

# Summit Scientific

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4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

October 18, 2022

Karen Olson

PDC Energy

1775 Sherman St. STE. 3000

Denver, CO 80203

RE: DWR Permit #137465

Work Order #2208440

Enclosed are the results of analyses for samples received by Summit Scientific on 08/30/22 17:37. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'P. Shrewsbury', with a stylized, cursive script.

Paul Shrewsbury

President



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: DWR Permit #137465  
Project Number: AFE #EX-000335  
Project Manager: Karen Olson

**Reported:**  
10/18/22 09:42

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
EFF-083022-1211	2208440-01	Water	08/30/22 12:11	08/30/22 17:37
INF-083022-1239	2208440-02	Water	08/30/22 12:39	08/30/22 17:37

Summit Scientific

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*

2208440

# Summit Scientific

S<sub>2</sub>

4653 Table Mountain Drive ♦ Golden, Colorado 80403

303-277-9310

Page 1 of 1

Client: PDC Energy / Tasman Geosciences

Project Manager: Karen Olson

Address: 6855 W. 119th Ave.

E-Mail: Karen.Olson@pdce.com; chamlin@tasman-geo.com

City/State/Zip: Broomfield / CO / 80020

Phone: 303-487-1228

Project Name: DWR Permit # 137465

Sampler Name: Bryce Goldade

Project Number: AFE # EX-000335

ID	Sample Description	Date Sampled	Time Sampled	# of containers	Preservative				Matrix				Analysis Requested						Special Instructions
					HCl	HNO <sub>3</sub>	None	Other	Water	Soil	Air-Canister #	Other	RSK-175 (Dissolved Gases)	PIC (Gas Composition)	PIC (Methane Carbon)	DIG (Methane Hydrogen)			
1	EFF-083022-1211	8/30/22	1211	3			X		X					X					
2	INF-083022-1239		1239	3			X		X					X					
3	INF-083022-1239		1239	1				X	X						X	X	X		Lot 120 s/n FGVR-L3
4																			* Please analyze
5																			DIG analysis on
6																			Standard turn
7																			
8																			
9																			
10																			

Relinquished by: <u>Bryce Goldade</u>	Date/Time: <u>8/30/22 1431</u>	Received by: <u>Tasman Lockbox</u>	Date/Time: <u>8/30/22 1431</u>	<b>Turn Around Time</b> (Check) Same Day <u>    </u> 72 hours <u>    </u> 24 hours <u>X</u> Standard <u>    </u> 48 hours <u>    </u> <b>Sample Integrity:</b> Temperature Upon Receipt: <u>111</u> Samples Intact: <u>Yes</u> No <u>    </u>	<b>Notes:</b>  Please provide data in PDF and COGCC EDD formats.  COGCC Facility No.: 765500
Relinquished by: <u>Tasman Lockbox</u>	Date/Time: <u>8/30/22</u>	Received by: <u>[Signature]</u>	Date/Time: <u>8/30/22</u>		
Relinquished by: <u>Tasman Lockbox</u>	Date/Time: <u>1737</u>	Received by: <u>[Signature]</u>	Date/Time: <u>1737</u>		

S<sub>2</sub>

## Sample Receipt Checklist

S2 Work Order# 2208440Client: Boc Trisman Client Project ID: DWR Permit #137465

Shipped Via: H.D./P.U./FedEx/UPS/USPS/Other \_\_\_\_\_ Airbill #: \_\_\_\_\_

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Matrix (Check all that apply) Air ☐ Soil/Solid ☐ Water ☒ Other ☐Temp (°C) 11.1 Thermometer # 1

	Yes	No	N/A	Comments (if any)
If samples require cooling, is the temperature < 6 °C <sup>(1)</sup> ? <b>NOTE:</b> If samples are delivered the same day of sampling, this requirement is met if there is evidence that cooling has begun.	-			on ice
If custody seals are present, are they intact <sup>(1)</sup> ?	-			
Are samples due within 48 hours present?	-			24 hrs
Are water samples with short hold times present? Note the short hold analysis in the comments column - pH, Nitrate/Nitrite, Ferrous Iron (Fe <sup>2+</sup> ), Hexavalent Chromium (Cr <sup>6+</sup> , Cr VI), COD/BOD, Total Coliform, E. Coli, Total Residual Chlorine (TRC), Dissolved Oxygen			-	
Is a chain-of-custody (COC) form present and filled out completely <sup>(1)</sup> ?	-			
Is the COC properly relinquished by the client w/ date and time recorded <sup>(1)</sup> ?	-			
Were all samples received intact <sup>(1)</sup> ?	-			
Was adequate sample volume provided <sup>(1)</sup> ?	-			
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	-	✓		
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	-			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.		-		
Are samples preserved that require preservation (excluding cooling) <sup>(1)</sup> ? Note the type of preservative in the comments column – HCl, H <sub>2</sub> SO <sub>4</sub> , NaOH, HNO <sub>3</sub> , etc.			-	
If samples are acid preserved for metals, is the pH ≤ 2 <sup>(1)</sup> ? Record the pH in Comments.			-	
If dissolved metals are requested, were samples field filtered?			-	
Additional Comments (if any):				

<sup>(1)</sup> If NO, then contact the client before proceeding with analysis and note in case narrative.
  
 Custodian Printed Name

8/30/22  
 Date/Time

20:00



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: DWR Permit #137465  
Project Number: AFE #EX-000335  
Project Manager: Karen Olson

**Reported:**  
10/18/22 09:42

**EFF-083022-1211**  
**2208440-01 (Water)**

**Summit Scientific**

**Dissolved Gases by RSK-175**

Date Sampled: **08/30/22 12:11**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
<b>Methane</b>	<b>5.4</b>	1.0		mg/L	100	BFH0653	08/30/22	08/31/22	RSK-175 mod	
Ethane	ND	0.010		"	1	"	"	"	"	
<b>Propane</b>	<b>5.8</b>	1.0		"	100	"	"	"	"	

Date Sampled: **08/30/22 12:11**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: Ethene	ND	192 %		70-130		"	"	"	"	S-01

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PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: DWR Permit #137465  
Project Number: AFE #EX-000335  
Project Manager: Karen Olson

**Reported:**  
10/18/22 09:42

**INF-083022-1239**  
**2208440-02 (Water)**

**Summit Scientific**

**Dissolved Gases by RSK-175**

**S-01**

Date Sampled: **08/30/22 12:39**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
<b>Methane</b>	<b>6.0</b>	1.0	mg/L	100	BFH0653	08/30/22	08/31/22	RSK-175 mod	
Ethane	ND	0.010	"	1	"	"	"	"	
<b>Propane</b>	<b>1.1</b>	1.0	"	100	"	"	"	"	

Date Sampled: **08/30/22 12:39**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: Ethene	ND	165 %	70-130		"	"	"	"	

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Denver CO, 80203

Project: DWR Permit #137465  
Project Number: AFE #EX-000335  
Project Manager: Karen Olson

**Reported:**  
10/18/22 09:42

**Dissolved Gases by RSK-175 - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch BFH0653 - GC**

**Blank (BFH0653-BLK1)**

Prepared: 08/30/22 Analyzed: 08/31/22

Methane	ND	0.010	mg/L							
Ethane	ND	0.010	"							
Propane	ND	0.010	"							
Surrogate: Ethene	0.0453		"	0.0364		124	70-130			

**LCS (BFH0653-BS1)**

Prepared: 08/30/22 Analyzed: 08/31/22

Methane	0.031	0.010	mg/L	0.0428		72.2	70-130			
Ethane	0.080	0.010	"	0.0798		101	70-130			
Propane	0.12	0.010	"	0.139		83.9	70-130			
Surrogate: Ethene	0.0777		"	0.0728		107	70-130			

**Duplicate (BFH0653-DUP1)**

Source: 2208407-01

Prepared: 08/30/22 Analyzed: 08/31/22

Methane	ND	0.010	mg/L		ND				30	
Ethane	ND	0.010	"		ND				30	
Propane	ND	0.010	"		ND				30	
Surrogate: Ethene	0.0364		"	0.0364		100	70-130			

**Matrix Spike (BFH0653-MS1)**

Source: 2208407-01

Prepared: 08/30/22 Analyzed: 08/31/22

Methane	0.031	0.010	mg/L	0.0428	ND	72.2	70-130			
Ethane	0.080	0.010	"	0.0798	ND	99.9	70-130			
Propane	0.12	0.010	"	0.139	ND	83.3	70-130			
Surrogate: Ethene	0.0631		"	0.0728		86.7	70-130			

Summit Scientific

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**dig**  
Dolan Integration Group

## Geochemistry for Energy

11025 Dover Street Unit 800  
Westminster, CO 80021  
p: 303.531.2030

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

**Job #:** 22088147  
**Lab #:** DIG-029019  
**Client:** Summit Scientific  
**Sample Name(s):** INF-083022-1239

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 60 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 #: 22088147  
 Lab #: DIG-029019  
 Client: Summit Scientific  
 Sample Name: INF-083022-1239  
 Date Sampled: 08/30/22  
 Time Sampled: 12:39  
 Sample Description: Isoflask  
 Sampling Notes:  
 Date Received: 08/31/22  
 Date Analyzed: Gas Composition: 09/13/22  $\delta^{13}\text{C}$ : 09/11/22  $\delta\text{D}$ : 09/08/22  
 Date Reported: 09/14/22  
 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> )	458152	46.31	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	67731	6.85	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	3111	0.31	-	-	-	
Helium (He) <sup>b</sup>	147	0.01	-	-	-	
Hydrogen (H <sub>2</sub> )	nd	nd	-	-	-	
Methane (CH <sub>4</sub> )	414010	41.85	89.97	-61.4	-256	
Ethane (C <sub>2</sub> H <sub>6</sub> )	28480	2.88	6.19		-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd		-	
Propane (C <sub>3</sub> H <sub>8</sub> )	12775	1.29	2.78		-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	1540	0.16	0.33		-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	2185	0.22	0.47		-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	373	0.04	0.08		-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	288	0.03	0.06		-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	528	0.05	0.11		-	

Calculated Values:	
Total HCs (ppm)	460179
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	10.03
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	10

<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

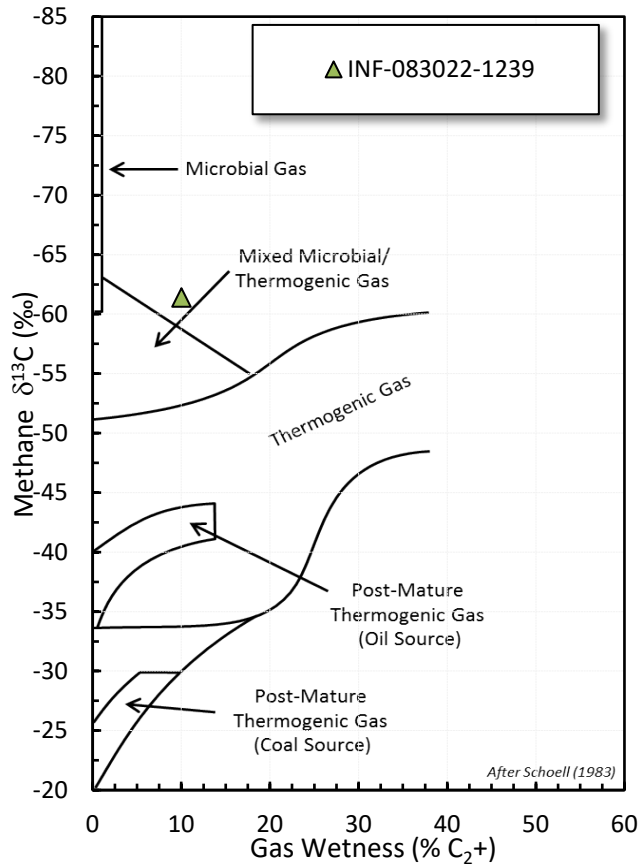
Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

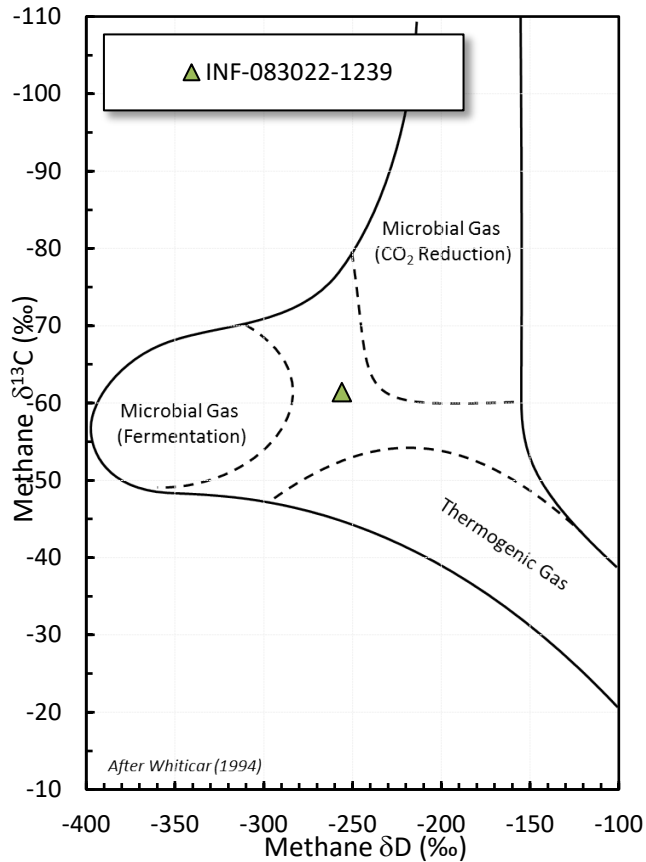
Error  $\delta\text{D}$  < 5.0 ‰

# Stable Isotope Interpretive Plots

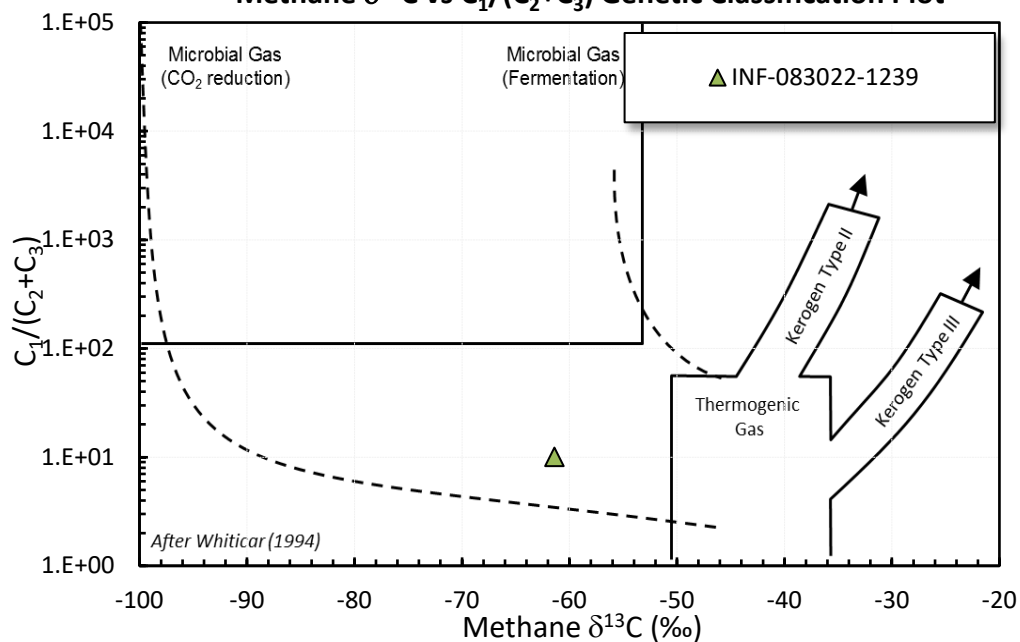
**Methane vs Gas Wetness Genetic**



**Methane  $\delta^{13}\text{C}$  vs  $\delta\text{D}$  Genetic Classification Plot**



**Methane  $\delta^{13}\text{C}$  vs  $\text{C}_1/(\text{C}_2+\text{C}_3)$  Genetic Classification Plot**



# Chain of Custody Form



Job 22088147  
DIG-029019



Geochemistry  
for Energy

main 303.531.2030 • info@digforenergy.com • digforenergy.com  
Office and Lab 11025 Dover St • Ste 800 • Westminster, CO 80021

Send Data to:		Send Invoice to (if different):		Additional:	
Name: Muri Premier / Paul Shrewsbury		Name: Ben Shrewsbury		AFE #:	
Company: Summit Scientific		Company: Summit Scientific		Project: 2208440	
Address: 4653 Table Mountain Drive		Address: 4653 Table Mountain Drive		PO #:	
City, State: Golden, CO 80403		City, State: Golden, CO 80403		Location:	
Phone: 303-277-9310		Phone: 303-277-9310		Sampled By:	
Email: mpremier@s2scientific.com / pshrewsbury@s2scientific.com		Email: bshrewsbury@s2scientific.com		API #:	

Turnaround Time\*\*: ☒ Standard (≤ 10 Business days) ☐ Rush (≤ 5 Business days) ☐ Expedited Rush ( )

Container Number	Sample Identification	Date Sampled	Time	Sample Type*	Gas Composition	d13C of Methane (C1)	d13C of Ethane (C2)	d13C of Propane+ (C3+)	d13C of Carbon Dioxide (CO2)	d13C of Methane (C1)
	INF-083022-1239	8/30/22	12:39	Other	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>

Chain of Custody Record				Comments:	
Relinquished by Signature	Company	Date	Time	Received by Signature	Company
	Summit Scientific	8/31/22	9:53		DIG

\*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 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., g exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030.

\*\* Rush and Expedited Rush turnaround time analysis will incur additional costs at 2x and 3x the standard turnaround time pricing.



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: DWR Permit #137465  
Project Number: AFE #EX-000335  
Project Manager: Karen Olson

**Reported:**  
10/18/22 09:42

### Notes and Definitions

S-01	The surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interference's.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference