



**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 #:** 240411591  
**Lab #:** DIG-035313  
**Client:** Olsson  
**Well Name:** SCMW042524  
**API #:**

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SAMPLE INFORMATION						COMPLETE GAS ANALYSIS														HYDROCARBON GAS ANALYSIS (normalized to total HC content)										BTU CONTENT*
Job Number	Lab Number	Well Name	Sample Type	Sample Date	Sample Time	GC Date	N <sub>2</sub> ppm	O <sub>2</sub> + Ar ppm	CO <sub>2</sub> ppm	C <sub>1</sub> ppm	C <sub>2</sub> ppm	C <sub>3</sub> ppm	iC <sub>4</sub> ppm	nC <sub>4</sub> ppm	iC <sub>5</sub> ppm	nC <sub>5</sub> ppm	C <sub>6</sub> + ppm	C <sub>2</sub> H <sub>4</sub> ppm	He ppm	H <sub>2</sub> ppm	C <sub>1</sub> mol%	C <sub>2</sub> mol%	C <sub>3</sub> mol%	iC <sub>4</sub> mol%	nC <sub>4</sub> mol%	iC <sub>5</sub> mol%	nC <sub>5</sub> mol%	C <sub>6</sub> + mol%	Total Gas BTU/ft <sup>3</sup>	
240411591	DIG-035313	SCMW042524 Gas	Gas	04/25/24	10:30	4/26/2024	447015	116034		345176	56834	23560	3143	6071	1336	1004	308				78.9	12.99	5.39	0.72	1.39	0.31	0.23	0.07	550	

SAMPLE INFORMATION						HYDROCARBON RATIOS				STABLE ISOTOPE ANALYSIS										Comments
Job Number	Lab Number	Well Name	Sample Type	Sample Date	Sample Time	Total HC ppm	Wetness % C <sub>2</sub> to C <sub>6</sub>	C <sub>1</sub> /C <sub>2</sub> +C <sub>3</sub> mol/mol	Balance Ratio C <sub>1</sub> +C <sub>2</sub> /C <sub>1</sub> -C <sub>2</sub>	Mass Spec Date	δ <sup>13</sup> C <sub>1</sub> ‰ VPDB	δ <sup>13</sup> C <sub>2</sub> ‰ VPDB	δ <sup>13</sup> C <sub>3</sub> ‰ VPDB	δ <sup>13</sup> iC <sub>4</sub> ‰ VPDB	δ <sup>13</sup> nC <sub>4</sub> ‰ VPDB	δ <sup>13</sup> iC <sub>5</sub> ‰ VPDB	δ <sup>13</sup> nC <sub>5</sub> ‰ VPDB	δ <sup>13</sup> CO <sub>2</sub> ‰ VPDB	δD ‰ VSMOW	
240411591	DIG-035313	SCMW042524 Gas	Gas	04/25/24	10:30	437432	21.1	4.3	11.4	5/1/2024	-45.4	-31.4	-28.1	-30.6	-27.1	-27.8				-256

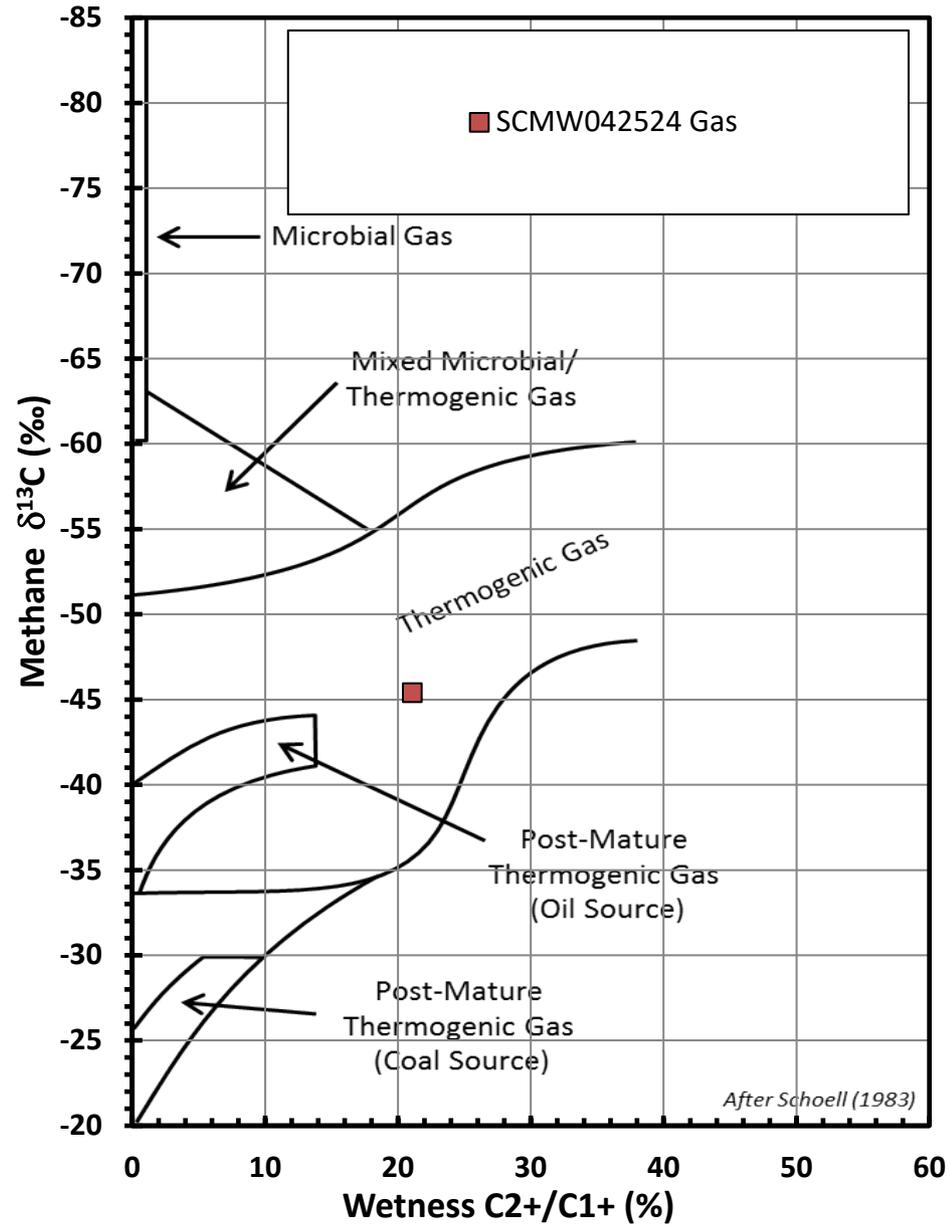
Stable isotope results based on multi-point laboratory calibration  
 Values in red represent low signal; interpret with caution  
 Precision δ13C < 0.5 ‰  
 Precision δD < 5 ‰

SPECIFIC GRAVITY*	
Total Gas Spec Grav	HCs only Spec Grav
0.871	0.712

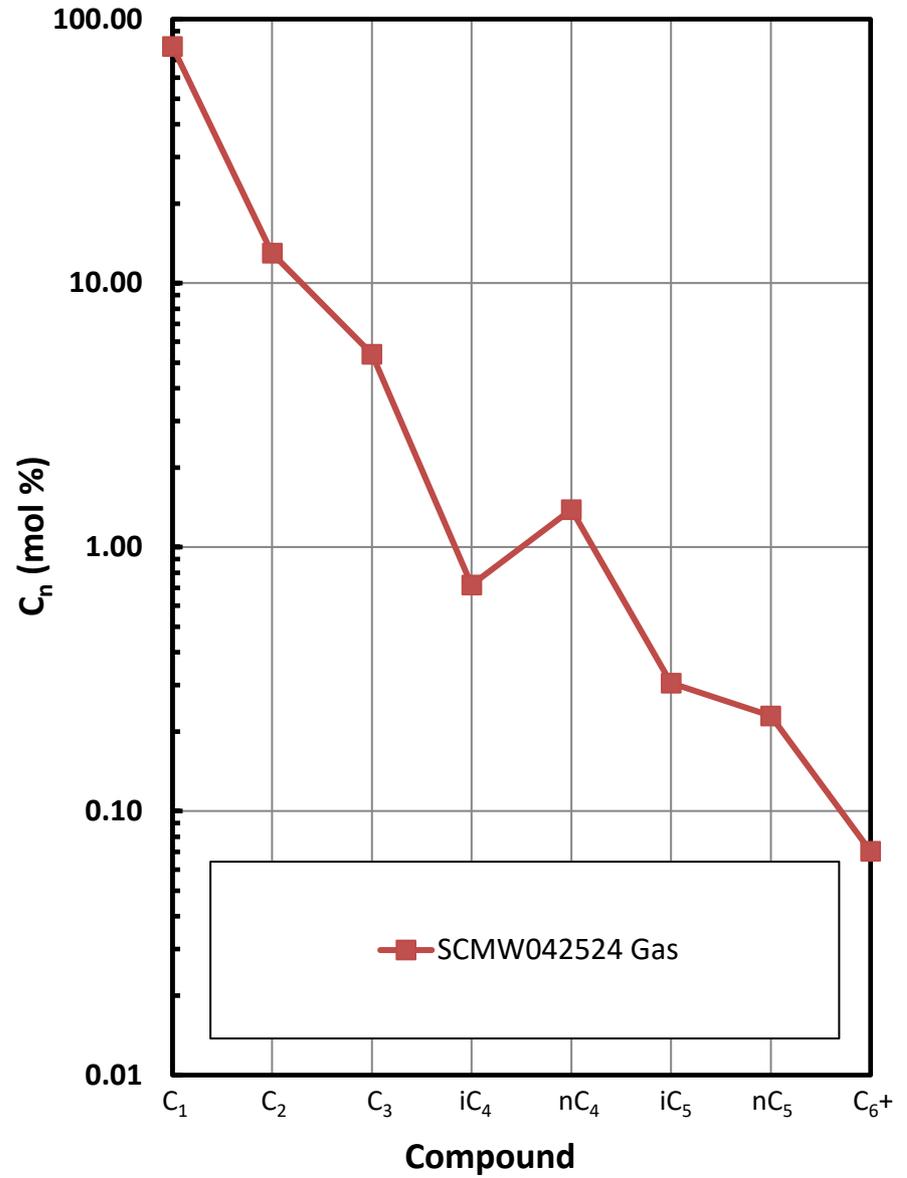
\* As ideal gas, with gas concentrations normalized to 100%; calculations based on GPA 2145-09 physical constants.

**INTERPRETIVE PLOTS**

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

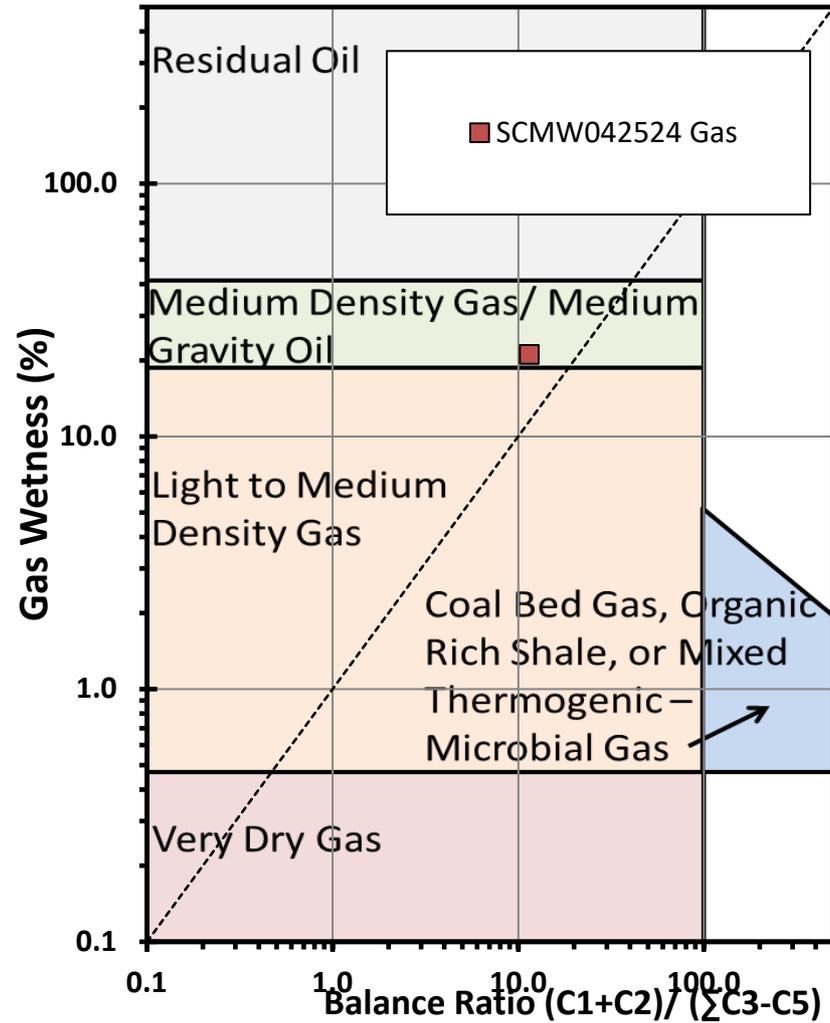


**Hydrocarbon Composition Plot**

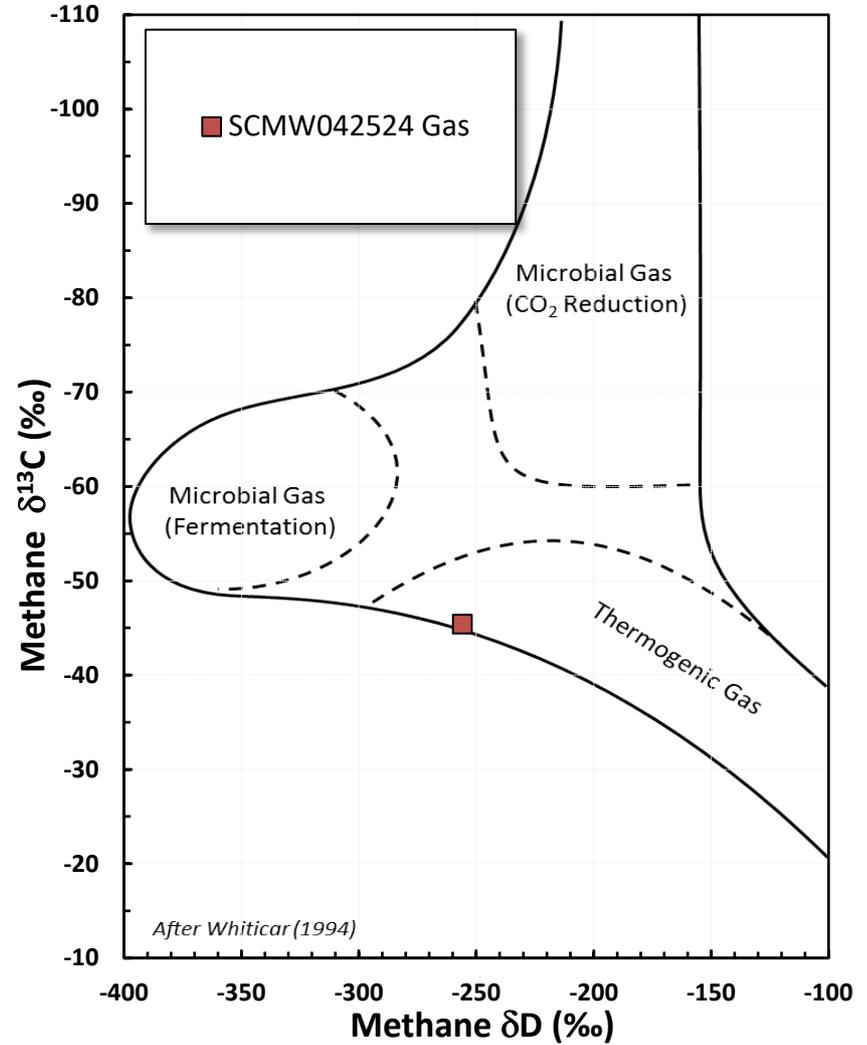


**INTERPRETIVE PLOTS**

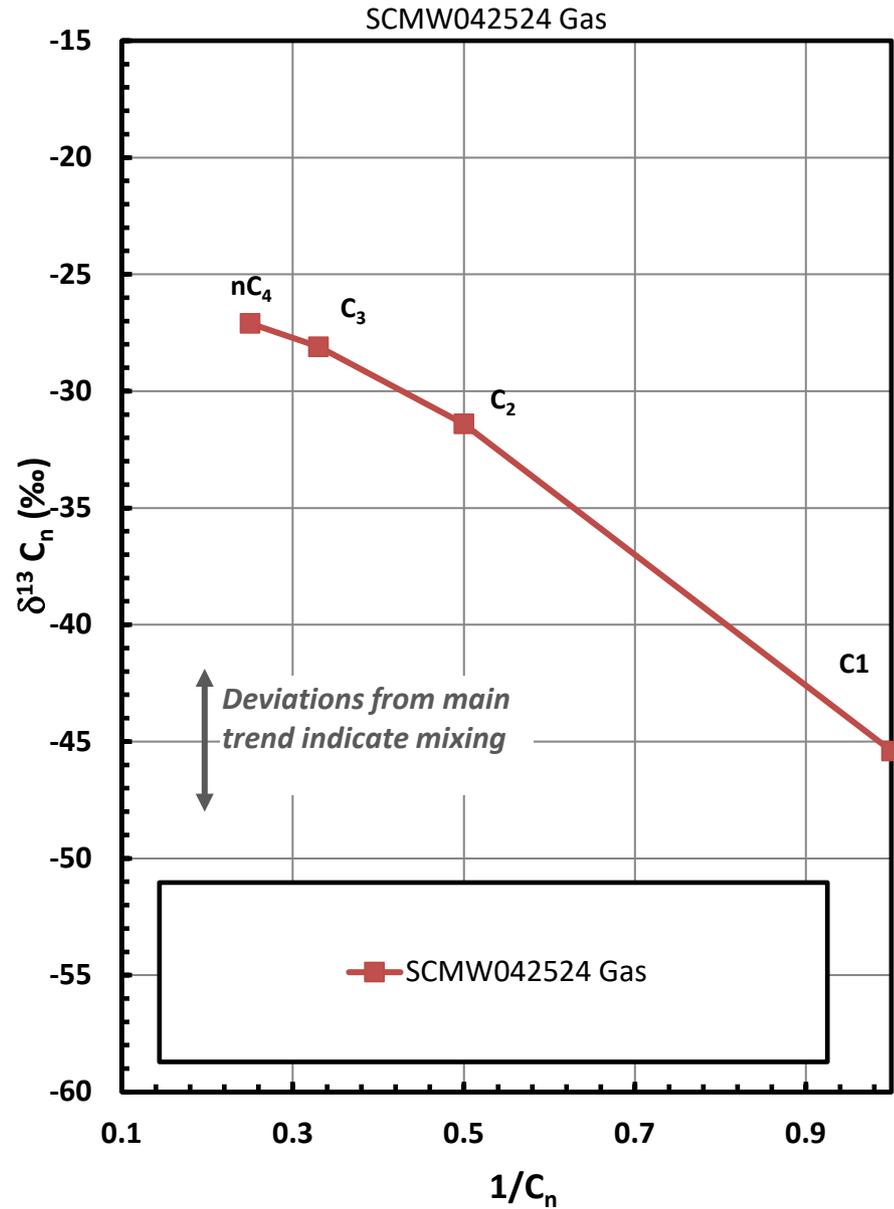
**Haworth Ratio Plot - Characterization of Hydrocarbon Type**



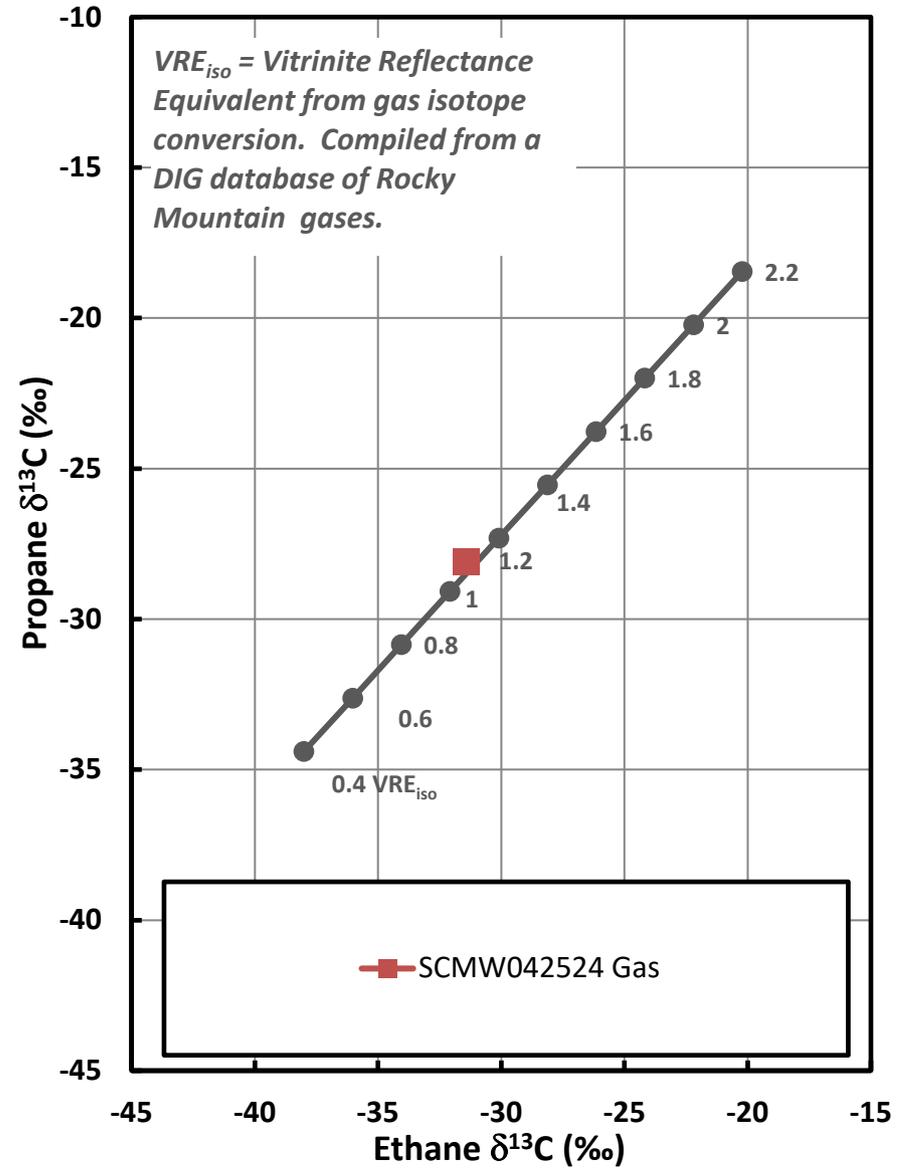
**Methane  $\delta^{13}C$  vs  $\delta D$  Genetic Classification Plot**



### Mixing Plot

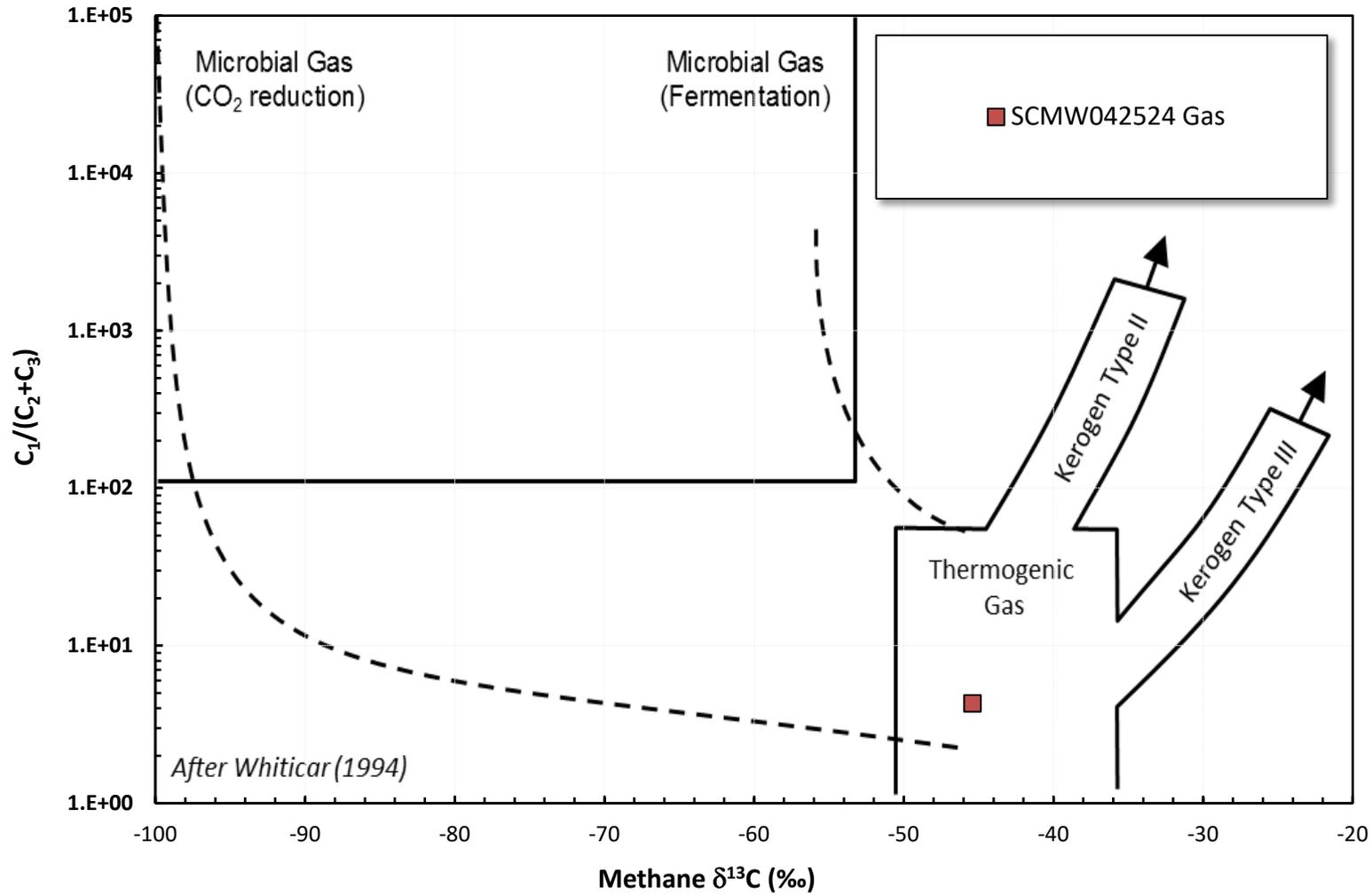


### Ethane - Propane Maturity Plot



**INTERPRETIVE PLOTS**

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



Organization	Reporting Organization	Reporting Organization Name	Order Number	Entity Requesting Analysis	Purpose	Project															
10206	COGCC Facility No.	Dolan Integration Group		Olsson																	
Sample	COGCC Facility No.	Sample Date and Time	API #	LAB Sample ID	Sample Type	Matrix	Comments	Project Number	Chain of Custody ID	Date Received by Lab											
Batch	LabID	Lab Batch Identifier	Leach Date	Extract Date and Time	Extract Method	Start Date and Time	Conc Method	Init Vol	Final Vol	Init Vol Units	Final Vol Units	Analysis Date and Time	Report Basis	Comments	File Name	Column #					
10206	240411591																				
Result	CAS Number	Analysis Name	Analysis Method	Analytical Method Modifier	Unit	Result Value	Qualifier	Test Type	Result Text	Data Flag	Dilution	Fraction Type	MDC	Requested MDC	Detection Limit	Instrument Detection Limit	Method Detection Limit	Comments	AnalyticalBatchID		
	O2+AR	OXYGEN + ARGON	SOP		MOL %	11.598									0.005	0.005	0.005		240411591		
	124-38-9	CARBON DIOXIDE	SOP		MOL %	0.005	ND								0.005	0.005	0.005		240411591		
	7727-37-9	NITROGEN (N2)	SOP		MOL %	44.680									0.005	0.005	0.005		240411591		
	7440-59-7	Helium	SOP		MOL %	0.005	ND								0.005	0.005	0.005		240411591		
	1333-74-0	HYDROGEN	SOP		MOL %	0.005	ND								0.005	0.005	0.005		240411591		
	74-82-8	METHANE	SOP		MOL %	34.501									0.005	0.005	0.005		240411591		
	74-84-0	ETHANE	SOP		MOL %	5.681									0.005	0.005	0.005		240411591		
	74-85-1	ETHENE	SOP		MOL %	0.005	ND								0.005	0.005	0.005		240411591		
	74-98-6	PROPANE	SOP		MOL %	2.355									0.005	0.005	0.005		240411591		
	75-28-5	ISOBUTANE	SOP		MOL %	0.314									0.005	0.005	0.005		240411591		
	106-97-8	N-BUTANE	SOP		MOL %	0.607									0.005	0.005	0.005		240411591		
	ICS	ISOPENTANE	SOP		MOL %	0.134									0.005	0.005	0.005		240411591		
	109-66-0	N-PENTANE	SOP		MOL %	0.100									0.005	0.005	0.005		240411591		
	92112-69-1+	C6+ (hexanes +)	SOP		MOL %	0.031									0.005	0.005	0.005		240411591		
	delta13C_C1	DELTA 13C C1	SOP		per mil	-45.4													240411591		
	deltaD_C1	DELTA D C1	SOP		per mil	-256													240411591		
	delta13C_C2	DELTA 13C C2	SOP		per mil	-31.4													240411591		
	delta13C_C3	DELTA 13C C3	SOP		per mil	-28.1													240411591		
	delta13C_C4	DELTA 13C C4	SOP		per mil	-30.6													240411591		
	delta13C_nC4	DELTA 13C nC4	SOP		per mil	-27.1													240411591		
	delta13C_IC5	DELTA 13C IC5	SOP		per mil	-27.8													240411591		
	BTU	BRITISH THERMAL UNITS	SOP		BTU/cuft	550													240411591		
	SpGrav	SPECIFIC GRAVITY	SOP		No Unit	0.871													240411591		

Low Signal  
Low Signal  
Low Signal

Send Data to:	Send Invoice to (if different):	Additional Information:
Name: Trent Wathne	Name:	AFE #:
Company: Olsson	Company:	Project:
Address: 1525 Raleigh St, Suite 400	Address:	PO #:
City, State: Denver, CO	City, State:	Location:
Phone: 303-237-2072	Phone:	Sampled By:
Email: twathne@olsson.com	Email:	API #:

Turnaround Time\*\*:

Standard (≤ 10 Business days)
  Rush (≤ 5 Business days)
  Expedited Rush (≤ 3 Business days)

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)	dD of Methane (C1)	Whole Oil Gas Chromatography	d18O and dD Isotopes of Water	RSK 175 Dissolved Gas Quantification
	SCMN042524	4/25	1030	Other	<input checked="" type="checkbox"/>								
				Other	<input type="checkbox"/>								
				Other	<input type="checkbox"/>								
				Other	<input type="checkbox"/>								
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				Other	<input type="checkbox"/>								

Chain of Custody Record

Comments:

Relinquished by Signature	Company	Date	Time	Received by Signature	Company	Date	Time
	Olsson	4/25	14:05		DIG	4/25/24	14:05

\*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.

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