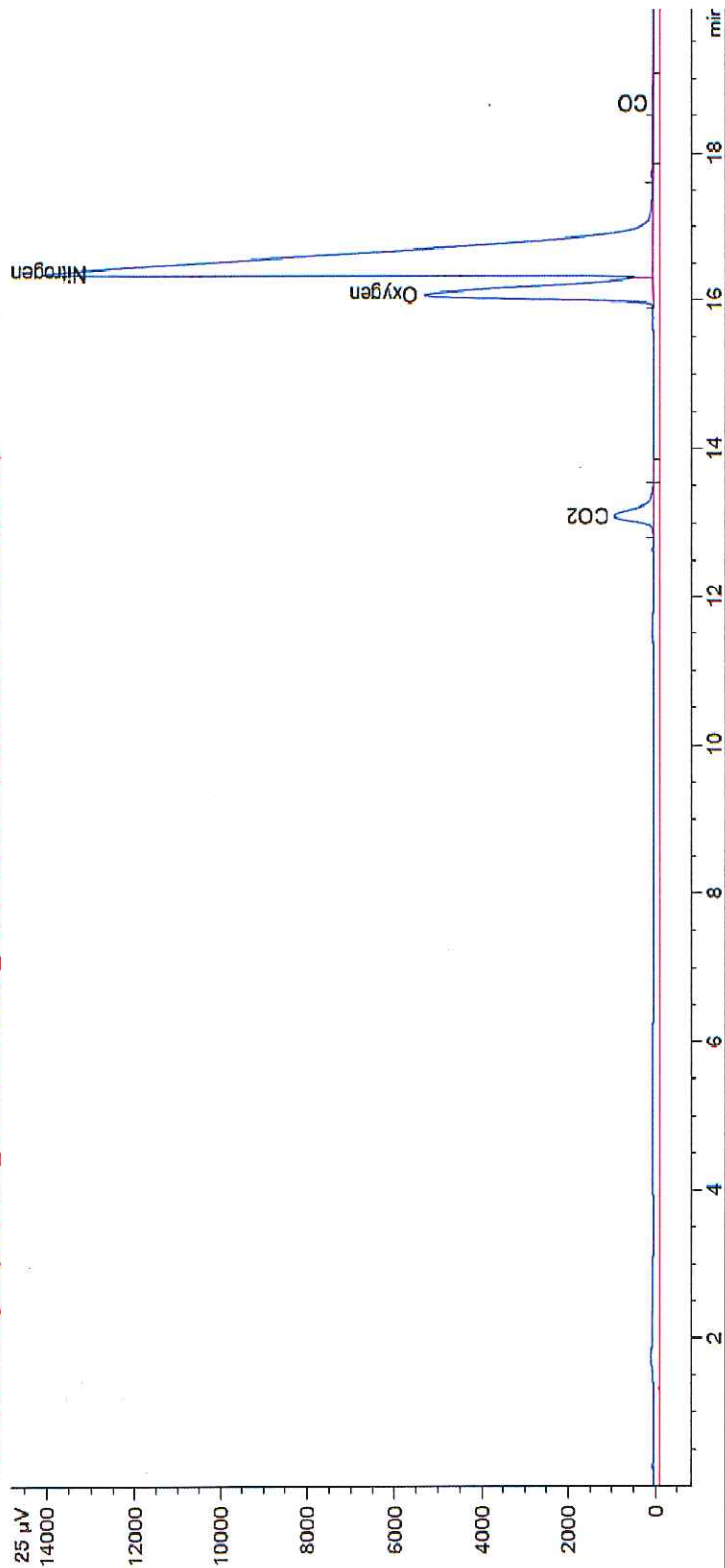
[illegible]



# Gas Chromatography (GC) Chromatogram

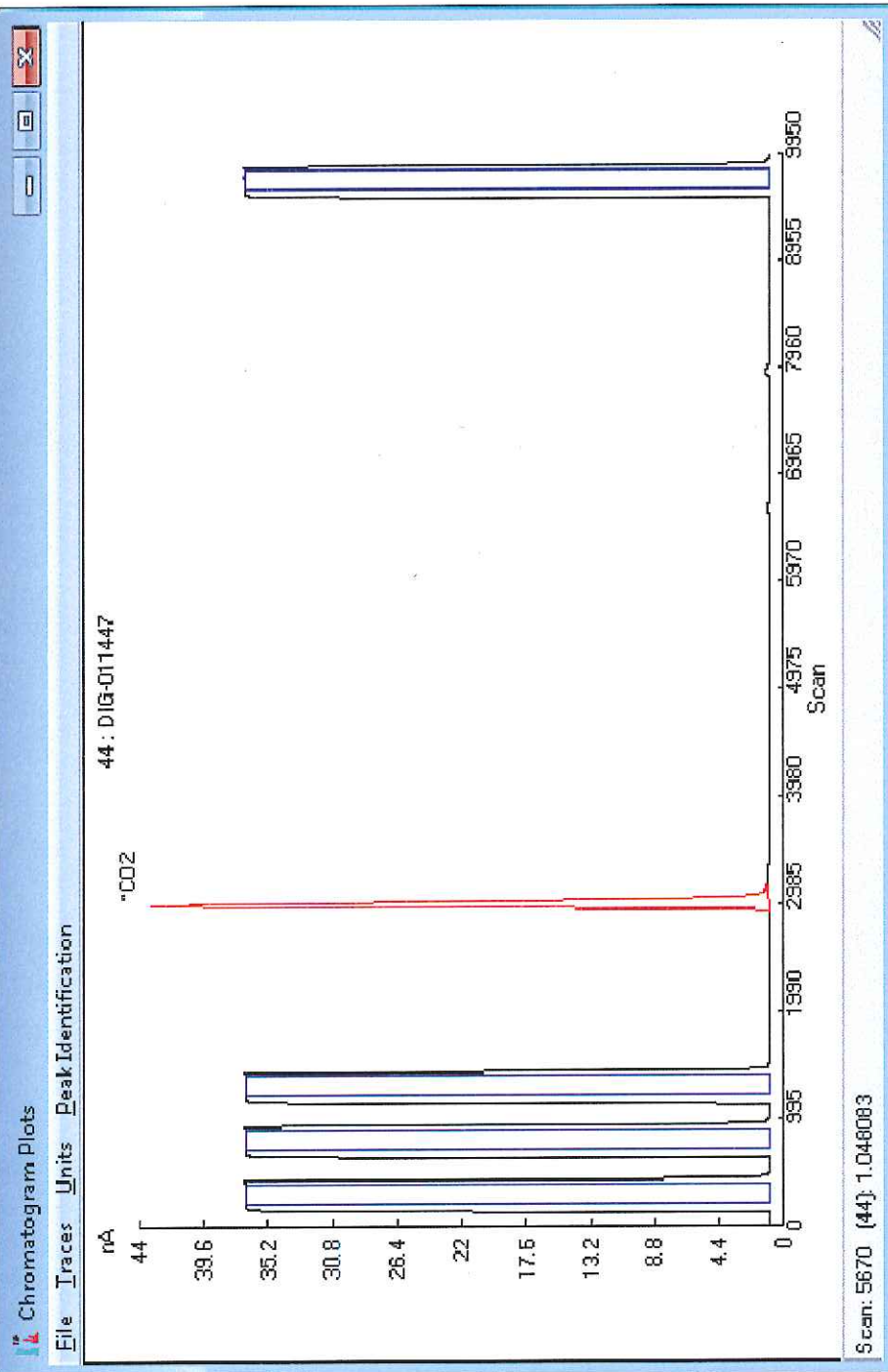


TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011447.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011447.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011418  
**Client:** Vista Geoscience  
**Sample Name(s):** VW490627171117

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011418  
 Client: Vista Geoscience  
 Sample Name: VW490627171117  
 Date Sampled: 06/27/17  
 Time Sampled: 11:17  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	830785	83.46	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	153276	15.40	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	11410	1.15	-	-25.8	-	
Carbon Monoxide ( $\text{CO}$ )	13	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, C<sub>2</sub>, C<sub>3</sub>

RSK-175\* (see composition)  
with dissolved C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>

gC Methane (Carbon)

gC Methane (Hydrogen)

gC Ethane-Pentane  
(C<sub>2</sub> - if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 54	062717	1032	X		X	X	X	+D13C CO2
	VW 49	062717	1117	X		X	X	X	+D13C CO2
	VW 18	062717	1246	X		X	X	X	+D13C CO2
	VW 43	062717	1043	X		X	X	X	+D13C CO2
	VW 13	062717	1241	X		X	X	X	+D13C CO2
	VW 55	062717	1343	X		X	X	X	+D13C CO2
	VW 47	062717	1210	X		X	X	X	+D13C CO2
	VW 24	062717	1401	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

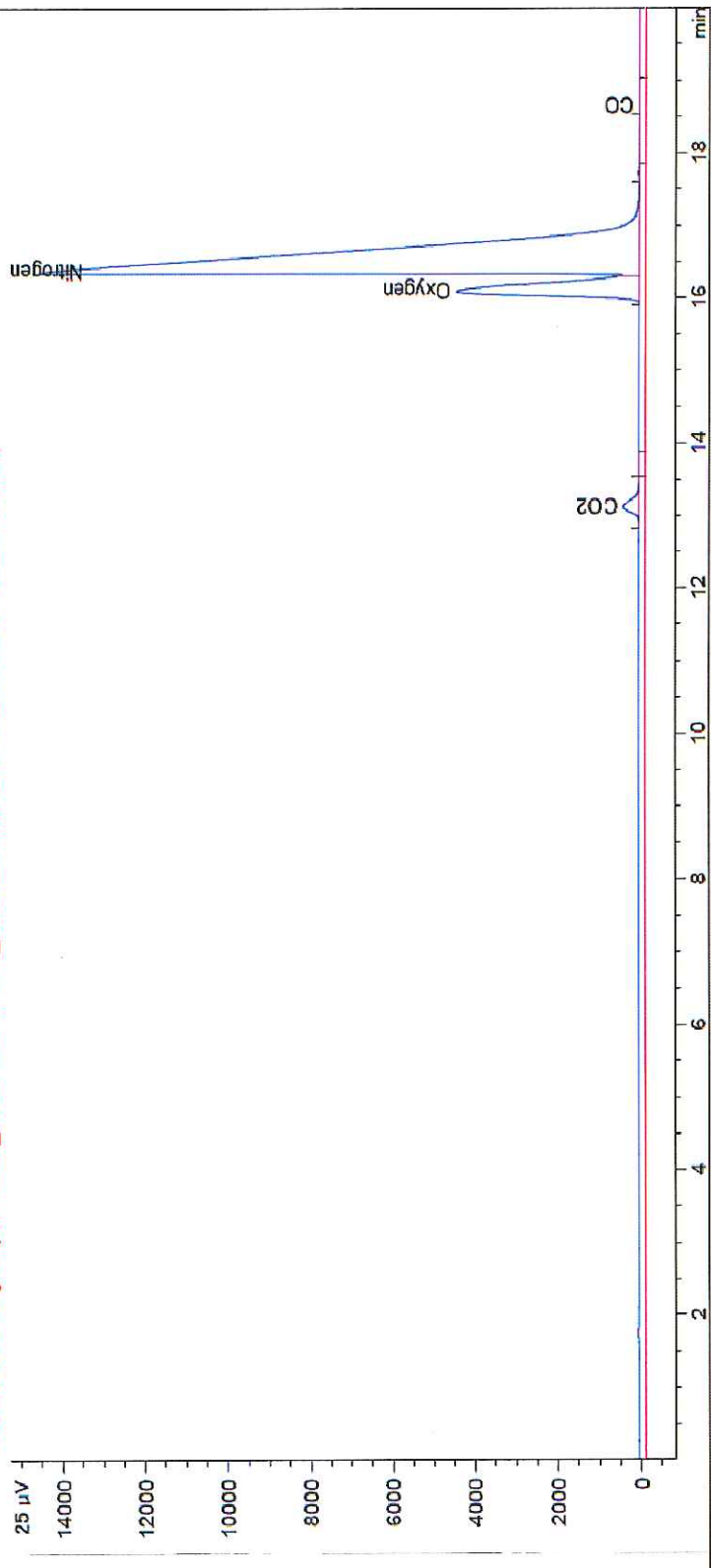
[illegible]



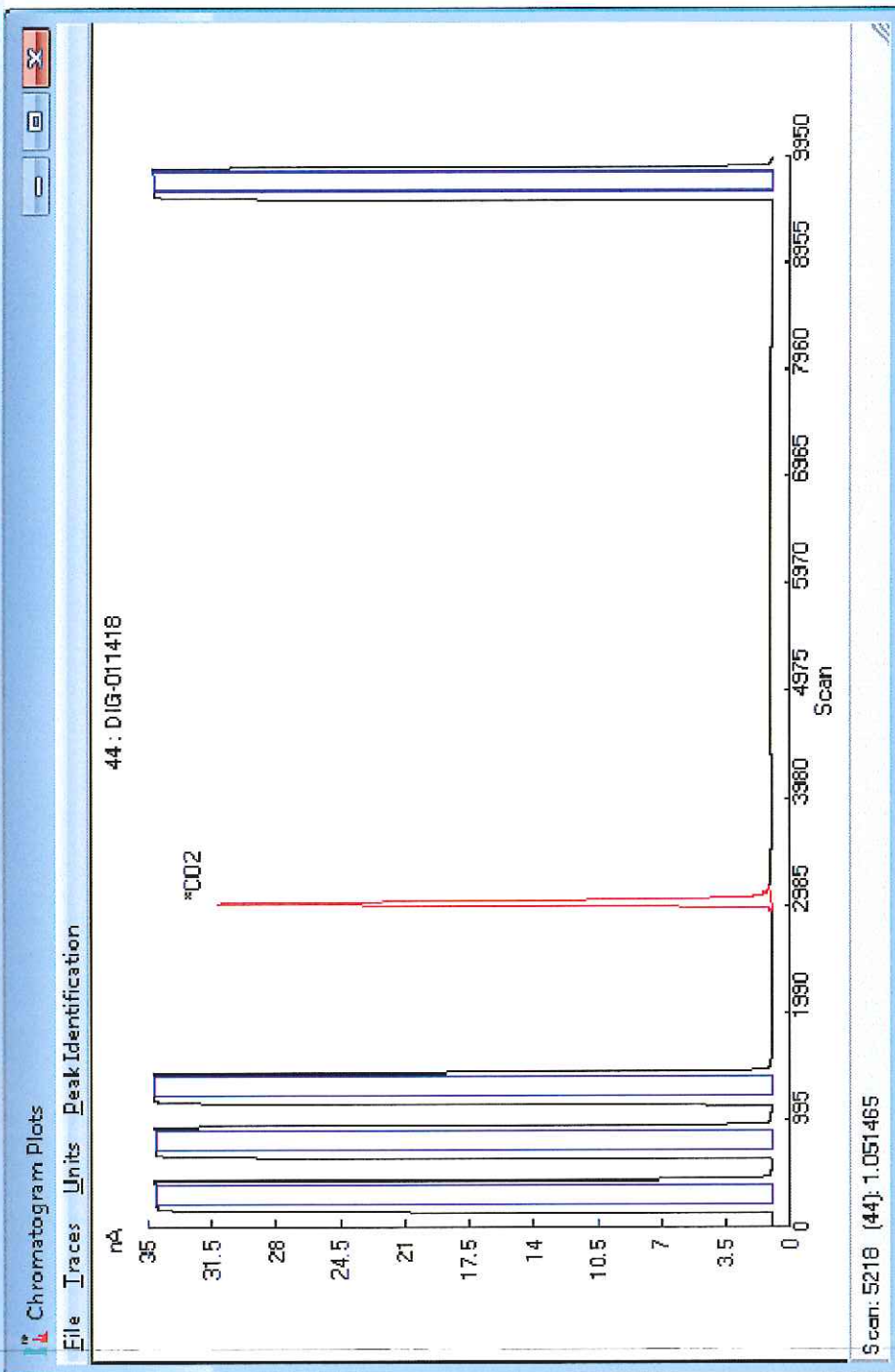
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011418.D)

TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011418.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram



\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011416  
**Client:** Vista Geoscience  
**Sample Name(s):** VW500627171056

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011416  
 Client: Vista Geoscience  
 Sample Name: VW500627171056  
 Date Sampled: 06/27/17  
 Time Sampled: 10:56  
 Sample Description: cali-5-bond bag  
 Sampling Notes: 06/27/17  
 Date Received:  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	768764	76.76	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	192632	19.23	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	40114	4.01	-	-19.8	-	
Carbon Monoxide ( $\text{CO}$ )	16	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + / \text{C}_1 +$ )	
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Westminster, CO 80234  
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Name: John Fontana  
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agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub> +	RSK-175* (see comments) H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub> +, with dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	8°C Methane (Carbon)	50 Methane (Hydrogen)	8°C Ethane-Pentane (C <sub>4</sub> +, if present)	
	VW 51	06/27/17	1102	X		X	X	X	
	VW 55	06/27/17	1342	X		X	X	X	+D13C CO2
	VW 32	06/27/17	1356	X		X	X	X	+D13C CO2
	VW 24	06/27/17	1258	X		X	X	X	+D13C CO2
	VW 35	06/27/17	1458	X		X	X	X	+D13C CO2
	VW 22	06/27/17	1451	X		X	X	X	+D13C CO2
	VW 52	06/27/17	1108	X		X	X	X	+D13C CO2
	VW 50	06/27/17	1056	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DTG</u>	<u>6/27/17</u>	<u>15:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

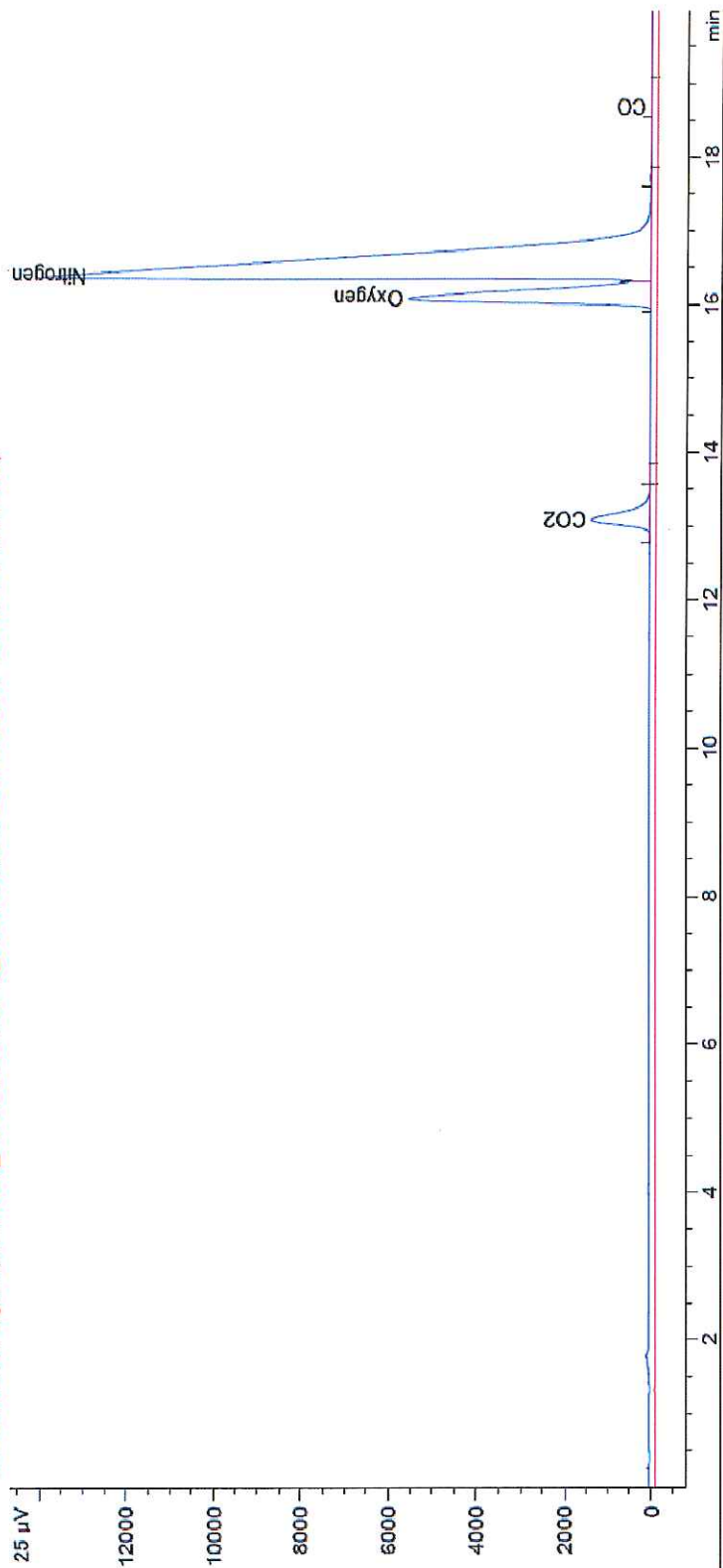


[illegible]

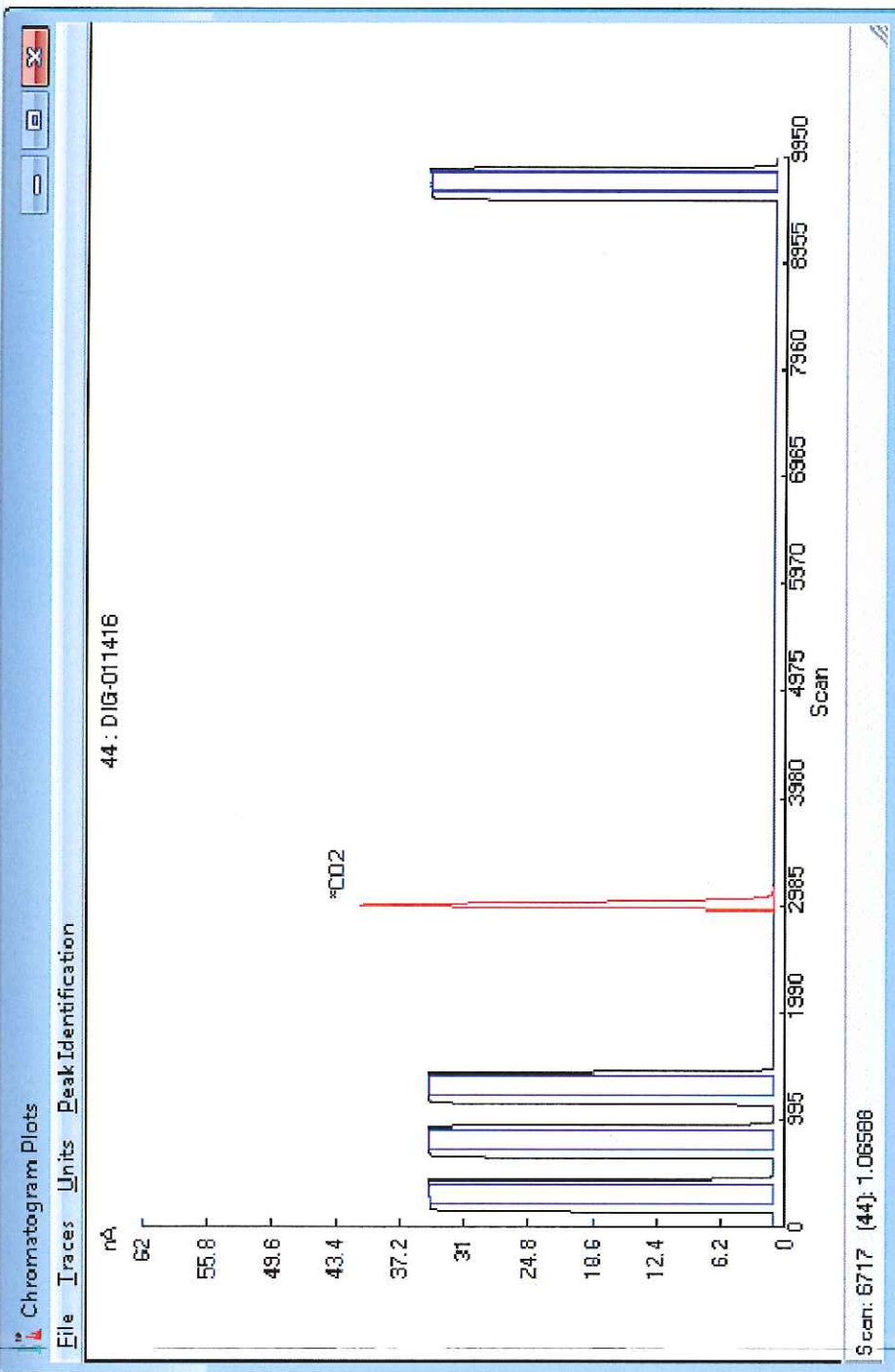


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011416.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011416.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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**Geochemistry for Energy**

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p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011409  
**Client:** Vista Geoscience  
**Sample Name(s):** VW510627171102

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011409  
 Client: Vista Geoscience  
 Sample Name: VW510627171102  
 Date Sampled: 06/27/17  
 Time Sampled: 11:02  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/27/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	776709	78.90	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	190986	19.40	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	16704	1.70	-	-19.1	-	
Carbon Monoxide ( $\text{CO}$ )	22	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175* Gas composition with dissolved Cl <sub>2</sub> , CO <sub>2</sub> & O <sub>2</sub>	8°C Methane (Carbon)	ED Methane (Hydrogen)	g°C Ethane-Pentane (C <sub>2</sub> to C <sub>5</sub> if present)	
	VW 51	06/27/17	1102	X		X	X	X	
	VW 55	06/27/17	1342	X		X	X	X	+D13C CO2
	VW 32	06/27/17	1356	X		X	X	X	+D13C CO2
	VW 24	06/27/17	1258	X		X	X	X	+D13C CO2
	VW 35	06/27/17	1458	X		X	X	X	+D13C CO2
	VW 22	06/27/17	1451	X		X	X	X	+D13C CO2
	VW 52	06/27/17	1108	X		X	X	X	+D13C CO2
	VW 50	06/27/17	1056	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>15:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

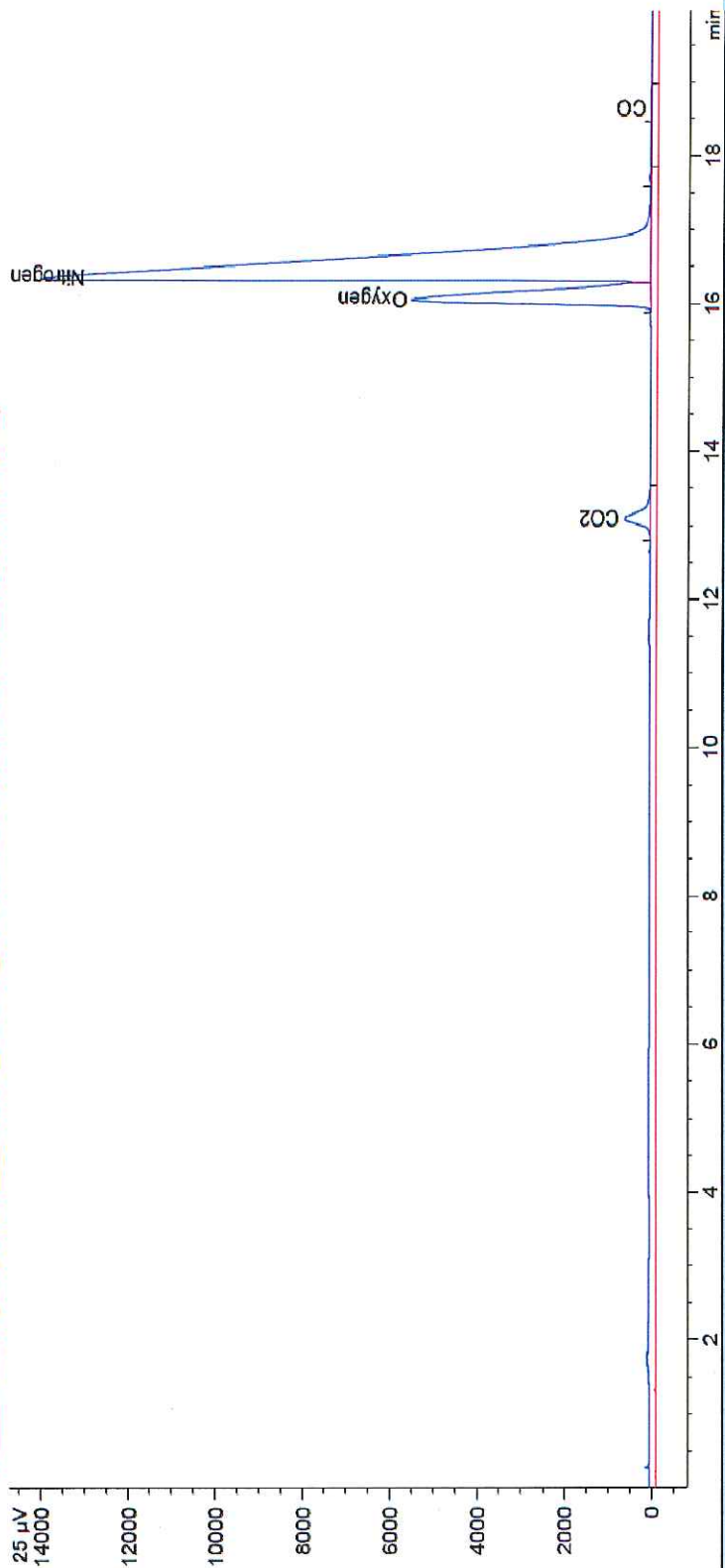
[illegible]



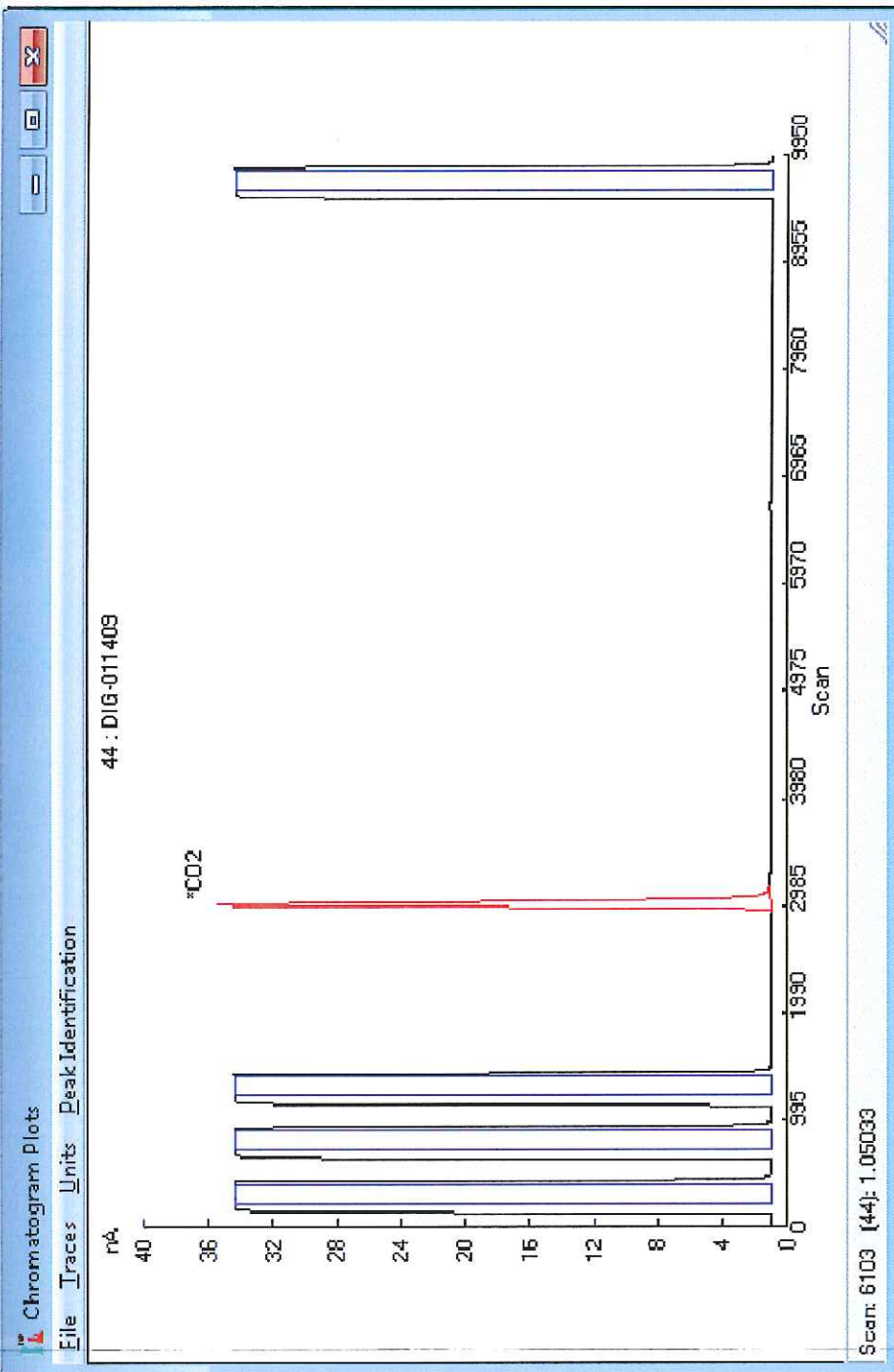


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26) DIG-011409REP.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26) DIG-011409REP.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011415  
**Client:** Vista Geoscience  
**Sample Name(s):** VW520627171108

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011415  
 Client: Vista Geoscience  
 Sample Name: VW520627171108  
 Date Sampled: 06/27/17  
 Time Sampled: 11:08  
 Sample Description: cali-5-bond bag  
 Sampling Notes: 06/27/17  
 Date Received:  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	795010	79.71	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	140562	14.09	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	61805	6.20	-	-21.4	-	
Carbon Monoxide ( $\text{CO}$ )	10	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC = Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰

# Chain of Custody Form



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Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* % O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175* % O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> with dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	8°C Methane (Carbon)	8°C Methane (Hydrogen)	8°C Ethane-Pentane (C <sub>2</sub> to C <sub>5</sub> if present)	
	VW 51	06/27/17	1102	X		X	X	X	
	VW 55	06/27/17	1342	X		X	X	X	+D13C CO2
	VW 32	06/27/17	1356	X		X	X	X	+D13C CO2
	VW 24	06/27/17	1258	X		X	X	X	+D13C CO2
	VW 35	06/27/17	1458	X		X	X	X	+D13C CO2
	VW 22	06/27/17	1451	X		X	X	X	+D13C CO2
	VW 52	06/27/17	1108	X		X	X	X	+D13C CO2
	VW 50	06/27/17	1056	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>15:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

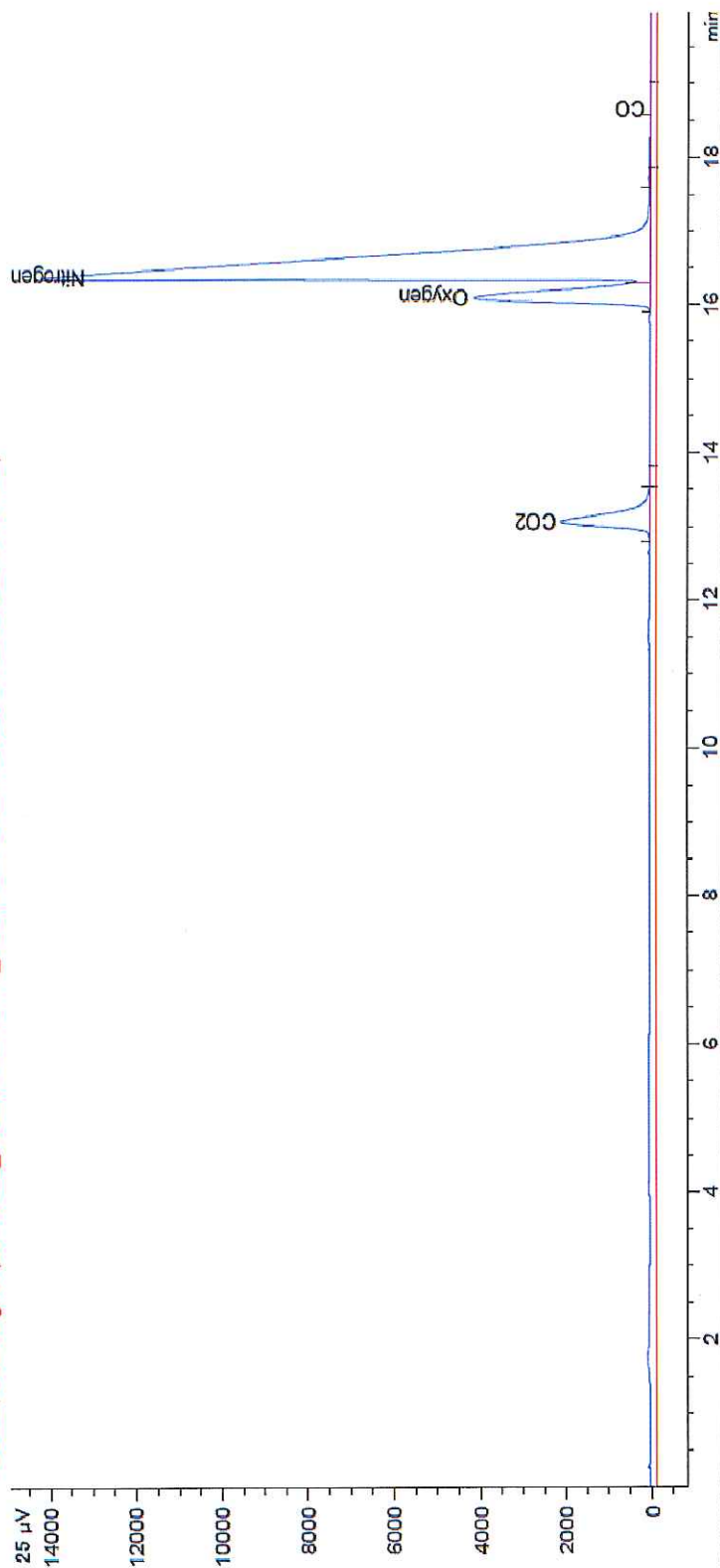
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

[illegible]



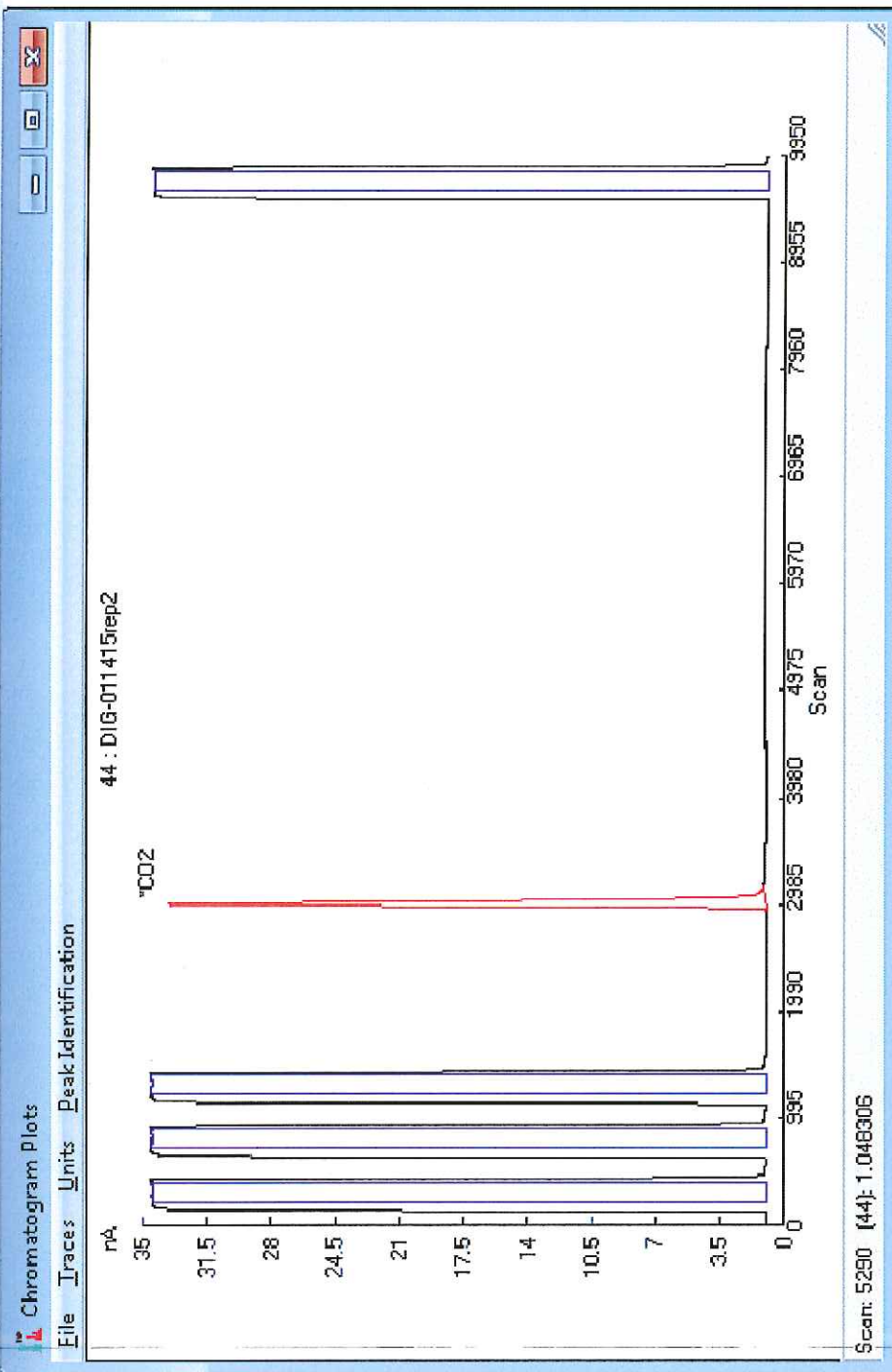
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011415.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011415.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





# Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

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p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011435  
**Client:** Vista Geoscience  
**Sample Name(s):** VW530627171106

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011435  
 Client: Vista Geoscience  
 Sample Name: VW530627171106  
 Date Sampled: 06/27/17  
 Time Sampled: 11:06  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	779752	77.43	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	189396	18.81	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	37912	3.76	-	-19.6	-	
Carbon Monoxide ( $\text{CO}$ )	21	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	#DIV/0!
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Westminster, CO 80234  
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## Send Data and Invoice to:

Name: John Fontana  
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Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> with dissolved Cl <sub>2</sub> , Cl <sub>2</sub> & CH <sub>4</sub>	δ <sup>13</sup> C Methane (Carbon)	δ <sup>13</sup> C Methane (Hydrogen)	δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	
	VW 59	062717	1148	X		X	X	X	
	VW 42	062717	1024	X		X	X	X	+D13C CO2
	VW 53	062717	1106	X		X	X	X	+D13C CO2
	VW 62	062717	1349	X		X	X	X	+D13C CO2
	VW 41	062717	1207	X		X	X	X	+D13C CO2
	VW 37	062717	1128	X		X	X	X	+D13C CO2
	VW 36	062717	1322	X		X	X	X	+D13C CO2
	VW 39	062717	1145	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>14:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

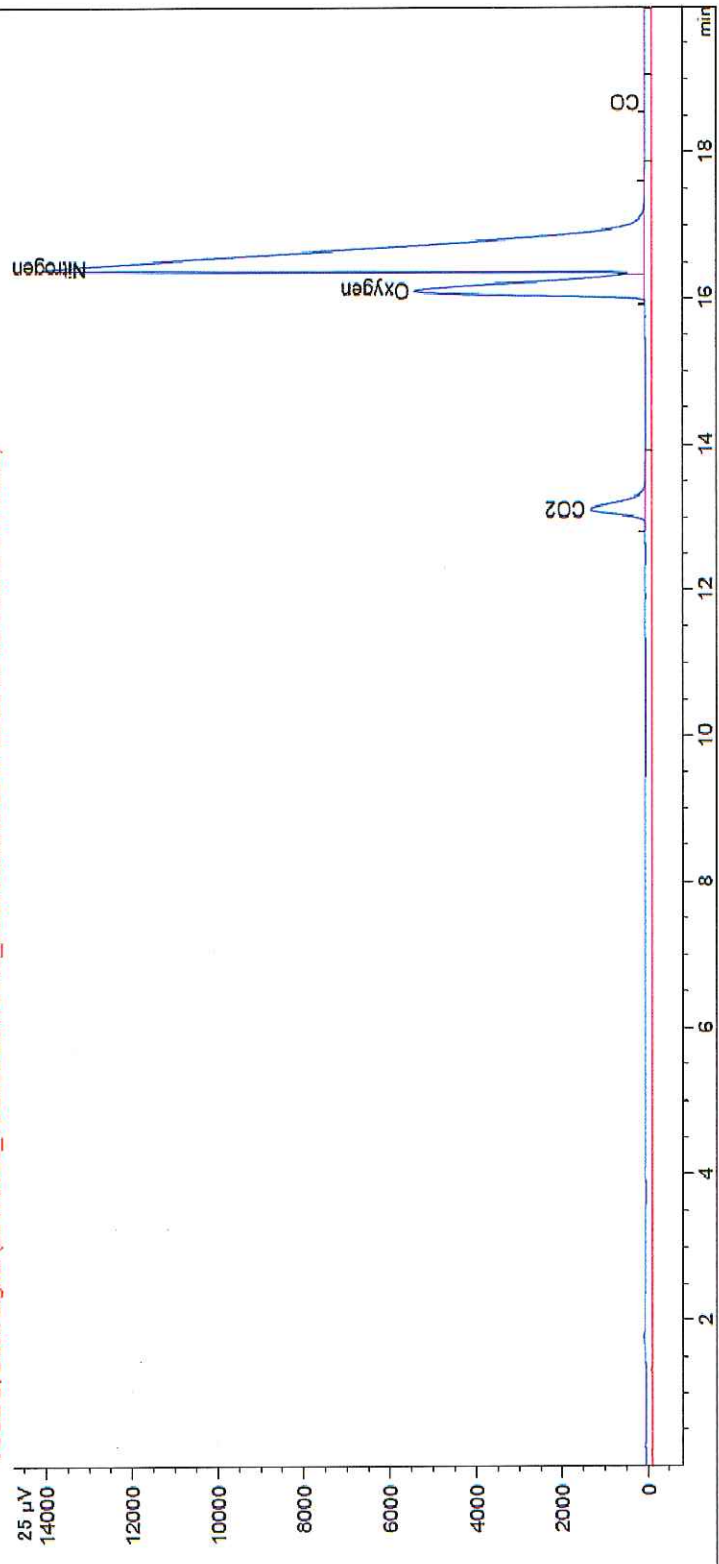
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

[illegible]

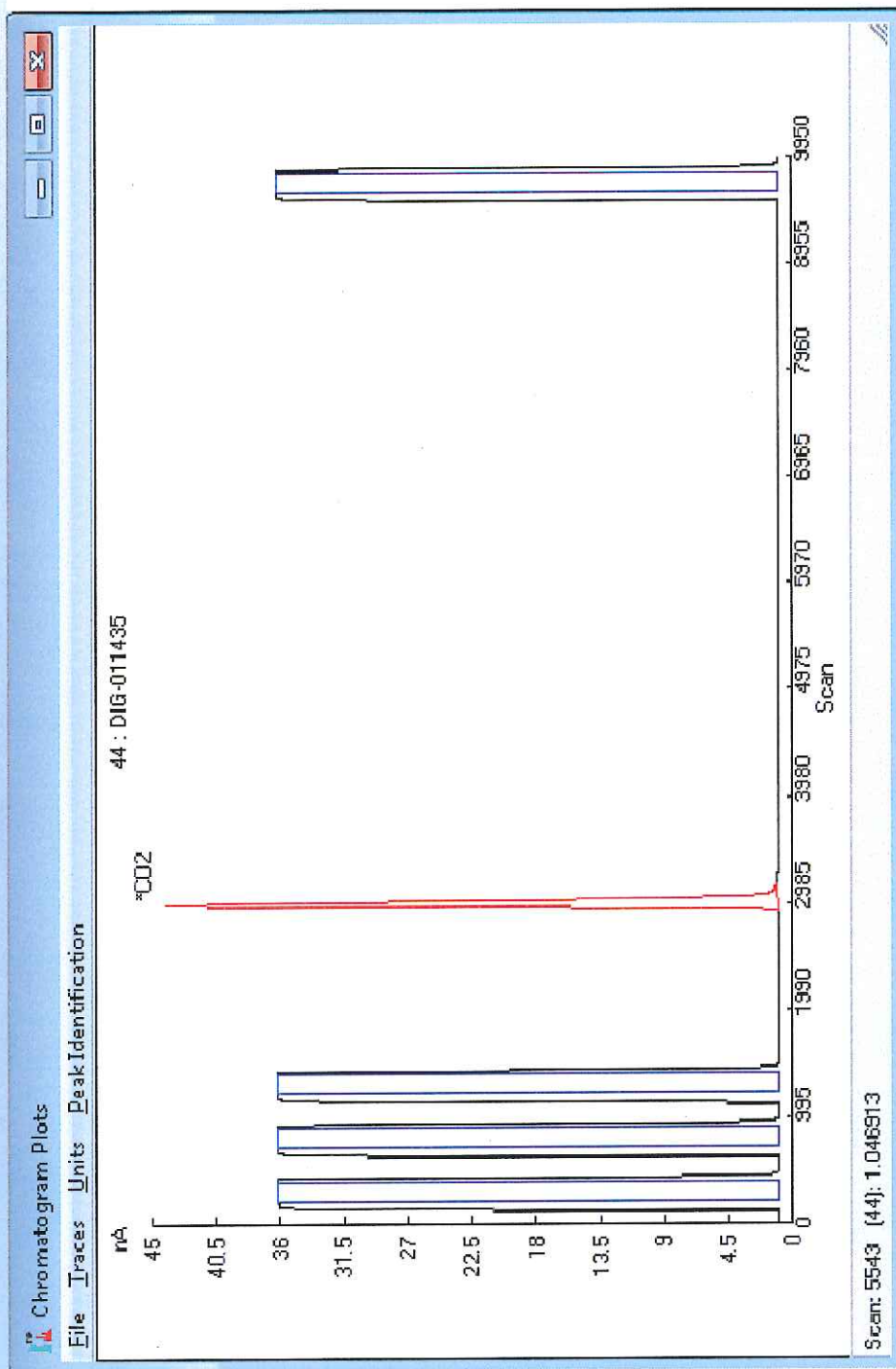


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011435.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011435.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

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p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011417  
**Client:** Vista Geoscience  
**Sample Name(s):** VW540627171032

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011417  
 Client: Vista Geoscience  
 Sample Name: VW540627171032  
 Date Sampled: 06/27/17  
 Time Sampled: 10:32  
 Sample Description: cali-5-bond bag  
 Sampling Notes: 06/27/17  
 Date Received:  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	781695	78.05	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	194700	19.44	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	25186	2.51	-	-18.8	-	
Carbon Monoxide ( $\text{CO}$ )	14	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + / \text{C}_1 +$ )	
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, C<sub>1</sub>-C<sub>4</sub>

RSK-175\* (for composition  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, C<sub>1</sub>-C<sub>4</sub>  
with dissolved CH<sub>4</sub>, C<sub>2</sub> & C<sub>3</sub>)

δ<sup>13</sup>C Methane (Carbon)

δ<sup>13</sup>C Methane (Hydrogen)

δ<sup>13</sup>C Ethane-Pentane  
(C<sub>2</sub> & if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 54	062717	1032	X		X	X	X	
	VW 49	062717	1117	X		X	X	X	+D13C CO2
	VW 18	062717	1246	X		X	X	X	+D13C CO2
	VW 43	062717	1043	X		X	X	X	+D13C CO2
	VW 13	062717	1241	X		X	X	X	+D13C CO2
	VW 55	062717	1343	X		X	X	X	+D13C CO2
	VW 47	062717	1210	X		X	X	X	+D13C CO2
	VW 24	062717	1401	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:27</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

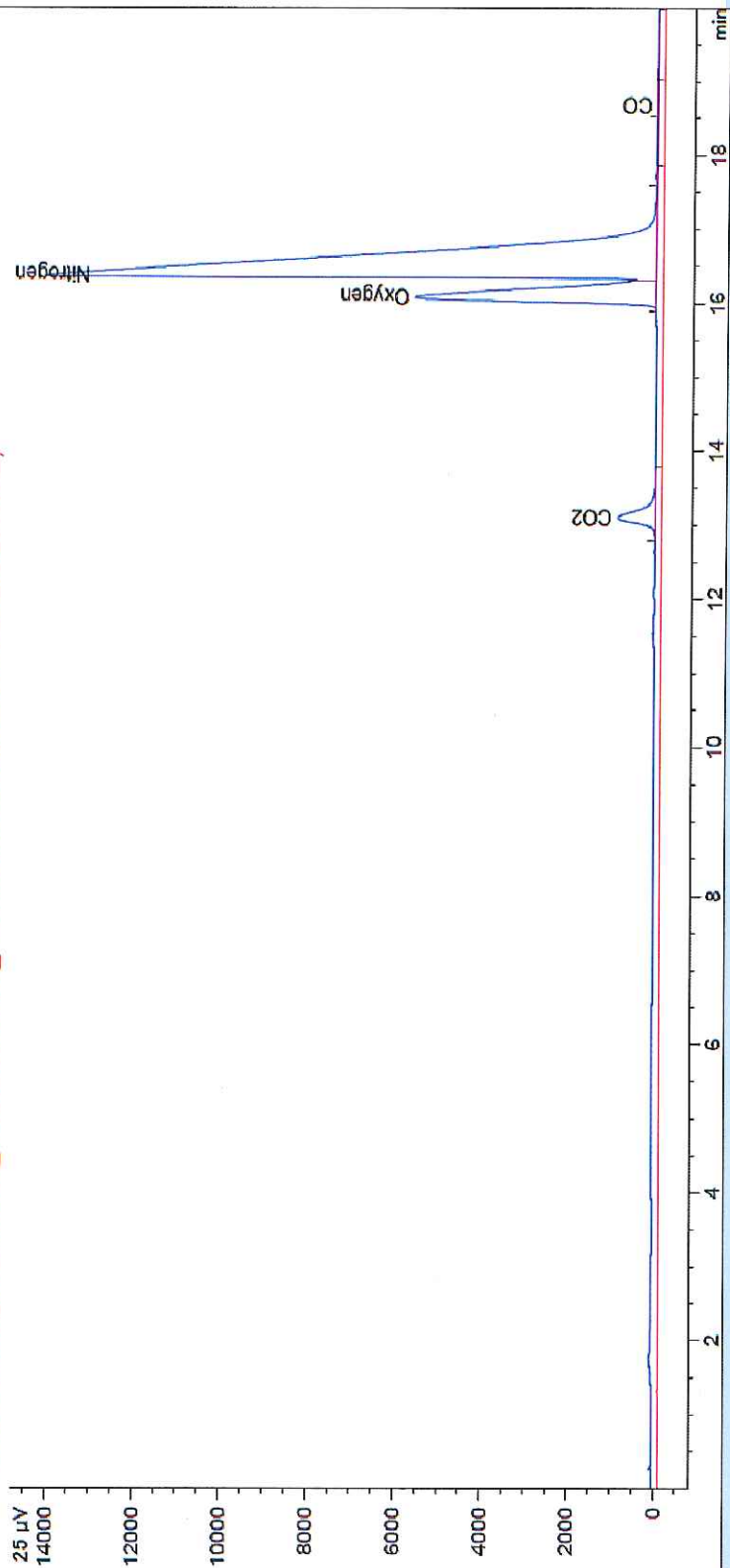




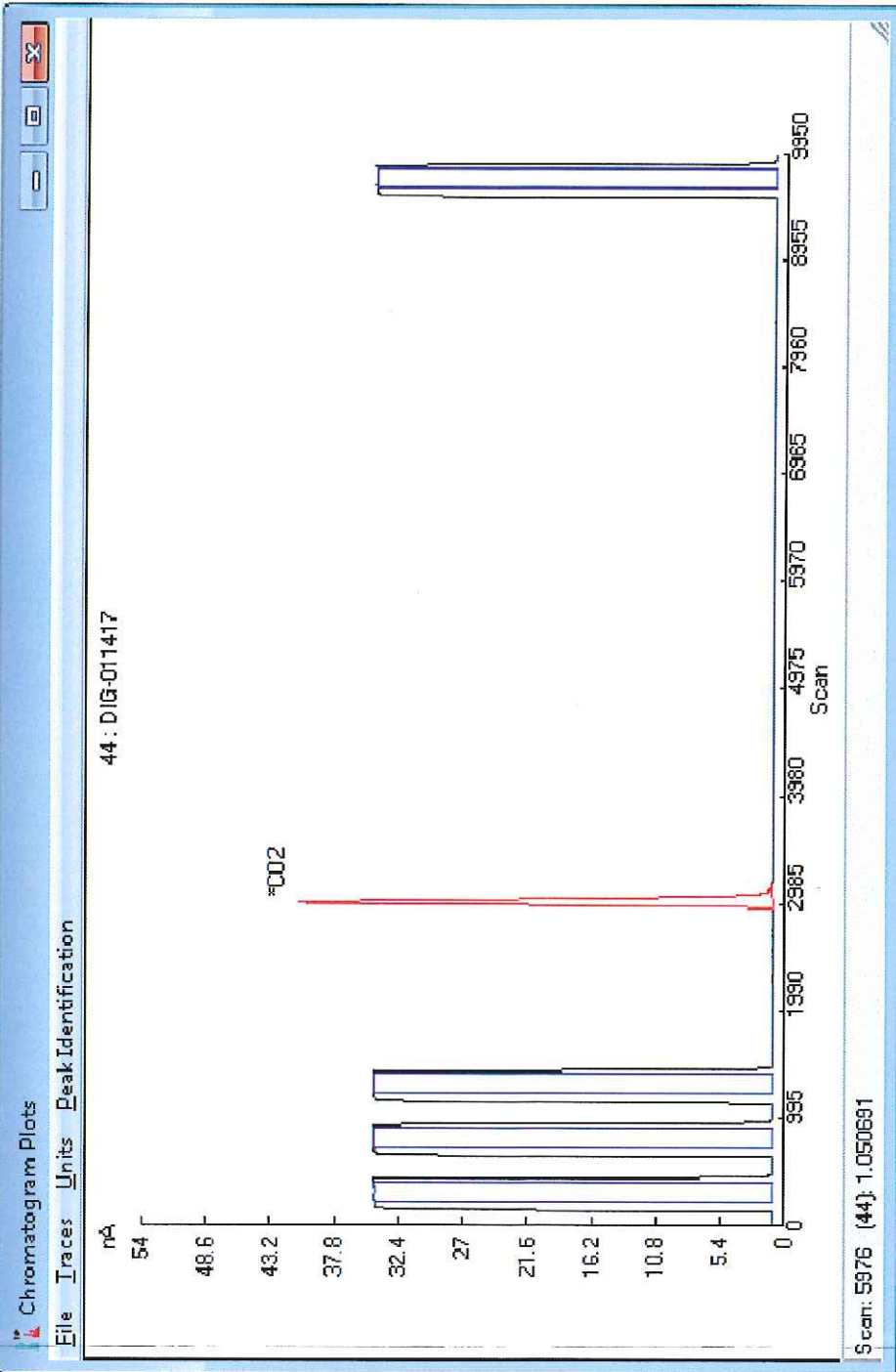
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011417.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011417.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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**Geochemistry for Energy**

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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011410  
**Client:** Vista Geoscience  
**Sample Name(s):** VW550627171342

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011410  
 Client: Vista Geoscience  
 Sample Name: VW550627171342  
 Date Sampled: 06/27/17  
 Time Sampled: 13:42  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	765593	77.42	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	176489	17.85	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	46801	4.73	-	-16.3	-	
Carbon Monoxide (CO)	17	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>6</sub> <sup>+</sup>	RSK-175* (see comments) H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> -C <sub>6</sub> <sup>+</sup> with dissolved Cl <sub>2</sub> , C <sub>2</sub> & C <sub>3</sub>	8°C Methane (Carbon)	8°C Methane (Hydrogen)	8°C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	
	VW 51	06/27/17	1102	X		X	X	X	
	VW 55	06/27/17	1342	X		X	X	X	+D13C CO2
	VW 32	06/27/17	1356	X		X	X	X	+D13C CO2
	VW 24	06/27/17	1258	X		X	X	X	+D13C CO2
	VW 35	06/27/17	1458	X		X	X	X	+D13C CO2
	VW 22	06/27/17	1451	X		X	X	X	+D13C CO2
	VW 52	06/27/17	1108	X		X	X	X	+D13C CO2
	VW 50	06/27/17	1056	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>15:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

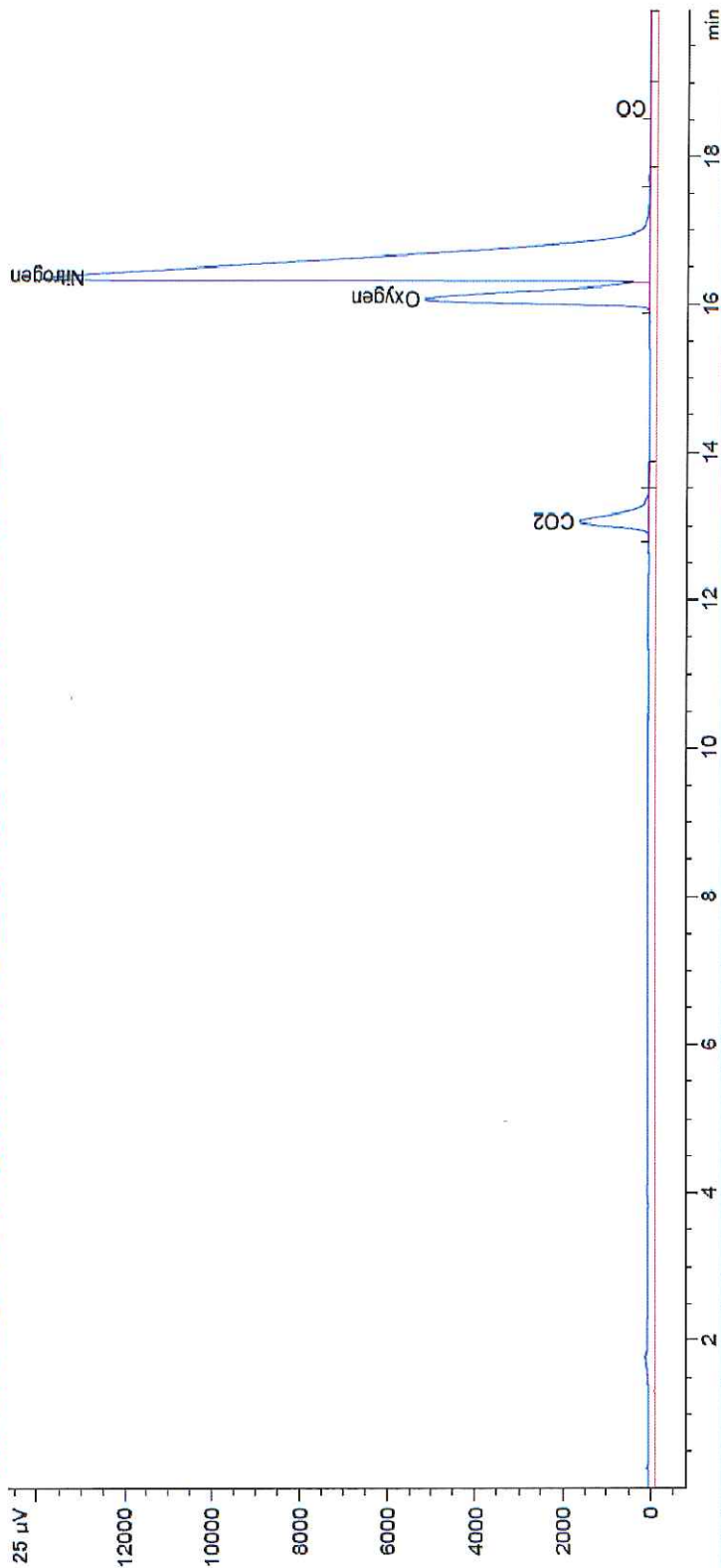
[illegible]



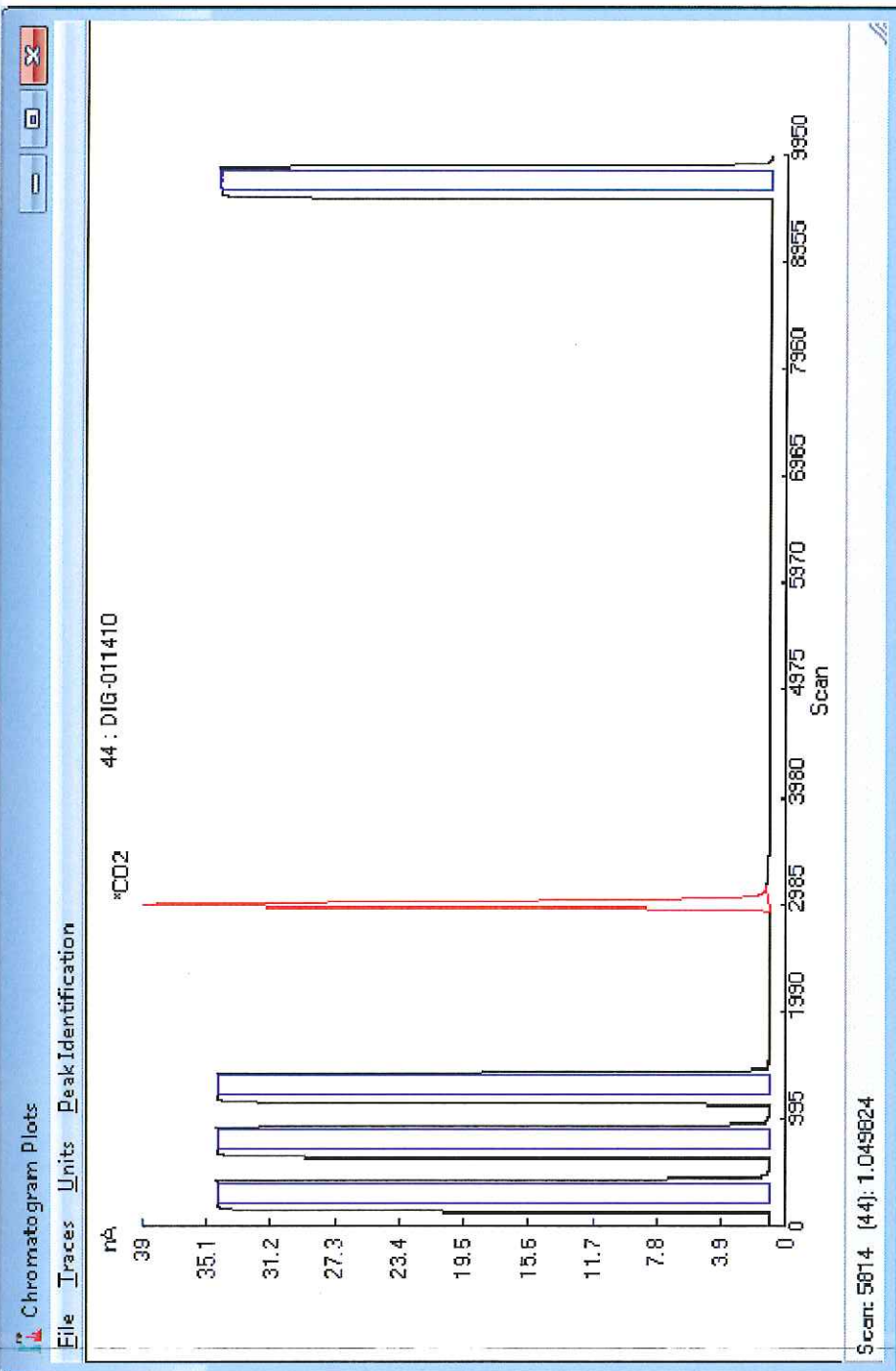


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011410REP.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011410REP.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011422  
**Client:** Vista Geoscience  
**Sample Name(s):** VW550627171343

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011422  
 Client: Vista Geoscience  
 Sample Name: VW550627171343  
 Date Sampled: 06/27/17  
 Time Sampled: 13:43  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/28/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	763331	77.52	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	190831	19.38	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	30502	3.10	-	-16.0	-	
Carbon Monoxide (CO)	16	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰

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AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* No. O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub> +	RSK-175* Gas composition No. O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub> +, with dissolved C <sub>1</sub> , C <sub>2</sub> & C <sub>3</sub>	δ <sup>13</sup> C Methane (Carbon)	δD Methane (Hydrogen)	δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> +, if present)	
	VW 54	062717	1032	X		X	X	X	+D13C CO2
	VW 49	062717	1117	X		X	X	X	+D13C CO2
	VW 18	062717	1246	X		X	X	X	+D13C CO2
	VW 43	062717	1043	X		X	X	X	+D13C CO2
	VW 13	062717	1241	X		X	X	X	+D13C CO2
	VW 55	062717	1343	X		X	X	X	+D13C CO2
	VW 47	062717	1210	X		X	X	X	+D13C CO2
	VW 24	062717	1401	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175: Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

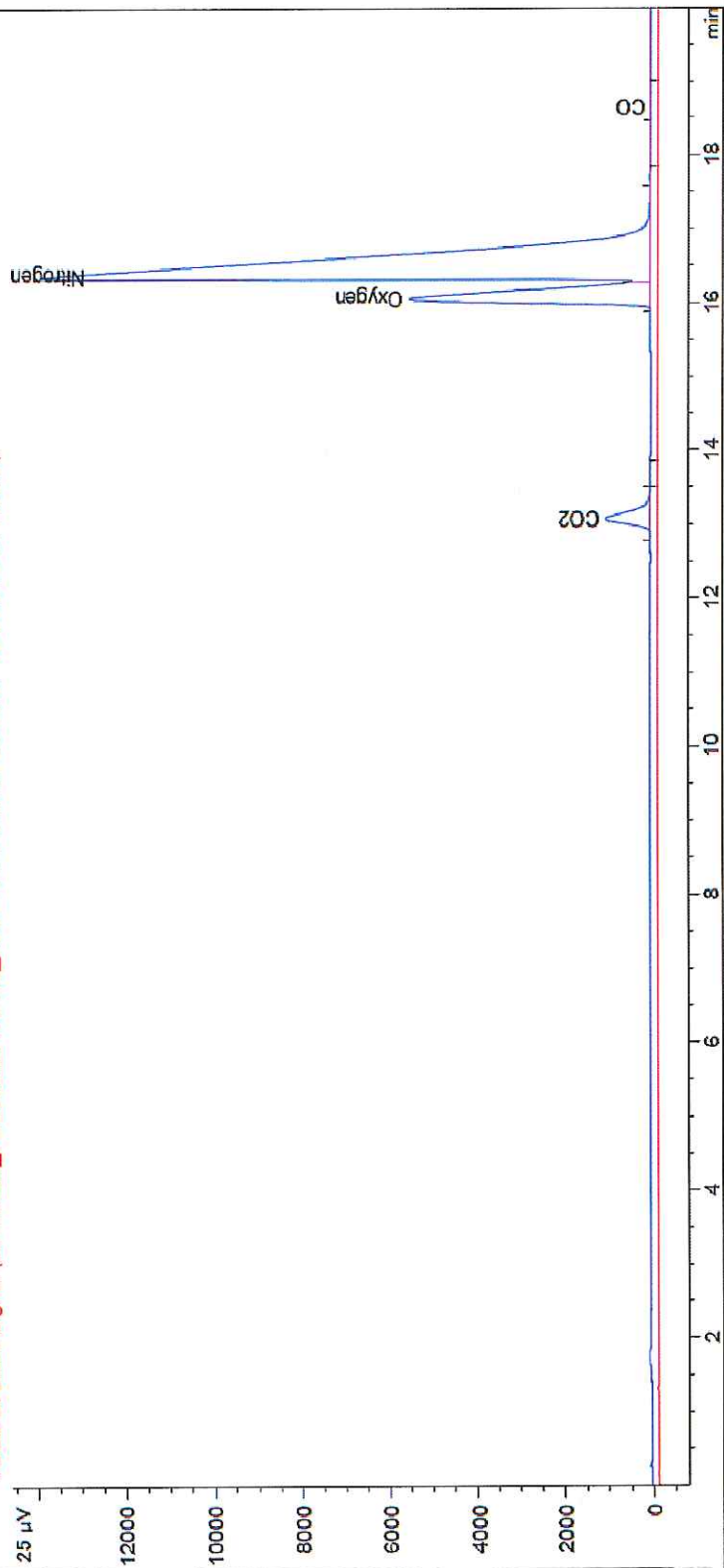
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Organization	Reporting Organization	Reporting Organization Name	Order Number	Entity/Requesting Analyst	Purpose	Project	Date Received by Lab	Chain of Custody ID	Project Number	Comments	Test Type	Result Text	Data Flag	Dilution	Fraction Type	Analysis Date and Time	Report Basis	Comments	File Name	Detection Limit	Instrument Detection Limit	Method Detection Limit	Comments	Analysis Batch ID
Sample	Lab ID	COGCC Facility No.	Lab Sample ID	APR #	Sample Type	Matrix	APR #	LAB Sample ID	Comments	Project Number	Core Method	Init Vol	Final Vol	Init Vol Units	Final Vol Units	Analysis Date and Time	Report Basis	Comments	File Name	Detection Limit	Instrument Detection Limit	Method Detection Limit	Comments	Analysis Batch ID
Batch	Lab ID	COGCC Facility No.	Lab Sample ID	APR #	Sample Type	Matrix	APR #	LAB Sample ID	Comments	Project Number	Core Method	Init Vol	Final Vol	Init Vol Units	Final Vol Units	Analysis Date and Time	Report Basis	Comments	File Name	Detection Limit	Instrument Detection Limit	Method Detection Limit	Comments	Analysis Batch ID
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	024R-38-9	17600983	024R-38-9	17600983	MDL %	MDL %	17600983	024R-38-9	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	7172-31-9	17600983	7172-31-9	17600983	MDL %	MDL %	17600983	7172-31-9	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	7486-50-7	17600983	7486-50-7	17600983	MDL %	MDL %	17600983	7486-50-7	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	1335-74-0	17600983	1335-74-0	17600983	MDL %	MDL %	17600983	1335-74-0	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	74-42-8	17600983	74-42-8	17600983	MDL %	MDL %	17600983	74-42-8	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	74-44-0	17600983	74-44-0	17600983	MDL %	MDL %	17600983	74-44-0	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	74-86-1	17600983	74-86-1	17600983	MDL %	MDL %	17600983	74-86-1	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	74-86-1	17600983	74-86-1	17600983	MDL %	MDL %	17600983	74-86-1	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	115-07-1	17600983	115-07-1	17600983	MDL %	MDL %	17600983	115-07-1	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	75-38-5	17600983	75-38-5	17600983	MDL %	MDL %	17600983	75-38-5	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	106-97-8	17600983	106-97-8	17600983	MDL %	MDL %	17600983	106-97-8	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	106-66-0	17600983	106-66-0	17600983	MDL %	MDL %	17600983	106-66-0	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	92113-60-1+	17600983	92113-60-1+	17600983	MDL %	MDL %	17600983	92113-60-1+	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	delta13C-C1	17600983	delta13C-C1	17600983	per ml	per ml	17600983	delta13C-C1	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	deltaD-C1	17600983	deltaD-C1	17600983	per ml	per ml	17600983	deltaD-C1	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	delta13C-C2	17600983	delta13C-C2	17600983	per ml	per ml	17600983	delta13C-C2	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	delta13C-C4	17600983	delta13C-C4	17600983	per ml	per ml	17600983	delta13C-C4	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	delta13C-C6	17600983	delta13C-C6	17600983	per ml	per ml	17600983	delta13C-C6	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	delta13C-C5	17600983	delta13C-C5	17600983	per ml	per ml	17600983	delta13C-C5	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	
	delta13C-C3	17600983	delta13C-C3	17600983	per ml	per ml	17600983	delta13C-C3	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	17600983	



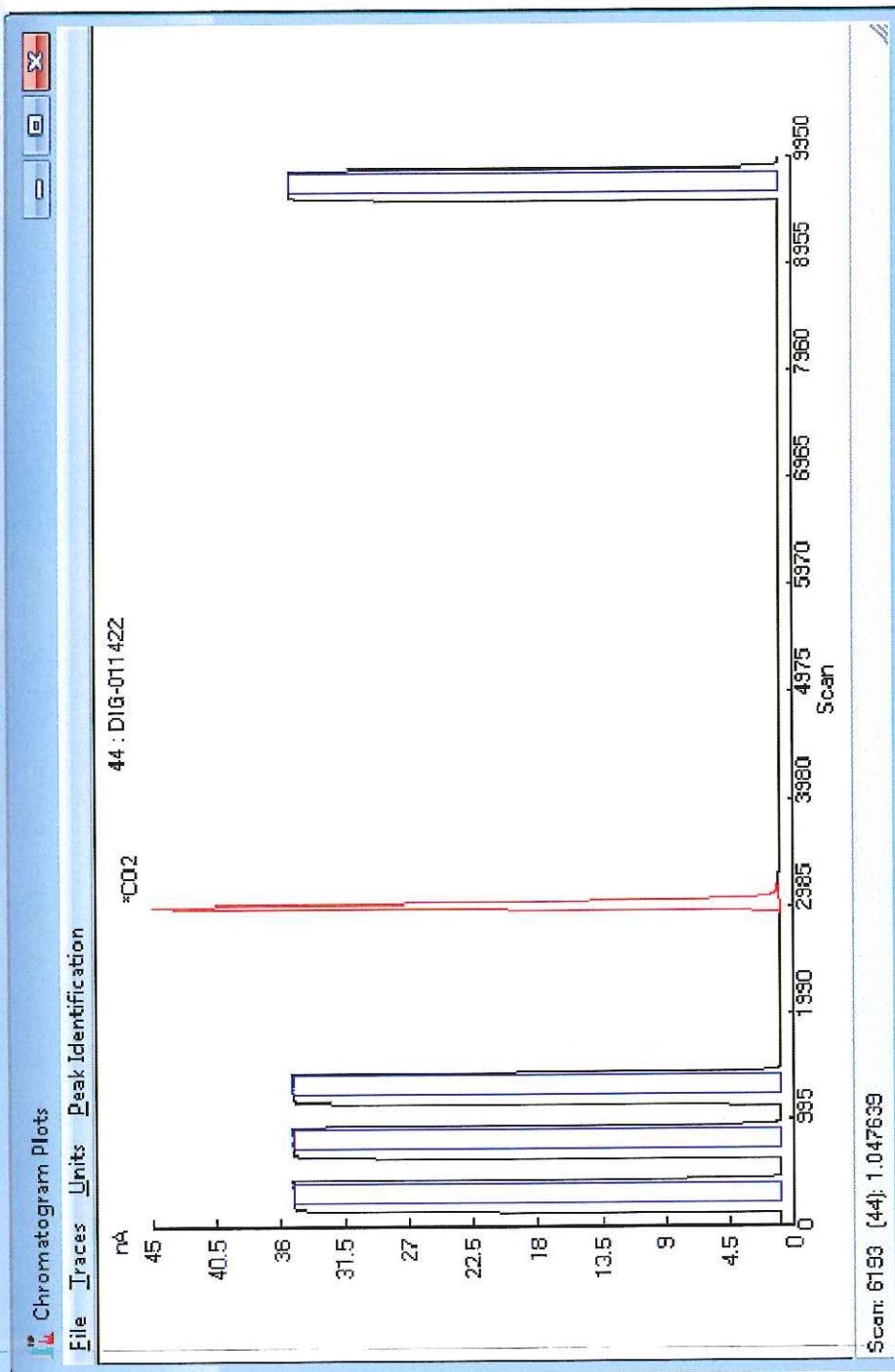
# Gas Chromatography (GC) Chromatogram

TCD1 A: Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011422.D)  
TCD2 B: Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011422.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011464  
**Client:** Vista Geoscience  
**Sample Name(s):** VW560628171027

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011464  
 Client: Vista Geoscience  
 Sample Name: VW560628171027  
 Date Sampled: 06/28/17  
 Time Sampled: 10:27  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	788070	78.21	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	188166	18.67	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	31373	3.11	-	-18.7	-	
Carbon Monoxide ( $\text{CO}$ )	17	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 1706A84  
DIL 011454-011466  
Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firesone  
Sampled By: JMT

## Sample Description

Sample Description										
Container #	Sample Identification	Date Sampled	Time	X		X	X	X		Comments
	VW060628171044	6-28-17	10:44	X		X	X	X		+D13C CO2
	VW170628171108	6-28-17	11:08	X		X	X	X		+D13C CO2
	VW100628171003	6-28-17	10:03	X		X	X	X		+D13C CO2
	VW050628171039	6-28-17	10:39	X		X	X	X		+D13C CO2
	VW190628171059	6-28-17	10:59	X		X	X	X		+D13C CO2
	VW560628171027	6-28-17	10:27	X		X	X	X		+D13C CO2
	VW630628171019	6-28-17	10:19	X		X	X	X		+D13C CO2
	VW070628171052	6-28-17	10:52	X		X	X	X		+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geoscience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>06/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

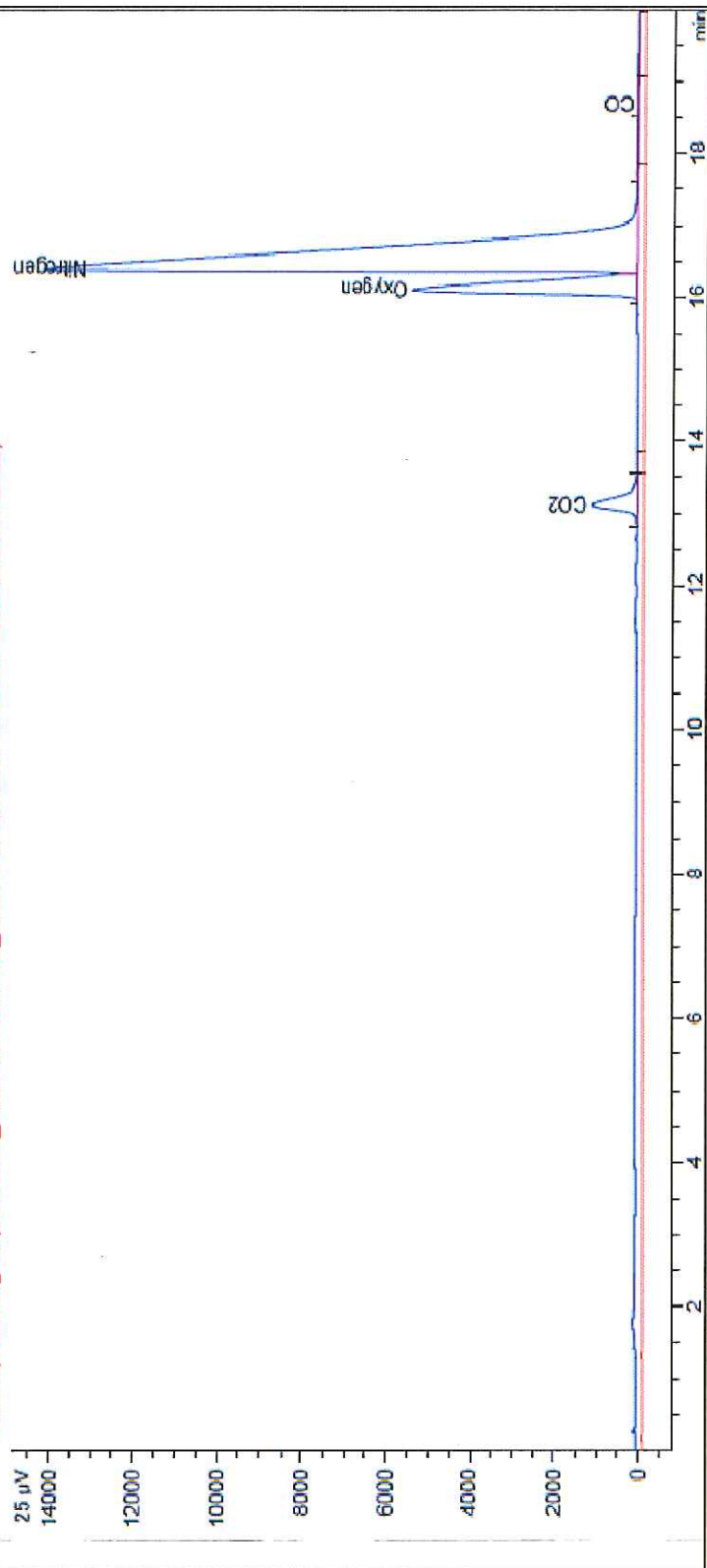
Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

[illegible]

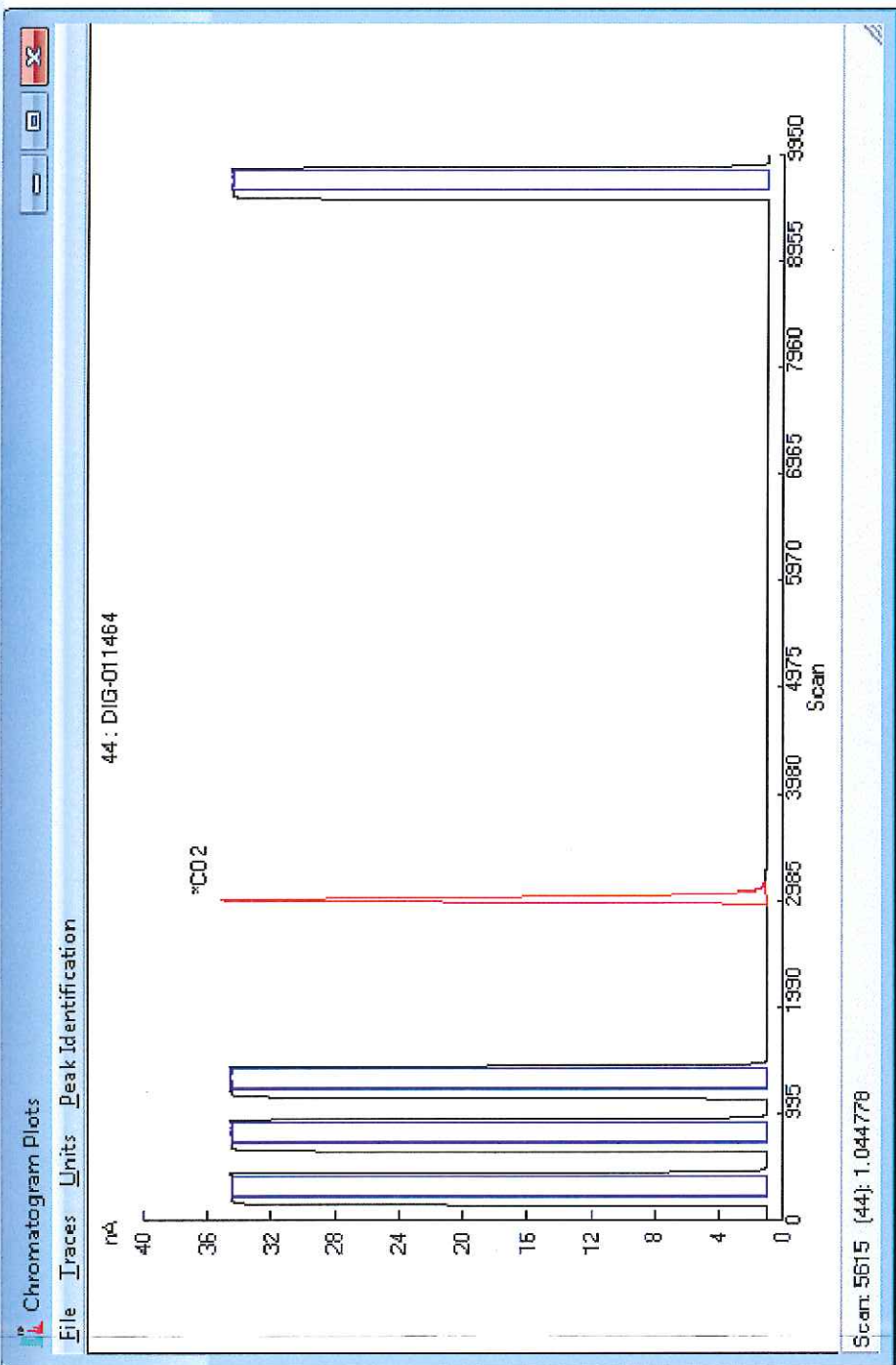


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785.JARS 2017-06-29 05:52:05) DIG-011464.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785.JARS 2017-06-29 05:52:05) DIG-011464.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060984  
**Lab #:** DIG-011471  
**Client:** Vista Geoscience  
**Sample Name(s):** VW57062817944

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011471  
 Client: Vista Geoscience  
 Sample Name: VW57062817944  
 Date Sampled: 06/28/17  
 Time Sampled: 9:44  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	792220	77.86	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	190348	18.71	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	34967	3.44	-	-17.8	-	
Carbon Monoxide ( $\text{CO}$ )	17	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Westminster, CO 80234  
p: 303.531.2030

JOB 17060984 **RUSH!**  
DIG - 011467-  
011474

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: Firestone  
Sampled By: JMTS

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested				Comments
				Gas Composition* H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub>	RSK-175* Gas composition with dissolved Cl, C <sub>2</sub> , C <sub>3</sub>	gpc Methane (Carbon)	gpc Methane (Hydrogen)	
VW15...	VW160628171231	6-28-17	12:31	X	X	X	X	+D13C CO2
	VW0628170945	6-28-17	0945	X	X	X	X	+D13C CO2
	VW050628171037	6-28-17	10:37	X	X	X	X	+D13C CO2
	VW040628171239	6-28-17	12:39	X	X	X	X	+D13C CO2
	VW57062817944	6-28-17	9:44	X	X	X	X	+D13C CO2
	VW110628171142	6-28-17	11:42	X	X	X	X	+D13C CO2
	VW090628171008	6-28-17	10:08	X	X	X	X	+D13C CO2
	VW160628171233	6-28-17	12:33	X	X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by	Vista GeoScience	6/28/17	14:22
Received by	DIG	6/28/17	14:25
Relinquished by			
Received by			

\*Gas composition vs RSK-175: Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

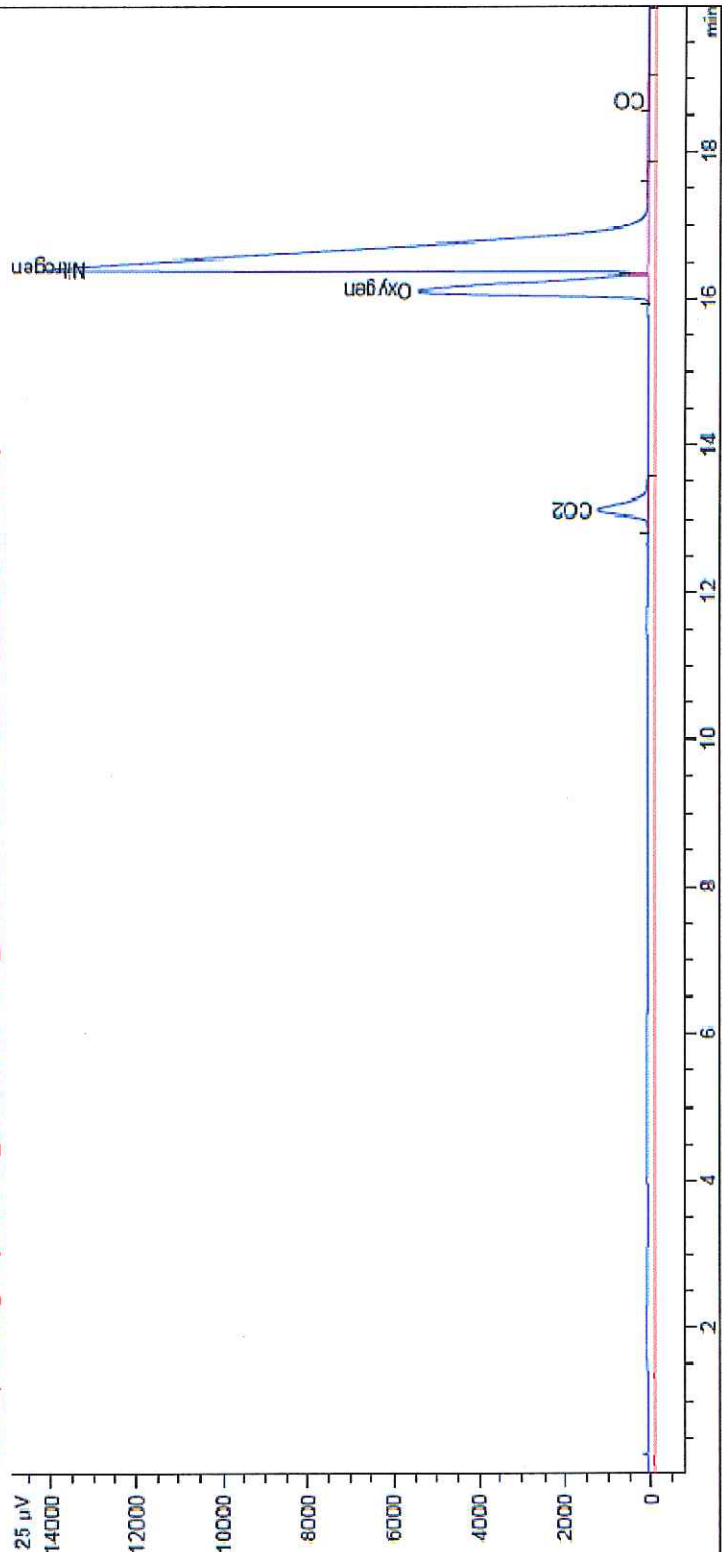




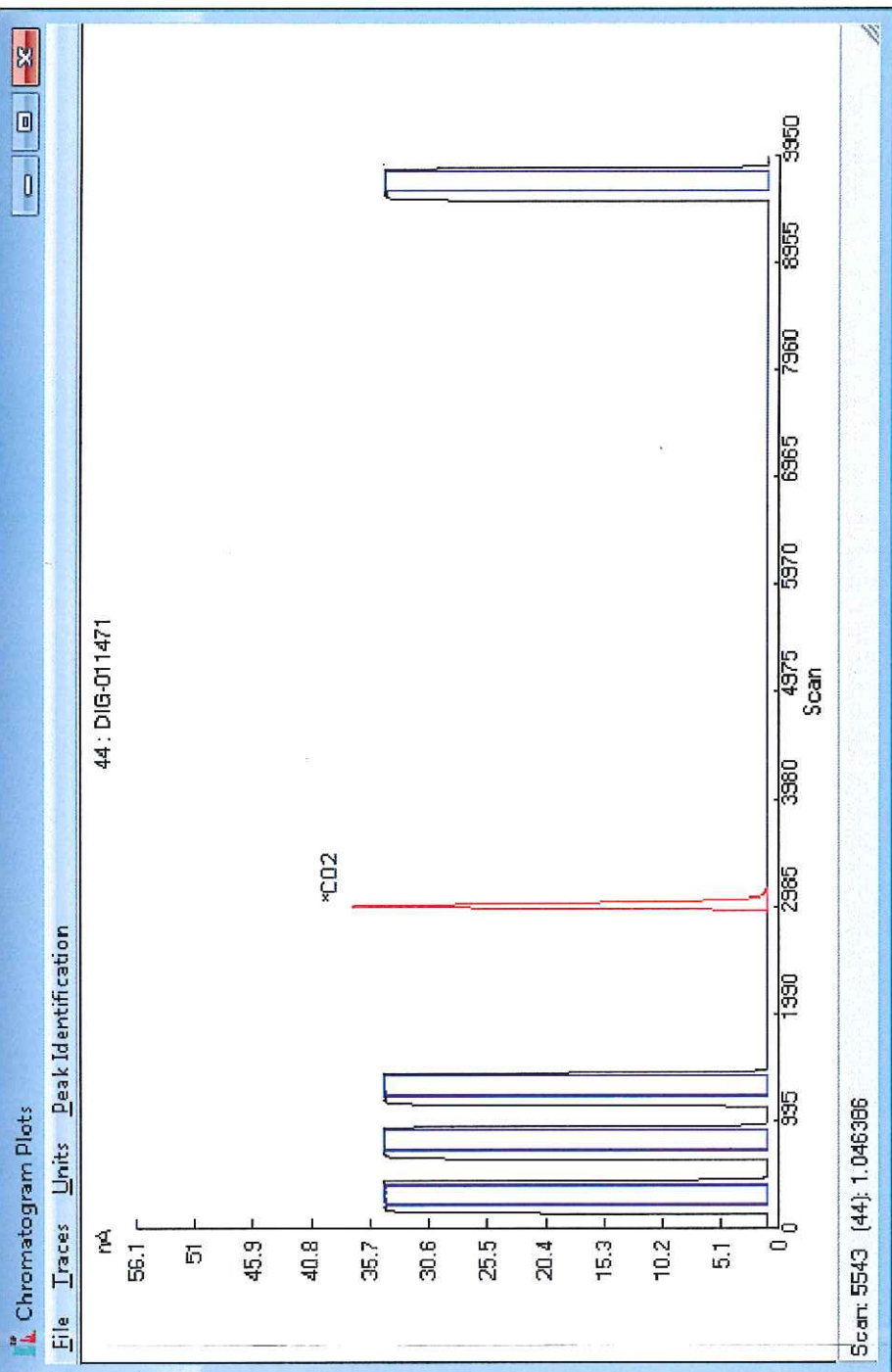


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-29 05-52-05\DIG-011471.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785\JARS 2017-06-29 05-52-05\DIG-011471.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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## Geochemistry for Energy

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p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011445  
**Client:** Vista Geoscience  
**Sample Name(s):** VW580627171155

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011445  
 Client: Vista Geoscience  
 Sample Name: VW580627171155  
 Date Sampled: 06/27/17  
 Time Sampled: 11:55  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/30/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	770306	77.60	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	198676	20.02	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	23635	2.38	-	-22.0	-	
Carbon Monoxide ( $\text{CO}$ )	17	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	#DIV/0!
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



**dig**  
Dolan Integration Group

## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

### Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition *	RSK-175 <sup>†</sup> (Gas composition)	RSK-175 <sup>†</sup> (Gas composition) with dissolved C1, C2 & C3	gC1 Methane (Carbon)	gC2 Methane (Hydrogen)	
	VW 31	06/27/17	1428	X			X	X	+D13C CO2
	VW 60	06/27/17	1307	X			X	X	+D13C CO2
	VW 30	06/27/17	1253	X			X	X	+D13C CO2
	VW 40	06/27/17	1159	X			X	X	+D13C CO2
	VW 58	06/27/17	1155	X			X	X	+D13C CO2
	VW 34	06/27/17	1328	X			X	X	+D13C CO2
	VW 48	06/27/17	1123	X			X	X	+D13C CO2
	VW 44	06/27/17	1038	X			X	X	+D13C CO2

### Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

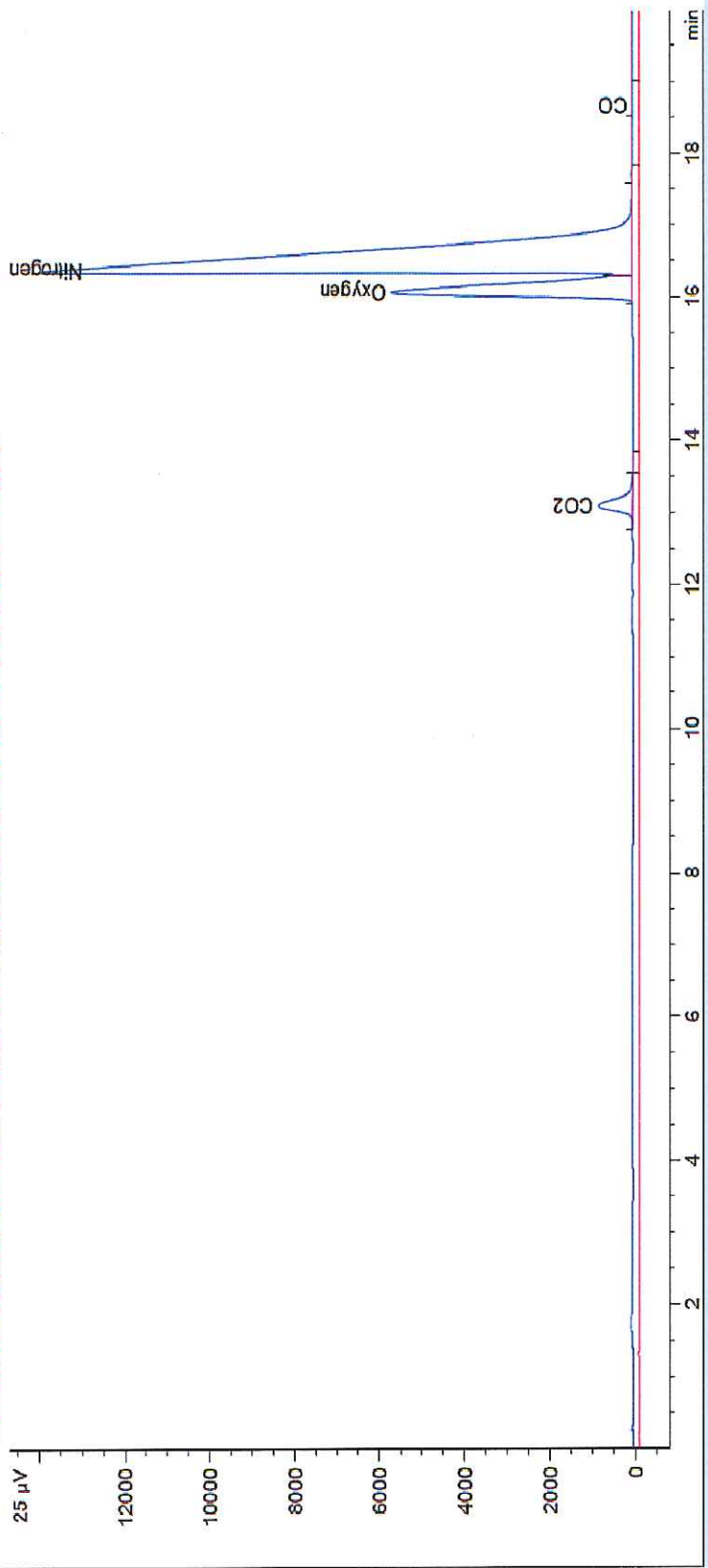
Organization	Reporting Organization		Reporting Organization Name		Order Number	Entity Requesting Analysis		Purpose	Project	Chain of Custody ID		Date Received by Lab		File Name	Instrument Detection Limit	Method Detection Limit	Comments	Analytical Result (MAD)
	COGCC Facility No.	Lab ID	Sample Date and Time	Lab Sample ID		Sample Type	Matrix			GA	Start Date and Time	Comments	Project Number					
Batch	COGCC Facility No.	Lab ID	Sample Date and Time	Lab Sample ID	Sample Type	Matrix	GA	Start Date and Time	Comments	Project Number	Final Vol	Final Vol Units	Analysis Date and Time	Import Baris	Comments	Detection Limit	Method Detection Limit	Comments
Result	COS Number	Analysis Method	Analysis Method	Analysis Method	Unit	Result Value	Qualifier	Test Type	Result Text	Dilution	Final Vol	Final Vol Units	Analysis Date and Time	Import Baris	Comments	Detection Limit	Method Detection Limit	Comments
Batch	Q2-AR	CONGEN + AROEN	SOP	MOL %	20.02											0.005	0.005	17606983
	12438-9	CARBON MONOXIDE	SOP	MOL %	2.38											0.005	0.005	17606983
	63048-0	HELIUM	SOP	MOL %	0.00											0.005	0.005	17606983
	63048-0	CARBON MONOXIDE	SOP	MOL %	0.01											0.005	0.005	17606983
	7440-58-7	HELIUM	SOP	MOL %	0.01											0.005	0.005	17606983
	1333-74-0	HYDROGEN	SOP	MOL %	0.01											0.005	0.005	17606983
	74-82-8	METHANE	SOP	MOL %	0.005											0.005	0.005	17606983
	74-82-8	ETHYLENE	SOP	MOL %	0.005											0.005	0.005	17606983
	74-85-1	ETHYLENE	SOP	MOL %	0.01											0.005	0.005	17606983
	74-98-6	PROPANE	SOP	MOL %	0.005											0.005	0.005	17606983
	115-07-1	PROPENE	SOP	MOL %	0.01											0.005	0.005	17606983
	75-28-5	ISOBUTANE	SOP	MOL %	0.01											0.005	0.005	17606983
	59-91-4	BUTANE	SOP	MOL %	0.005											0.005	0.005	17606983
	105-90-4	ISOPENTANE	SOP	MOL %	0.01											0.005	0.005	17606983
	109-66-0	N-PENTANE	SOP	MOL %	0.01											0.005	0.005	17606983
	32113-69-1	Cis-Isomers-1	SOP	MOL %	0.01											0.005	0.005	17606983
Batch	delia13C_C1	DELTA 13C_C1	SOP	per mil	nd											0.005	0.005	17606983
	delia13C_C2	DELTA 13C_C2	SOP	per mil	nd											0.005	0.005	17606983
	delia13C_C3	DELTA 13C_C3	SOP	per mil	nd											0.005	0.005	17606983
	delia13C_C4	DELTA 13C_C4	SOP	per mil	nd											0.005	0.005	17606983
	delia13C_C4d	DELTA 13C_C4d	SOP	per mil	nd											0.005	0.005	17606983
	delia13C_C5	DELTA 13C_C5	SOP	per mil	nd											0.005	0.005	17606983
delia13C_C02	DELTA 13C_C02	SOP	per mil	-22.0											0.005	0.005	17606983	



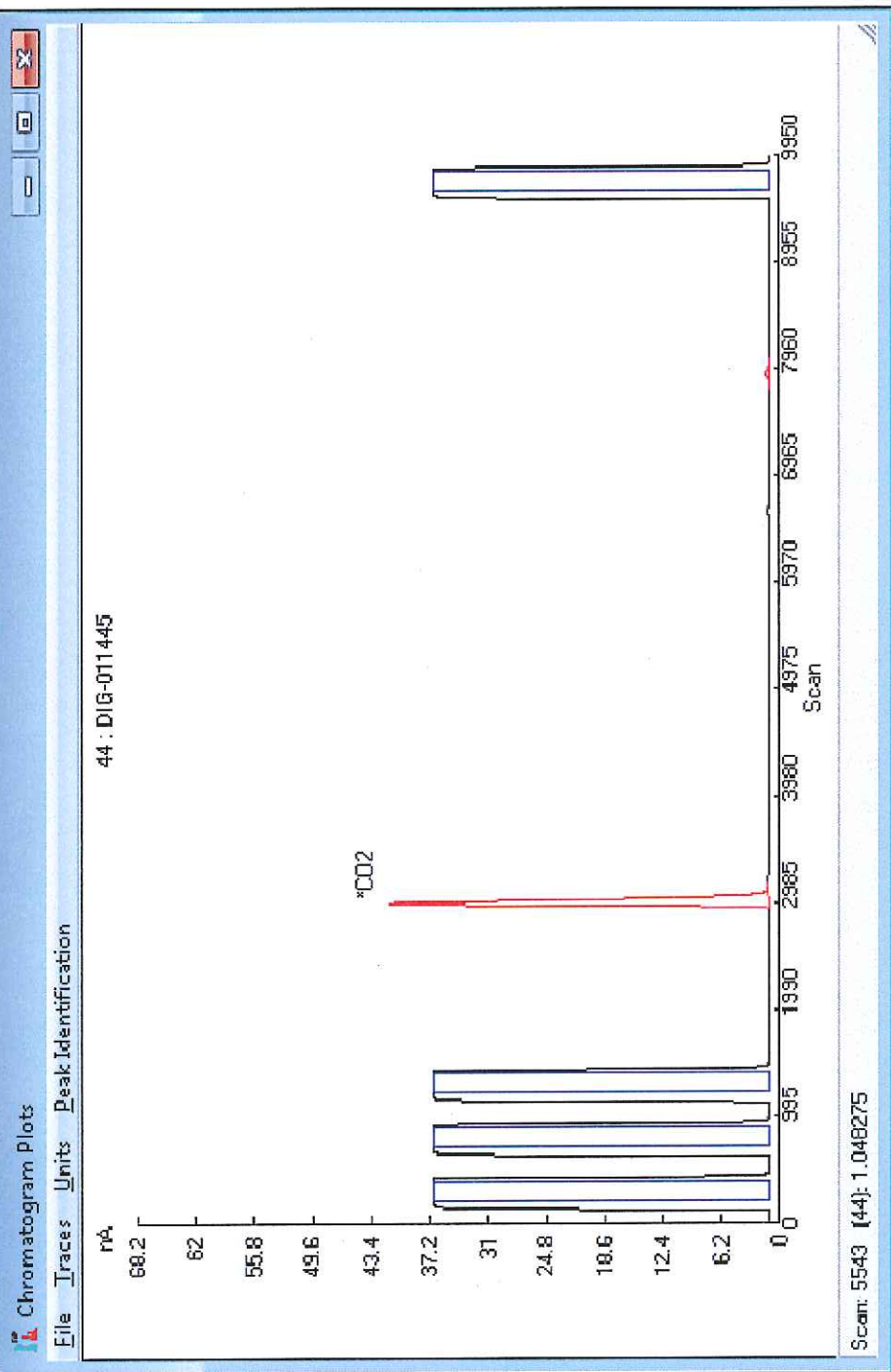
# Gas Chromatography (GC) Chromatogram



TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011445.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011445.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





# Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011433  
**Client:** Vista Geoscience  
**Sample Name(s):** VW590627171148

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitableness of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011433  
 Client: Vista Geoscience  
 Sample Name: VW590627171148  
 Date Sampled: 06/27/17  
 Time Sampled: 11:48  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	818306	81.55	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	172292	17.17	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	12729	1.27	-	-26.9	-	
Carbon Monoxide ( $\text{CO}$ )	71	0.01	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + \text{C}_1 +$ )	#DIV/0!
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰

# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy  
1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Sample Description				Analysis Requested					Comments
Container #	Sample Identification	Date Sampled	Time	Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub> +	RSK-175* (gas composition) N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , He, H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub> +, with dissolved Cl <sub>2</sub> , C <sub>2</sub> & C <sub>3</sub>	δ <sup>13</sup> C Methane (Carbon)	δD Methane (Hydrogen)	δ <sup>13</sup> C Ethane-Pentane (C <sub>2</sub> & C <sub>3</sub> if present)	
	VW 59	062717	1148	X		X	X	X	+D13C CO2
	VW 42	062717	1024	X		X	X	X	+D13C CO2
	VW 53	062717	1106	X		X	X	X	+D13C CO2
	VW 62	062717	1349	X		X	X	X	+D13C CO2
	VW 41	062717	1207	X		X	X	X	+D13C CO2
	VW 37	062717	1128	X		X	X	X	+D13C CO2
	VW 36	062717	1322	X		X	X	X	+D13C CO2
	VW 39	062717	1145	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>14:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175: Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

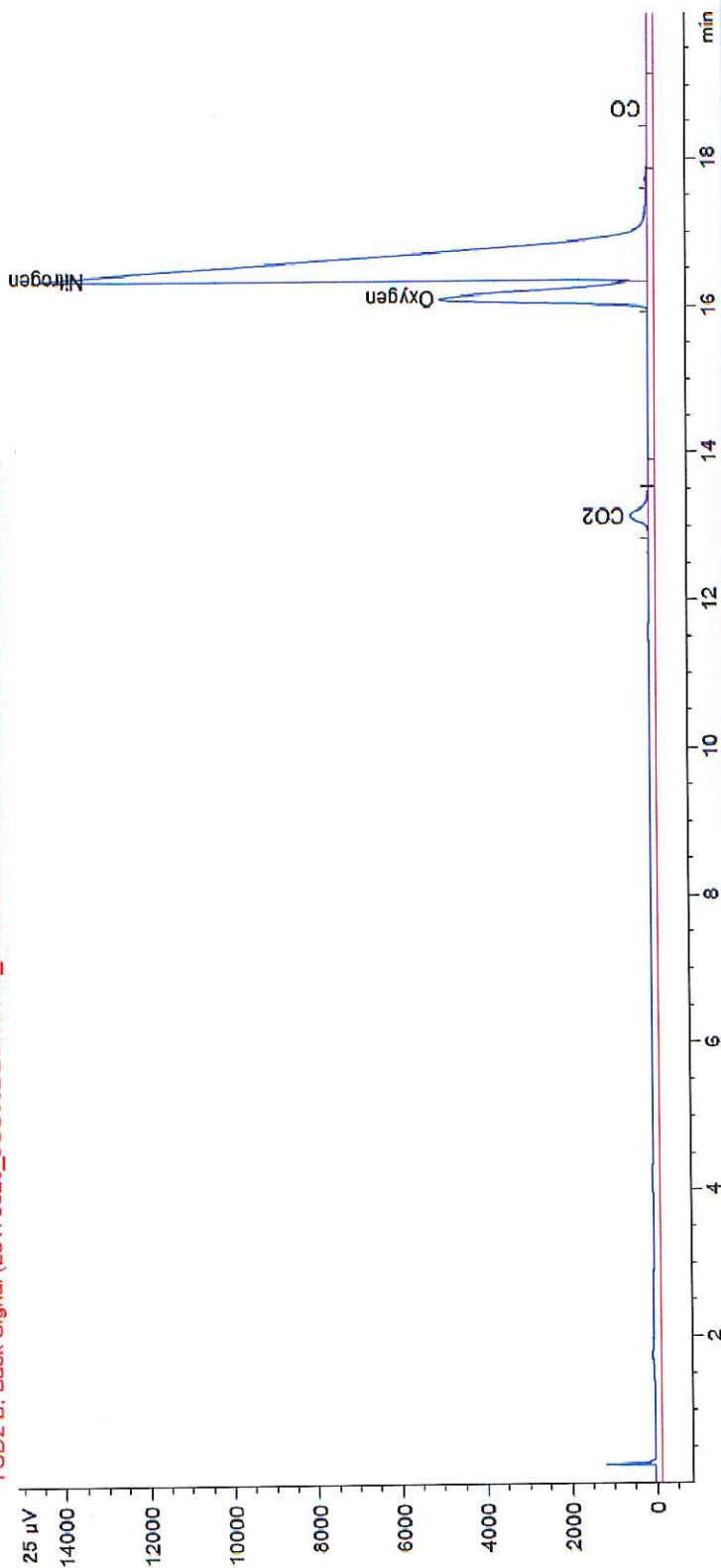
[illegible]





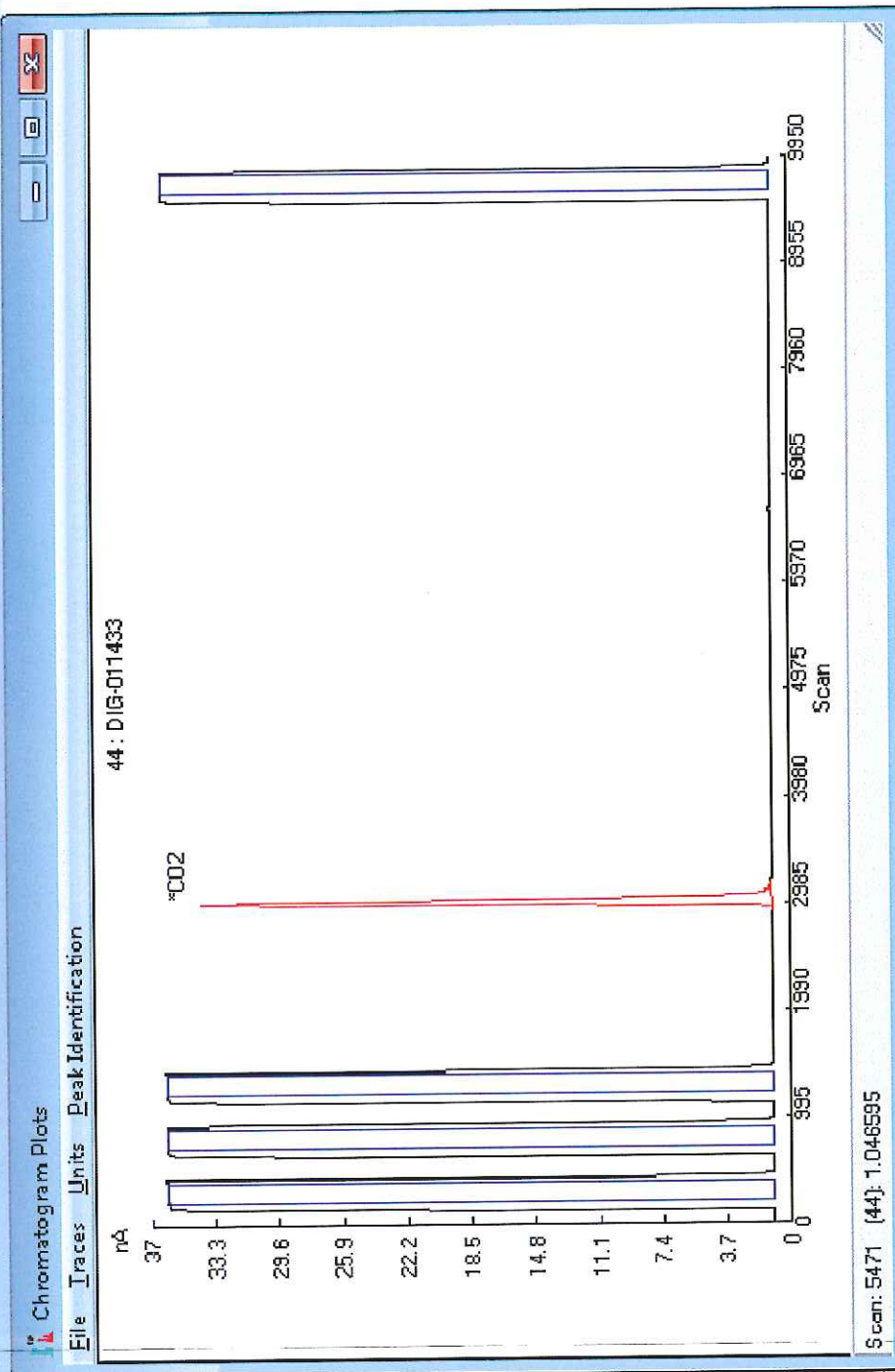
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011433.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011433.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011442  
**Client:** Vista Geoscience  
**Sample Name(s):** VW600627171307

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011442  
 Client: Vista Geoscience  
 Sample Name: VW600627171307  
 Date Sampled: 06/27/17  
 Time Sampled: 13:07  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/30/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	774347	78.10	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	158424	15.98	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	58662	5.92	-	-17.3	-	
Carbon Monoxide ( $\text{CO}$ )	12	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	#DIV/0!
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



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Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub>	RSK-175* (see comment) N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> C, C <sub>2</sub> H <sub>6</sub> with dissolved CH <sub>4</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> H <sub>8</sub>	gC Methane (Carbon)	gC Methane (Hydrogen)	gC Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> if present)	
	VW 31	06/27/17	1428	X		X	X	X	+D13C CO2
	VW 60	06/27/17	1307	X		X	X	X	+D13C CO2
	VW 30	06/27/17	1253	X		X	X	X	+D13C CO2
	VW 40	06/27/17	1159	X		X	X	X	+D13C CO2
	VW 58	06/27/17	1155	X		X	X	X	+D13C CO2
	VW 34	06/27/17	1328	X		X	X	X	+D13C CO2
	VW 48	06/27/17	1123	X		X	X	X	+D13C CO2
	VW 44	06/27/17	1038	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

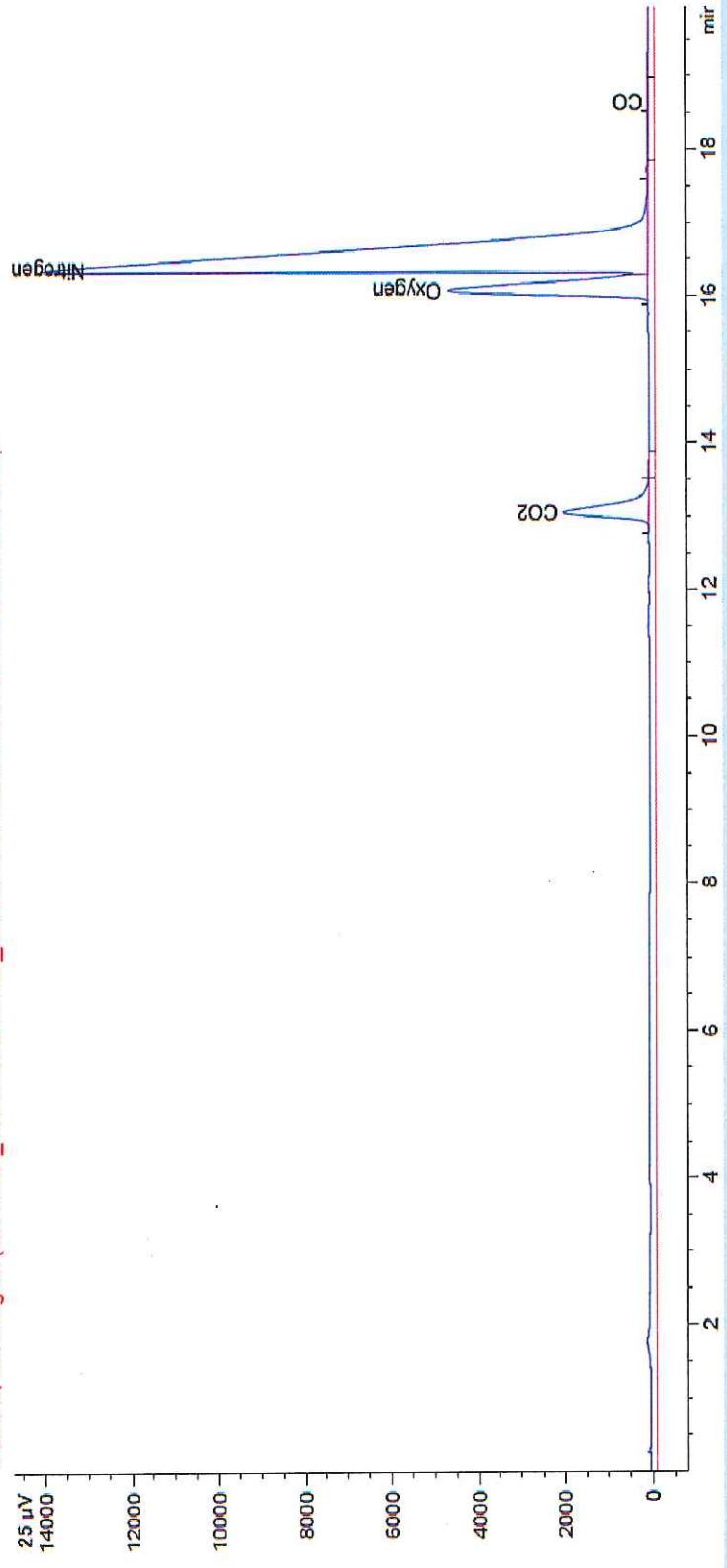
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[illegible]

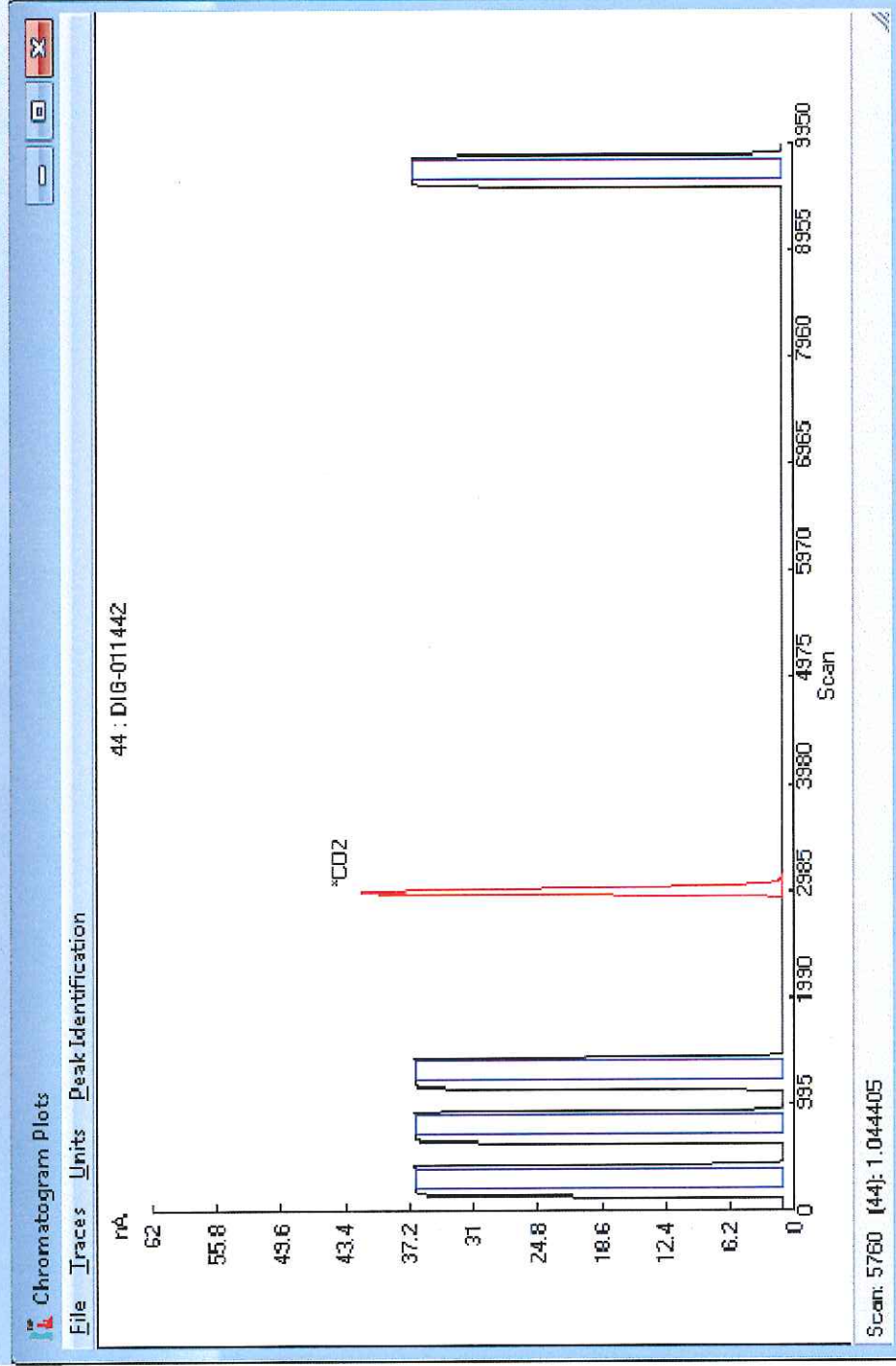


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011442.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011442.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram







Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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**Geochemistry for Energy**

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Westminster, CO 80234  
p: 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes  
Data and Interpretation**

**Job #:** 17060983  
**Lab #:** DIG-011432  
**Client:** Vista Geoscience  
**Sample Name(s):** VW610627171314

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# Analytical Report



Job #: 17060983  
 Lab #: DIG-011432  
 Client: Vista Geoscience  
 Sample Name: VW610627171314  
 Date Sampled: 06/27/17  
 Time Sampled: 13:14  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/28/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	785106	79.25	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	153032	15.45	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	52559	5.31	-	-18.3	-	
Carbon Monoxide (CO)	15	0.00	-	-	-	
Helium (He) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	nd	nd	nd	nd	nd	
Ethane (C <sub>2</sub> H <sub>6</sub> )	nd	nd	nd	nd	-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd	na	-	
Propane (C <sub>3</sub> H <sub>8</sub> )	nd	nd	nd	nd	-	
Propene (C <sub>3</sub> H <sub>6</sub> )	nd	nd	nd	na	-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	nd	nd	nd	nd	-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	nd	nd	nd	nd	-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	#DIV/0!
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

Error  $\delta\text{D}$  < 5.0 ‰



# Chain of Custody Form



**dig**  
Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303-531-2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

agorody@gmail.com

Analysis Requested

Gas Composition\*  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, C<sub>2</sub>, C<sub>3</sub>+

RSK-175\* (see composition)  
N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, C<sub>2</sub>, C<sub>3</sub>+,  
with dissolved C<sub>2</sub>, C<sub>3</sub> & C<sub>4</sub>

gC Methane (Carbon)

gC Methane (Hydrogen)

gC Ethane-Pentane  
(C<sub>2</sub>-C<sub>5</sub>, if present)

Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW 42	062717	1030	X		X	X	X	+D13C CO2
	VW 23	062717	1439	X		X	X	X	+D13C CO2
	VW 33	062717	1334	X		X	X	X	+D13C CO2
	VW 40	062717	1204	X		X	X	X	+D13C CO2
	VW 14	062717	1444	X		X	X	X	+D13C CO2
	VW 25	062717	1258	X		X	X	X	+D13C CO2
	VW 38	062717	1132	X		X	X	X	+D13C CO2
	VW 61	062717	1314	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

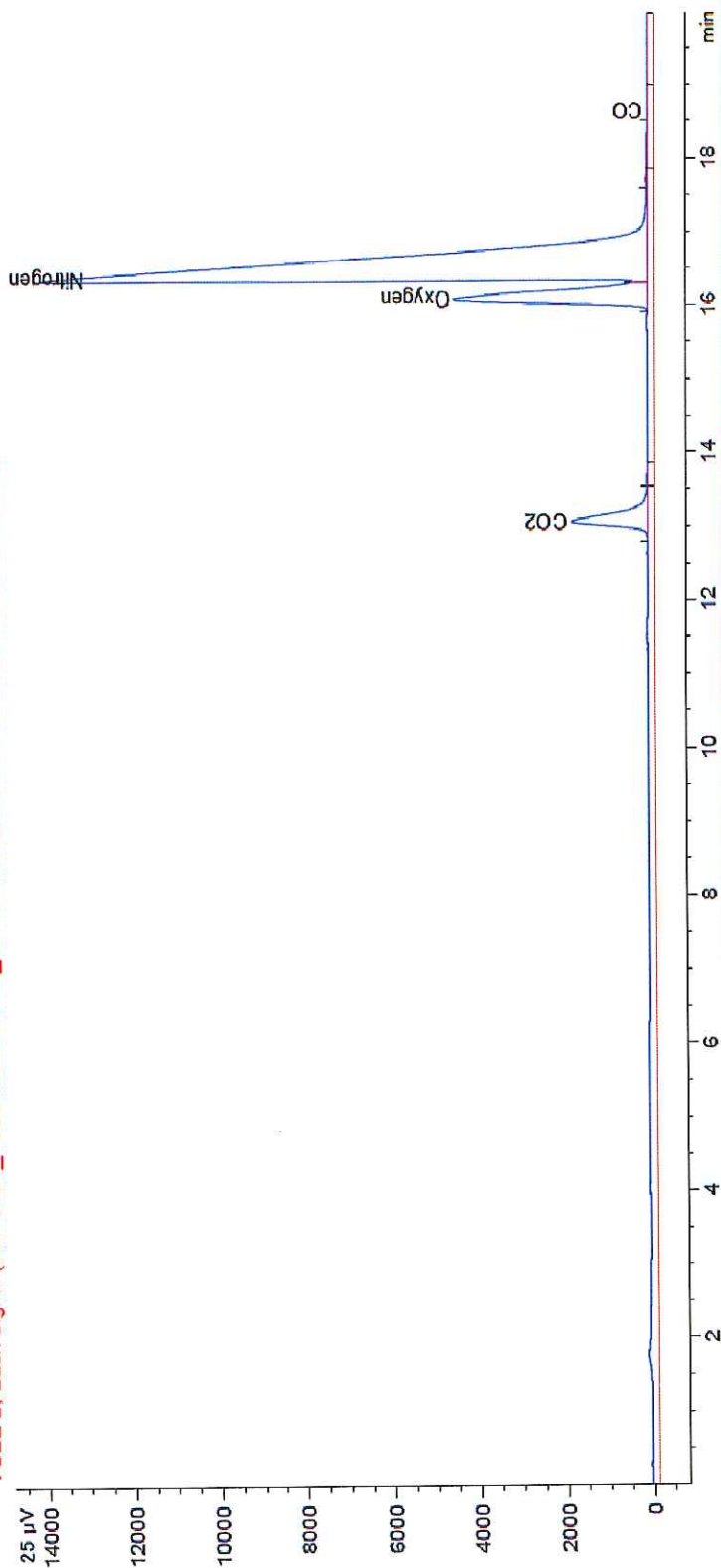


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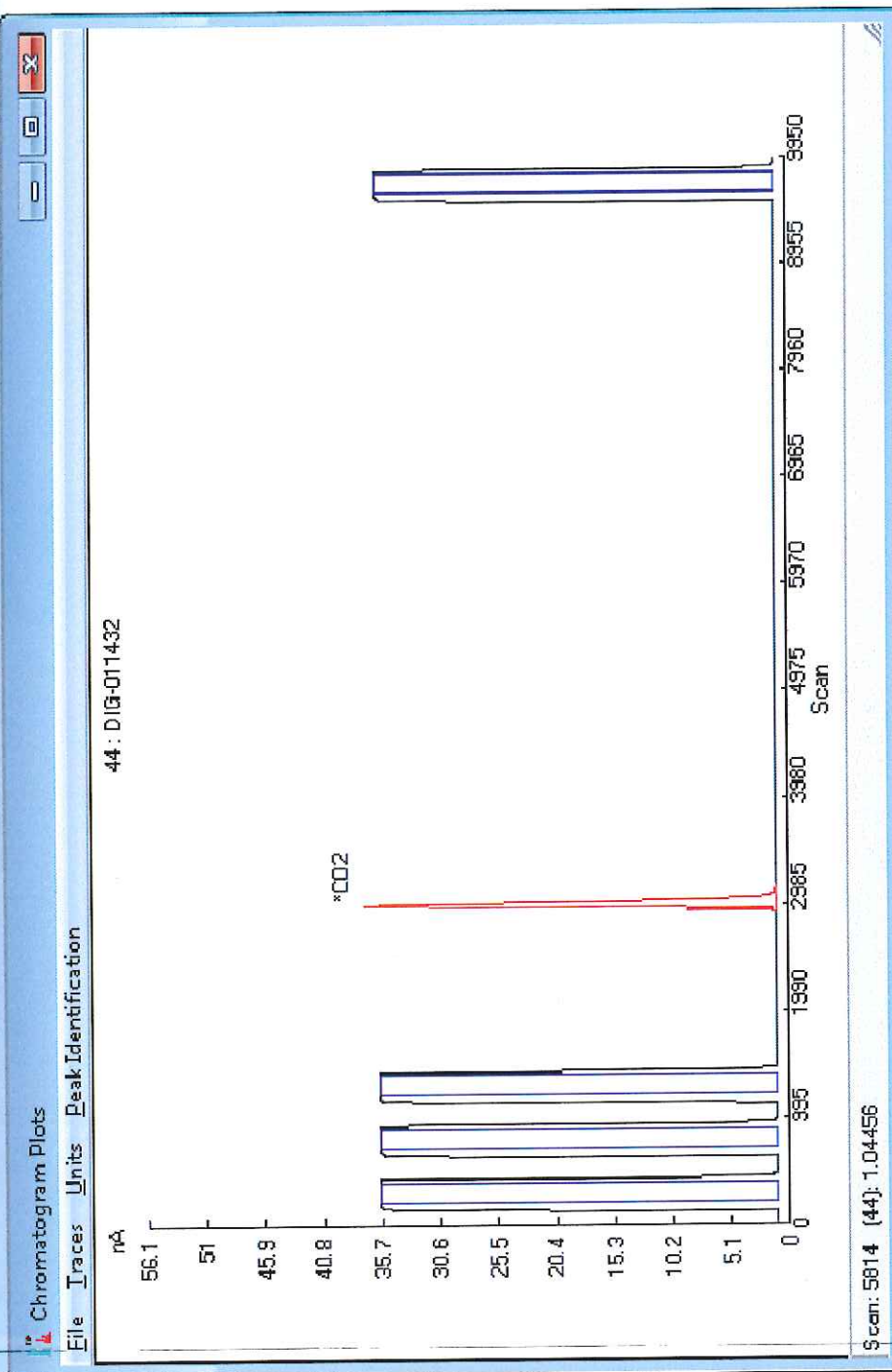


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011432.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-28 07-53-26\DIG-011432.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





# Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis





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## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060983  
**Lab #:** DIG-011436  
**Client:** Vista Geoscience  
**Sample Name(s):** VW620627171349

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

Dolan Integration Group shall use commercially reasonable efforts to maintain the Samples it receives from Customer in the condition in which same were initially received, and shall store, free of charge, any portion(s) of the Sample(s) not consumed or altered in the course of testing and analysis for a period of 90 days after their initial receipt, after which time the Samples will be destroyed. At Customer's written request and expense, Dolan Integration Group shall return unused Samples to Customer. At Customer's written request, Dolan Integration Group will also store and maintain Customer's Samples beyond the Free Storage Period for a monthly fee in accordance with Dolan Integration Group's the current storage rates. If Customer fails to timely pay any applicable storage charges, Dolan Integration Group shall

# Analytical Report



Job #: 17060983  
 Lab #: DIG-011436  
 Client: Vista Geoscience  
 Sample Name: VW620627171349  
 Date Sampled: 06/27/17  
 Time Sampled: 13:49  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/27/17  
 Date Analyzed: Gas Composition: 6/29/17  $\delta^{13}\text{C}$ : 6/29/17  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	768883	76.38	-	-	-	
Oxygen + Argon ( $\text{O}_2 + \text{Ar}$ )	195776	19.45	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	41916	4.16	-	-16.2	-	
Carbon Monoxide ( $\text{CO}$ )	19	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2 + / \text{C}_1 +$ )	#DIV/0!
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	#VALUE!

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰



# Chain of Custody Form



**dig**  
Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: \_\_\_\_\_  
Sampled By: Woodward

## Sample Description

Container #	Sample Identification	Date Sampled	Time	Analysis Requested					Comments
				Gas Composition* N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub>	RSK-175 <sup>®</sup> Gas Composition N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> , C <sub>2</sub> , C <sub>3</sub> with dissolved Cl <sub>2</sub> , CO <sub>2</sub> & CH <sub>4</sub>	8°C Methane (Carbon)	8°C Methane (Hydrogen)	8°C Ethane-Pentane (C <sub>2</sub> -C <sub>5</sub> , if present)	
	VW 59	062717	1148	X		X	X	X	
	VW 42	062717	1024	X		X	X	X	+D13C CO2
	VW 53	062717	1106	X		X	X	X	+D13C CO2
	VW 62	062717	1349	X		X	X	X	+D13C CO2
	VW 41	062717	1207	X		X	X	X	+D13C CO2
	VW 37	062717	1128	X		X	X	X	+D13C CO2
	VW 36	062717	1322	X		X	X	X	+D13C CO2
	VW 39	062717	1145	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by: <u>[Signature]</u>	<u>Vista Geo</u>	<u>6/27/17</u>	<u>16:23</u>
Received by: <u>[Signature]</u>	<u>DIG</u>	<u>6/27/17</u>	<u>16:45</u>
Relinquished by:			
Received by:			

\*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030

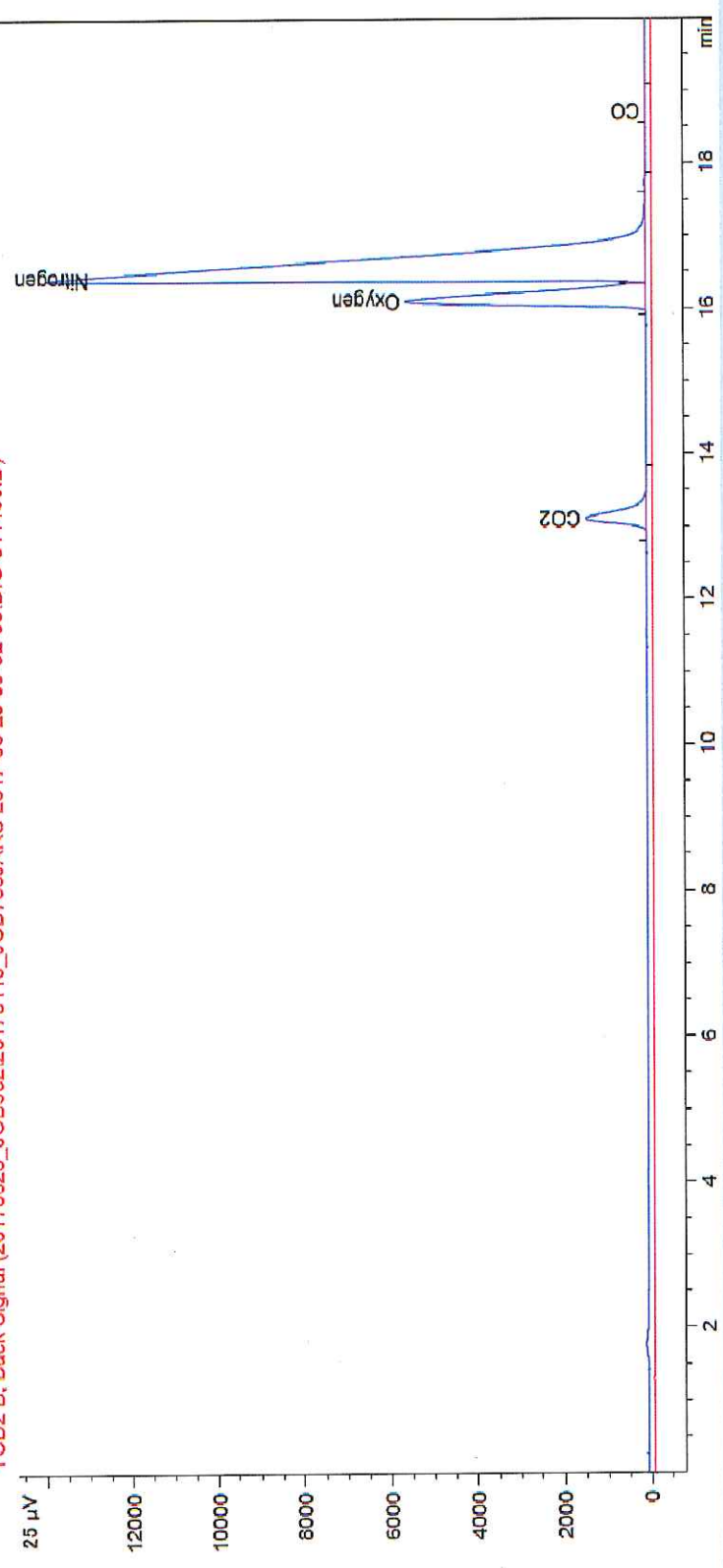




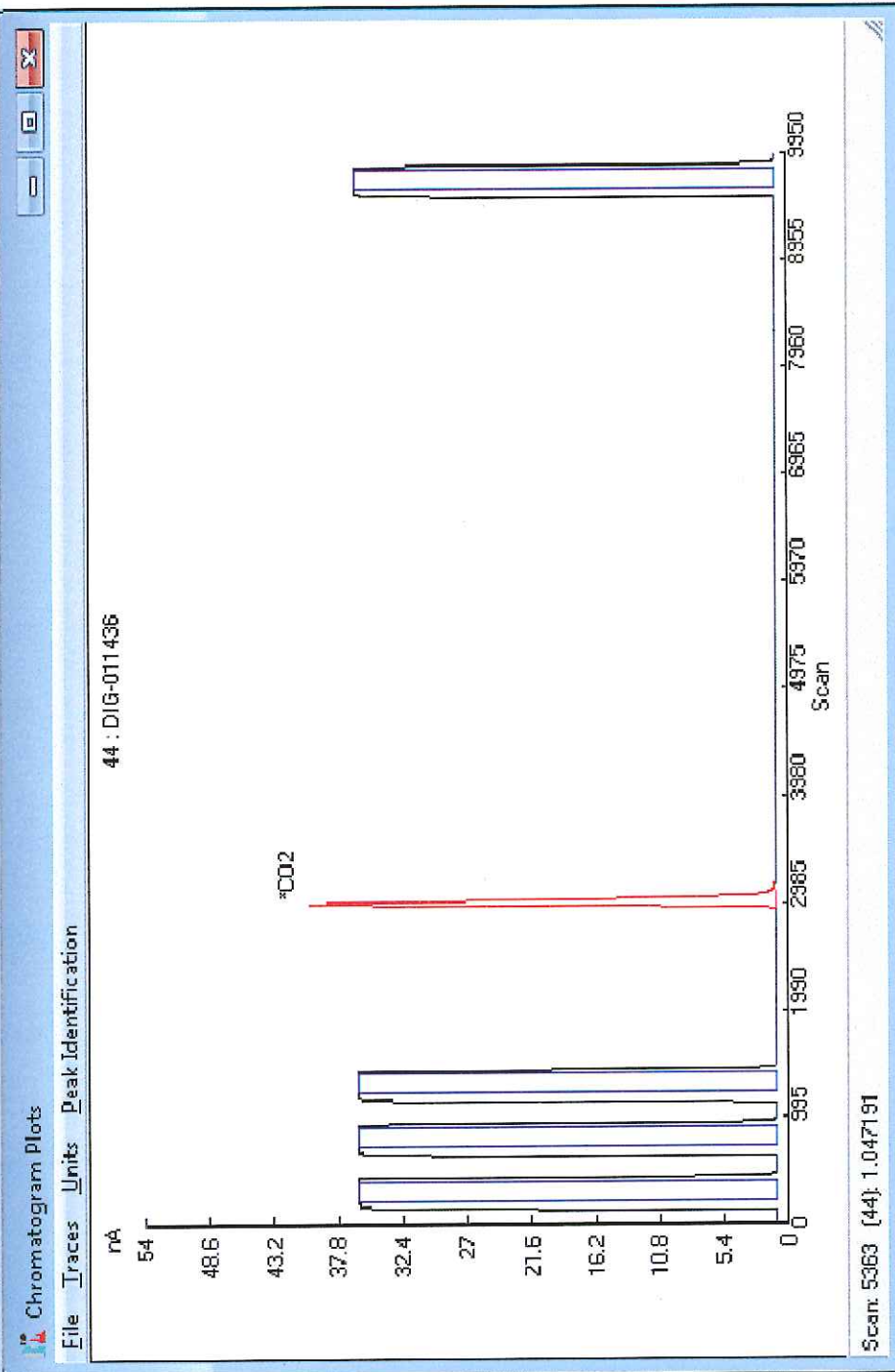


# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011436.D)  
TCD2 B, Back Signal (20170626\_JOB982\20170119\_JOB785JARS 2017-06-29 05-52-05\DIG-011436.D)



# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis



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Dolan Integration Group

## Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 17060984  
**Lab #:** DIG-011465  
**Client:** Vista Geoscience  
**Sample Name(s):** VW630628171019

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitableness of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 17060984  
 Lab #: DIG-011465  
 Client: Vista Geoscience  
 Sample Name: VW630628171019  
 Date Sampled: 06/28/17  
 Time Sampled: 10:19  
 Sample Description: cali-5-bond bag  
 Sampling Notes:  
 Date Received: 06/28/17  
 Date Analyzed: Gas Composition: 6/29/17,  $\delta^{13}\text{C}$ : 6/29/2017  
 Date Reported: 06/30/17  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen ( $\text{N}_2$ )	791783	78.30	-	-	-	
Oxygen + Argon ( $\text{O}_2+\text{Ar}$ )	170701	16.88	-	-	-	
Carbon Dioxide ( $\text{CO}_2$ )	48743	4.82	-	-16.2	-	
Carbon Monoxide ( $\text{CO}$ )	17	0.00	-	-	-	
Helium ( $\text{He}$ ) <sup>b</sup>	nd	nd	-	-	-	
Hydrogen ( $\text{H}_2$ )	nd	nd	-	-	-	
Methane ( $\text{CH}_4$ )	nd	nd	nd	nd	nd	
Ethane ( $\text{C}_2\text{H}_6$ )	nd	nd	nd	nd	-	
Ethene ( $\text{C}_2\text{H}_4$ )	nd	nd	nd	na	-	
Propane ( $\text{C}_3\text{H}_8$ )	nd	nd	nd	nd	-	
Propene ( $\text{C}_3\text{H}_6$ )	nd	nd	nd	na	-	
iso-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
n-Butane ( $\text{C}_4\text{H}_{10}$ )	nd	nd	nd	nd	-	
iso-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
n-Pentane ( $\text{C}_5\text{H}_{12}$ )	nd	nd	nd	nd	-	
Hexanes + ( $\text{C}_6\text{H}_{14}$ )	nd	nd	nd	na	-	

Calculated Values:	
Total HCs (ppm)	0
Gas Wetness (mol % $\text{C}_2+\text{C}_1+$ )	
$\text{C}_1/(\text{C}_2+\text{C}_3)$ (mol/mol)	

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C} < 0.5$  ‰

Error  $\delta\text{D} < 5.0$  ‰

# Chain of Custody Form



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Dolan Integration Group

Geochemistry for Energy

1317 West 121<sup>st</sup> Ave  
Westminster, CO 80234  
p: 303.531.2030

JOB 1706984  
DIG 011454-011466  
Rush!

## Send Data and Invoice to:

Name: John Fontana  
Company: Vista GeoScience  
Address: 130 Capital Dr. Ste C  
Golden, CO 80401  
Phone: 303-277-1694  
Fax: 303-278-0104  
Email: jfontana@vistageoscience.com  
agorody@gmail.com

AFE #: \_\_\_\_\_  
Report Ctr: \_\_\_\_\_  
Project: 17137.01  
PO #: JVF051517  
Location: FiresOne  
Sampled By: JMT

## Sample Description

Container #	Sample Identification	Date Sampled	Time	X		X	X	X	Comments
	VW060628171044	6-28-17	10:44	X		X	X	X	+D13C CO2
	VW170628171108	6-28-17	11:08	X		X	X	X	+D13C CO2
	VW100628171003	6-28-17	10:03	X		X	X	X	+D13C CO2
	VW050628171039	6-28-17	10:39	X		X	X	X	+D13C CO2
	VW190628171059	6-28-17	10:59	X		X	X	X	+D13C CO2
	VW560628171027	6-28-17	10:27	X		X	X	X	+D13C CO2
	VW630628171019	6-28-17	10:19	X		X	X	X	+D13C CO2
	VW070628171052	6-28-17	10:52	X		X	X	X	+D13C CO2

## Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Vista Geoscience</u>	<u>6/28/17</u>	<u>14:22</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>06/28/17</u>	<u>14:25</u>
Relinquished by			
Received by			

\*Gas composition vs RSK-175: Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

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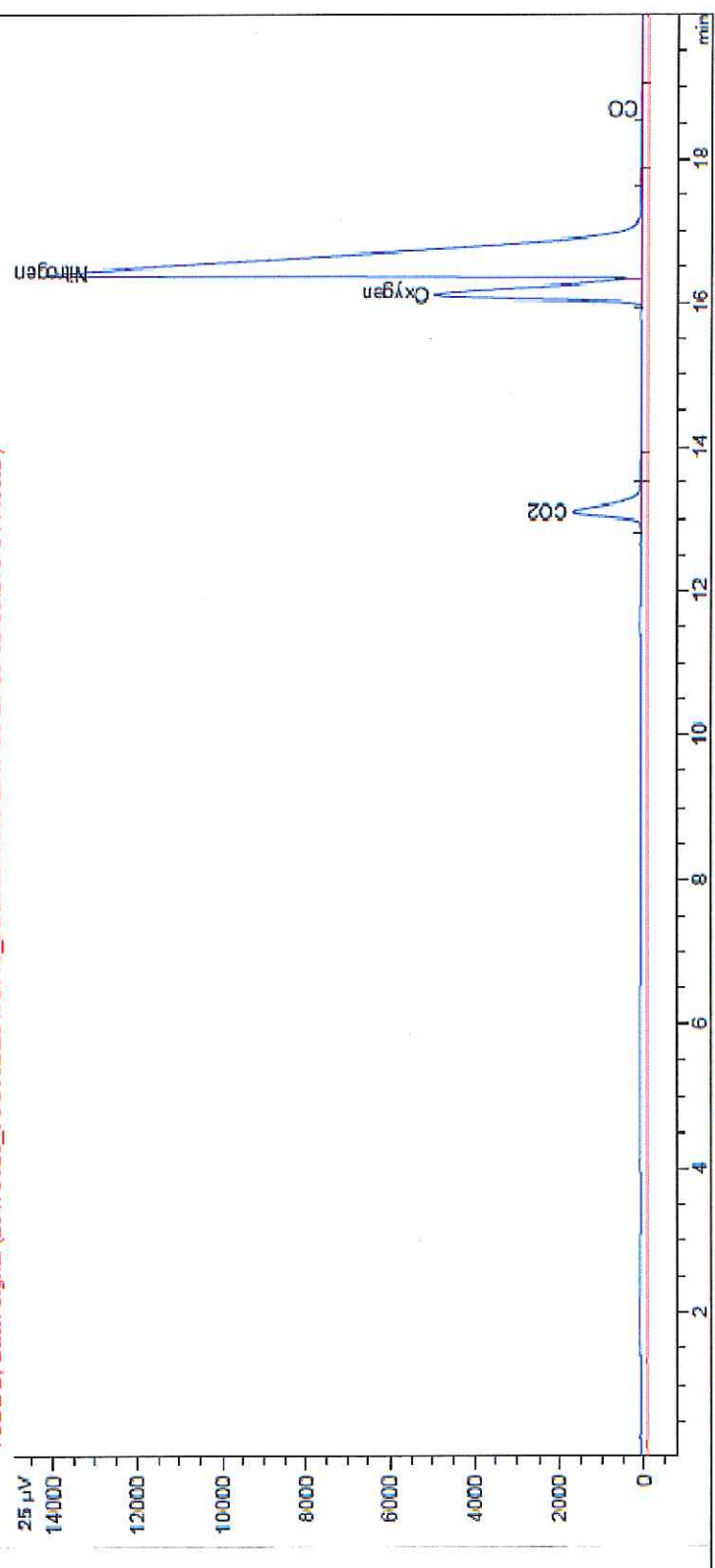
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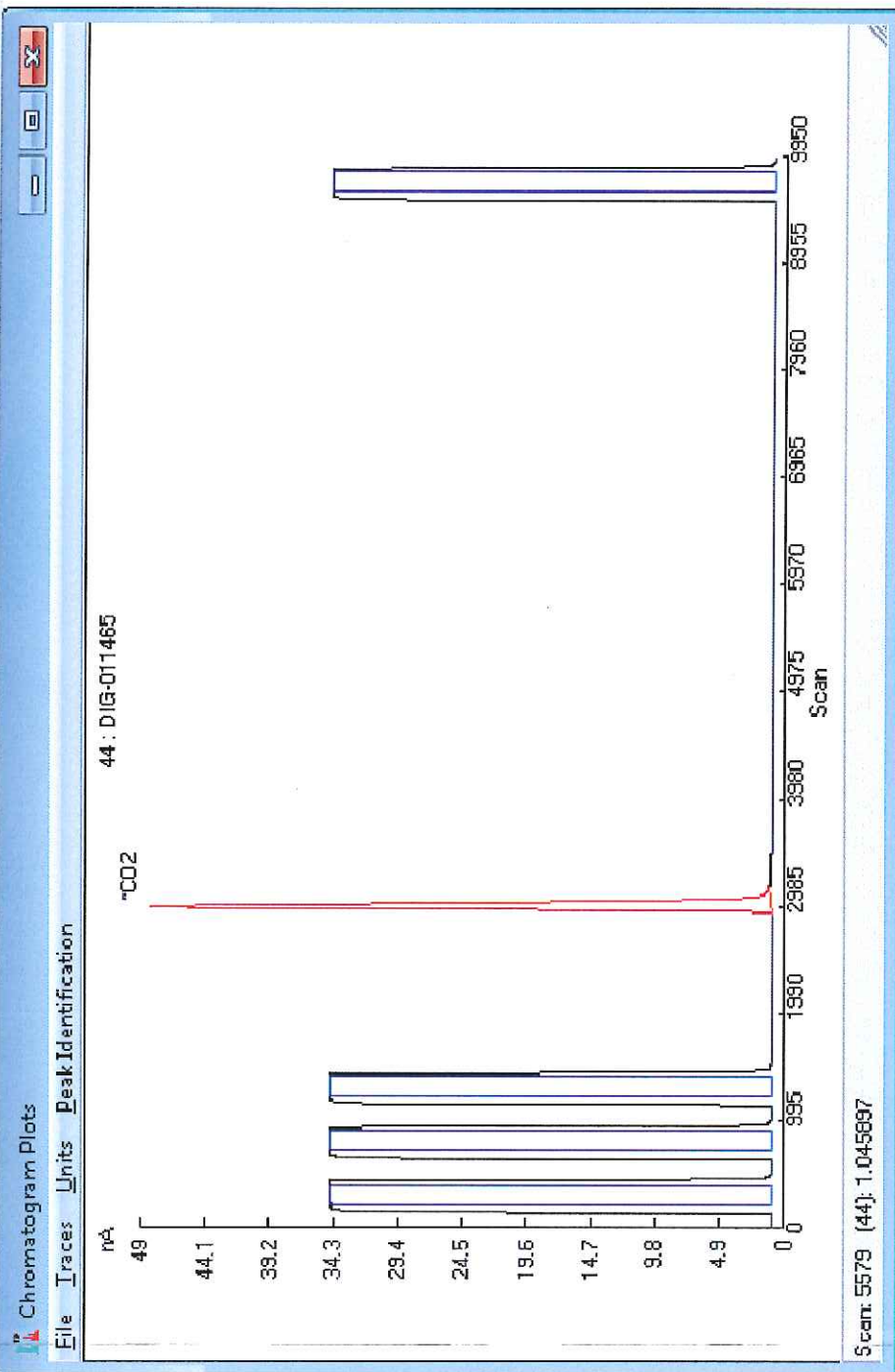
# Gas Chromatography (GC) Chromatogram

TCD1 A, Front Signal (20170626\_JOB982) 20170119\_JOB785JARS 2017-06-29 05:52:05 (DIG-011465.D)  
TCD2 B, Back Signal (20170626\_JOB982) 20170119\_JOB785JARS 2017-06-29 05:52:05 (DIG-011465.D)





# Gas Chromatography - Combustion - Isotope Ratio Mass Spectrometry (GC-C-IRMS) Chromatogram





## Gas Chromatography - Pyrolysis - Isotope Ratio Mass Spectrometry (GC-P-IRMS) Chromatogram

\* Methane concentration too low for stable hydrogen isotope analysis