

**ATTACHMENT D-3  
SUPPORTING DOCUMENTS**

**GAS ANALYSIS**

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**EXTENDED GAS ANALYSIS SUMMARY**

**CERTIFIED GAS ANALYSIS – 02/13/14**

Laurel Mountain Midstream Operating, LLC  
**SPRINGHILL COMPRESSOR STATION**  
 Application for Authorization to Use General Permit GP-5  
 Attachment D - Gas Analysis

**Extended Gas Analysis Summary**

Representative Gas Analysis - 02/13/14

Compound	CAS	Formula	Molecular Weight (MW)	Mole % (M% = V%)	Mole Fraction (M%/Sum-M%)	Weighted Sum (MW*MF)	Weight % (WS/Sum-WS)	lb/MMscf (WS/UGC#)
Water	109-86-4	H2O	18.02	---	---	---	---	---
Carbon Monoxide	630-08-0	CO	28.01	---	---	---	---	---
Nitrogen	7727-37-9	N2	28.01	0.2620	0.00262	0.0734	0.4457	193.41
Oxygen	7782-44-7	O2	32.00	---	---	---	---	---
Hydrogen Sulfide	2148-87-8	H2S	34.09	---	---	---	---	---
Carbon Dioxide	124-38-9	CO2	44.01	0.3320	0.00332	0.1461	0.8874	385.03
Methane*	75-82-8	CH4	16.04	97.3540	0.97353	15.6179	94.8505	41,155.79
Ethane*	74-84-0	C2H6	30.07	1.9750	0.01975	0.5939	3.6066	1,564.92
Propane**	74-98-6	C3H8	44.10	0.0770	0.00077	0.0340	0.2062	89.47
i-Butane**	75-28-5	C4H10	58.12	---	---	---	---	---
n-Butane**	106-97-8	C4H10	58.12	---	---	---	---	---
Cyclopentane**	287-92-3	C5H10	70.10	---	---	---	---	---
i-Pentane**	78-78-4	C5H12	72.15	---	---	---	---	---
n-Pentane**	109-66-0	C5H12	72.15	---	---	---	---	---
Cyclohexane**	110-82-7	C6H12	84.16	---	---	---	---	---
Other Hexanes**	110-54-3	C6H14	86.18	---	---	---	---	---
Methylcyclohexane**	108-87-2	C7H14	98.19	---	---	---	---	---
Heptanes**	142-82-5	C7H16	100.20	---	---	---	---	---
C8+ Heavies**	Various	C8+	130.00 est	---	---	---	---	---
Benzene***	71-43-2	C6H6	78.11	0.0001	0.00000	0.0001	0.0005	0.21
Ethylbenzene***	100-41-4	C8H10	106.17	0.0001	0.00000	0.0001	0.0006	0.28
n-Hexane***	110-54-3	C6H14	86.18	0.0001	0.00000	0.0001	0.0005	0.23
Toluene***	108-88-3	C7H8	92.14	0.0001	0.00000	0.0001	0.0006	0.24
2,2,4-TMP***	540-84-1	C8H18	114.23	0.0001	0.00000	0.0001	0.0007	0.30
Xylenes***	1330-20-7	C8H10	106.17	0.0001	0.00000	0.0001	0.0006	0.28

<b>NOTE:</b> The Representative Extended Gas Analysis actually shows the HAP Content as "NIL"	Total:	100.0006	1.00000	16.4658	100.0000	43,390.16
	THC:	99.4066	0.99406	16.2463	98.6669	42,811.73
	Total VOC:	0.0776	0.00078	0.0345	0.2097	91.01
	Total HAP:	0.0006	0.00001	0.0006	0.0035	1.54

\* = Hydrocarbon (HC)      \*\* = also Volatile Organic Compound (EPA-VOC)      \*\*\* = also Hazardous Air Pollutant (EPA-HAP)  
 #UGC (Universal Gas Constant) = 379.482 scf/lb-mol @ 60 °F and 14.696 psia.      Pound "X"/scf = M% of "X" \* MW of "X" / UGC

Wt% Total Hydrocarbon (THC) = 98.67	lb THC/MMscf = 42,811.73	percent of THC = 100.00%
W% of Methane (CH4) = 94.85	lb CH4/MMscf = 41,155.79	percent of THC = 96.13%
W% NM/NE VOCs = 0.21	lb VOC/MMscf = 91.01	percent of THC = 0.21%
W% Benzene = 0.0005	lb Benzene/MMscf = 0.21	percent of THC = 0.0005%
W% HAP = 0.0035	lb HAP/MMscf = 1.54	percent of THC = 0.0036%

MW Hydrogen (H) = 1.0079	MW Nitrogen Dioxide (NO2) = 46.0055
MW Carbon (C) = 12.0107	MW Sulfur Dioxide (SO2) = 64.0688
MW Nitrogen (N) = 14.0067	MW Nitrous Oxide (N2O) = 44.0128
MW Oxygen (O) = 15.9994	MW Formaldehyde (HCHO) = 30.0260

To be conservative, the following "worst-case" values were assumed:

Compound	CAS	Formula	Representative Gas Analysis			Assumed "Worst-Case" Gas Parameters		
			Mole %	Wgt %	lb/MMscf	Mole %	Wgt %	lb/MMscf
Carbon Dioxide	124-38-9	CO2	0.3320	0.8874	385.03	0.690	1.844	800.00
Methane	75-82-8	CH4	97.3540	94.8505	41,155.79	100.000	100.000	42,275.00
VOC (Propane)	74-98-6	C3H8	0.0776	0.2097	91.01	0.171	0.461	200.00
Benzene***	71-43-2	C6H6	0.0001	0.0005	0.21	0.0005	0.002	1.00
Ethylbenzene***	100-41-4	C8H10	0.0001	0.0006	0.28	0.0004	0.002	1.00
n-Hexane***	110-54-3	C6H14	0.0001	0.0005	0.23	0.0004	0.002	1.00
Toluene***	108-88-3	C7H8	0.0001	0.0006	0.24	0.0004	0.002	1.00
2,2,4-TMP***	540-84-1	C8H18	0.0001	0.0007	0.30	0.0003	0.002	1.00
Xylenes***	1330-20-7	C8H10	0.0001	0.0006	0.28	0.0004	0.002	1.00
Total HAP	Various	C6 thru C8	0.0006	0.0035	1.54	0.0023	0.014	6.00

Laurel Mountain Midstream Operating, LLC  
**SPRINGHILL COMPRESSOR STATION**  
Application for Authorization to Use General Permit GP-5  
Attachment D - Gas Analysis

**Certificate of Analysis**



Certificate of Analysis  
Number: 2030-14020216-001A

Carencro Laboratory  
4790 NE Evangeline Thruway  
Carencro, LA 70520

Alan Ball  
Gas Analytical Services  
PO Box 1028  
Bridgeport, WV 26330

Feb. 28, 2014

Field: Williams LMM  
Station Name: Springhill Comp.  
Sample Point: Submeter  
Cylinder No: GAS  
Analyzed: 02/28/2014 00:00:00 by CC

Sampled By: JD-GAS  
Sample Of: Gas Spot  
Sample Date: 02/13/2014  
Sample Conditions: 820 psig  
Method: GPA-2261M

**Analytical Data**

Components	Mol. %	Wt. %	GPM at 14.73 psia		
Nitrogen	0.262	0.446		GPM TOTAL C2+	0.550
Carbon Dioxide	0.332	0.887		GPM TOTAL C3+	0.021
Methane	97.354	94.854		GPM TOTAL IC5+	0.000
Ethane	1.975	3.607	0.529		
Propane	0.077	0.206	0.021		
Iso-butane	NIL	NIL	NIL		
n-Butane	NIL	NIL	NIL		
Iso-pentane	NIL	NIL	NIL		
n-Pentane	NIL	NIL	NIL		
Hexanes Plus	NIL	NIL	NIL		
	100.000	100.000	0.550		

<b>Physical Properties</b>	<b>Total</b>	<b>C6+</b>
Relative Density Real Gas	0.5695	3.2176
Calculated Molecular Weight	16.47	93.19
Compressibility Factor	0.9979	

**GPA 2172-09 Calculation:**

**Calculated Gross BTU per ft<sup>3</sup> @ 14.73 psia & 60°F**

Real Gas Dry BTU	1024.7	NIL
Water Sat. Gas Base BTU	1007.2	NIL

**Comments:** H<sub>2</sub>O Mol% : 1.740 ; Wt% : 1.901  
Unable to perform GPA 2286. No components past Propane.

Hydrocarbon Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.