



Produced Gas Isotope and Compositional Analyses

**Crestone Peak Resources Produced Gases
Colorado**

Crestone Peak Resources

June 17, 2019



PRODUCED GAS ISOTOPE ANALYSIS

Crestone Peak Resources Crestone Peak Resources Produced Gases, Colorado

Sample ID	Cylinder ID Number	COGCC ID	Sampling Date	Sampling Time	Shipment	Casing Pressure (psia)	Stable Carbon Isotopes										
							$\delta^{13}\text{C}$ Methane (%)	$\delta^{13}\text{C}$ Ethane (%)	$\delta^{13}\text{C}$ Propane (%)	$\delta^{13}\text{C}$ i-Butane (%)	$\delta^{13}\text{C}$ n-Butane (%)	$\delta^{13}\text{C}$ i-Pentane (%)	$\delta^{13}\text{C}$ n-Pentane (%)	δD Methane (%)	$\delta^{13}\text{C}$ CO ₂ (%)		
Baker C Unit 1 - Production CSG	246126	2/6/2019	8:00 AM	7th Shipment		-47.9	-32.4	-29.1	-31.4	-28.5						-247	0.4
Baker C Unit 1 - Surface CSG	246126	2/6/2019	8:00 AM	7th Shipment		-50.2	-32.6	-30.3	-32.6	-30.0						-240	-14.1
Cosslett 32-22 - Production CSG	420875	2/8/2019	10:30 AM	7th Shipment		-49.2	-32.8	-28.4	-31.4	-28.2						-241	-3.7
Cosslett 32-22 - Surface CSG	420875	2/8/2019	10:30 AM	7th Shipment		-51.9	-33.1	-29.0	-32.0	-29.0						-239	-15.2
Cosslett 4-0-22 - Production CSG	420763	2/6/2019	12:00 PM	7th Shipment		-48.7	-32.7	-28.4	-32.3	-28.3						-240	-1.2
Cosslett 4-0-22 - Surface CSG	420763	2/6/2019	12:00 PM	7th Shipment		-53.2	-33.9	-28.7	-32.0	-28.8						-247	-9.7
Cosslett 6-4-22 - Production CSG	420884	2/8/2019	11:00 AM	7th Shipment		-48.6	-32.1	-28.7	-31.5	-28.2						-240	0.7
Cosslett 6-4-22 - Surface CSG	420884	2/8/2019	11:00 AM	7th Shipment		-50.6	-33.6	-29.1	-32.8	-28.5						-241	-5.6
Costigan 43-20 - Production CSG	301574	1/31/2019	9:30 AM	7th Shipment		-48.2	-32.6	-28.8	-30.6	-27.5						-248	0.6
Costigan 43-20 - Surface CSG	301574	1/31/2019	9:30 AM	7th Shipment		-49.3	-32.8	-28.8	-31.8	-28.4						-249	-16.2
Davis 1B-9H - Production CSG	428589	2/1/2019	1:00 PM	7th Shipment		-46.4	-31.2	-28.2	-31.3	-27.9						-244	-12.5
Davis 1B-9H - Surface CSG	428589	2/1/2019	1:00 PM	7th Shipment		-49.4	-32.5	-28.6	-31.8	-27.7						-244	-16.2
Davis 1C-9H - Production CSG	428455	2/1/2019	2:00 PM	7th Shipment		-48.4	-32.5	-28.8	-31.4	-28.2						-245	-16.4
Davis 1C-9H - Surface CSG	428455	2/1/2019	2:00 PM	7th Shipment		-50.9	-33.1	-28.1	-31.5	-27.4						-239	-18.4
McPeck 4-8-10 - Production CSG	431853	2/13/2019	4:00 PM	7th Shipment			-32.0	-28.5	-31.6	-28.6							-14.1
Melbon Ranch 4J-17H - Surface CSG	457070	2/11/2019	10:30 AM	7th Shipment		-47.0	-32.2	-28.7	-31.2	-28.3						-244	-15.2
Melbon Ranch 4K-17H - Production CSG	457073	2/11/2019	10:00 AM	7th Shipment		-48.6	-32.9	-29.6	-31.2	-28.1						-248	0.7
Melbon Ranch 4K-17H - Surface CSG	457073	2/11/2019	10:00 AM	7th Shipment		-52.3	-34.1	-29.2	-30.1	-26.7						-249	-15.6
Nelson 23-32 - Production CSG	251795	1/31/2019	1:30 PM	7th Shipment		-47.4	-31.5	-28.8	-31.8	-28.6						-240	-0.1
Pratt 4-2-29 - Production CSG	420035	1/31/2019	12:00 PM	7th Shipment		-48.4	-31.8	-29.9	-31.8	-28.6						-243	-10.1
Pratt 4-2-29 - Surface CSG	420035	1/30/2019	12:00 PM	7th Shipment		-50.6	-34.2	-30.2	-32.6	-29.7						-242	-15.7
Regnier 33-19 - Production CSG	275675	1/31/2019	8:30 AM	7th Shipment		-49.4	-32.6	-29.6	-33.5	-30.6						-245	0.4
Regnier 33-19 - Surface CSG	275675	1/31/2019	8:30 AM	7th Shipment		-55.3	-33.9	-32.0	-32.9	-32.0						-263	-15.4
Regnier 4-4-19 - Production CSG	289889	1/30/2019	3:30 PM	7th Shipment		-49.3	-32.8	-30.9	-32.3	-29.9						-246	-4.5
Regnier 4-4-19 - Surface CSG	289889	1/30/2019	3:30 PM	7th Shipment		-54.7	-33.6	-32.2	-33.0	-32.0						-262	-17.2



PRODUCED GAS ISOTOPE ANALYSIS

Crestone Peak Resources Crestone Peak Resources Produced Gases, Colorado

Sample ID	Cylinder ID Number	COGCC ID	Sampling Date	Sampling Time	Shipment	Casing Pressure (psia)	Produced Gas Composition																	Specific Gravity (Air = 1.0)
							H ₂ Conc. (mole %)	H ₂ Conc. (mole %)	O ₂ +Ar Conc. (mole %)	N ₂ Conc. (mole %)	CO ₂ Conc. (mole %)	H ₂ S Conc. (mole %)	CO Conc. (mole %)	C ₁ Conc. (mole %)	C ₂ Conc. (mole %)	C ₂ H ₄ Conc. (mole %)	C ₃ Conc. (mole %)	C ₃ H ₆ Conc. (mole %)	iC ₄ Conc. (mole %)	nC ₄ Conc. (mole %)	iC ₅ Conc. (mole %)	nC ₅ Conc. (mole %)	C ₆ + Conc. (mole %)	
Baker C Unit 1 - Production CSG	246126	2/6/2019	8:00 AM	7th Shipment		0.00	0.11	0.64	2.21	2.07	0.00	0.09	74.47	12.50	0.00	5.30	0.00	0.67	1.58	0.20	0.15	0.01	0.738	
Baker C Unit 1 - Surface CSG	246126	2/6/2019	8:00 AM	7th Shipment		0.00	0.00	0.64	4.33	0.01	0.00	0.09	78.88	7.84	0.00	5.25	0.00	0.75	1.56	0.36	0.37	0.30	0.719	
Cosslett 32-22 - Production CSG	420975	2/8/2019	10:30 AM	7th Shipment		0.00	1.87	0.42	1.75	0.68	0.00	0.09	76.97	11.77	0.00	4.41	0.00	0.50	1.07	0.19	0.19	0.08	0.693	
Cosslett 32-22 - Surface CSG	420975	2/8/2019	10:30 AM	7th Shipment		0.00	0.04	0.35	2.36	0.01	0.00	0.09	82.16	9.27	0.00	4.07	0.00	0.42	0.81	0.16	0.16	0.11	0.677	
Cosslett 4-0-22 - Production CSG	420763	2/6/2019	12:00 PM	7th Shipment		0.00	1.04	0.70	3.05	0.99	0.00	0.09	76.52	11.51	0.00	4.45	0.00	0.48	0.93	0.12	0.10	0.04	0.699	
Cosslett 4-0-22 - Surface CSG	420763	2/6/2019	12:00 PM	7th Shipment		0.00	0.00	0.51	3.65	0.01	0.00	0.08	80.15	8.65	0.00	4.60	0.00	0.61	1.19	0.23	0.21	0.12	0.696	
Cosslett 6-4-22 - Production CSG	420884	2/8/2019	11:00 AM	7th Shipment		0.00	1.26	0.65	8.52	1.96	0.00	0.08	70.19	11.13	0.00	4.43	0.00	0.51	1.06	0.14	0.12	0.04	0.731	
Cosslett 6-4-22 - Surface CSG	420884	2/8/2019	11:00 AM	7th Shipment		0.00	0.13	0.81	3.93	0.01	0.00	0.09	78.58	9.70	0.00	4.67	0.00	0.55	1.16	0.16	0.16	0.05	0.699	
Costigan 43-20 - Production CSG	301574	1/31/2019	9:30 AM	7th Shipment		0.00	0.04	0.88	3.10	1.70	0.00	0.08	75.61	11.64	0.00	4.49	0.00	0.59	1.41	0.19	0.23	0.05	0.728	
Costigan 43-20 - Surface CSG	301574	1/31/2019	9:30 AM	7th Shipment		0.00	0.01	0.38	1.65	0.02	0.00	0.09	81.17	8.17	0.00	4.21	0.00	0.66	1.63	0.47	0.41	0.14	0.702	
Davis 1B-9H - Production CSG	428589	2/1/2019	1:00 PM	7th Shipment		0.00	0.25	1.90	7.48	0.07	0.00	0.09	70.27	11.43	0.00	4.70	0.00	0.69	1.57	0.43	0.50	0.61	0.762	
Davis 1B-9H - Surface CSG	428589	2/1/2019	1:00 PM	7th Shipment		0.00	0.10	0.95	3.85	0.02	0.00	0.00	78.44	9.62	0.00	4.09	0.00	0.59	1.22	0.41	0.36	0.37	0.711	
Davis 1C-9H - Production CSG	428455	2/1/2019	2:00 PM	7th Shipment		0.00	0.59	0.60	2.68	0.02	0.00	0.08	75.69	12.40	0.00	4.87	0.00	0.63	1.34	0.32	0.36	0.40	0.725	
Davis 1C-9H - Surface CSG	428455	2/1/2019	2:00 PM	7th Shipment		0.00	0.07	0.67	6.25	0.01	0.00	0.08	80.10	7.69	0.00	3.44	0.00	0.52	0.75	0.19	0.12	0.10	0.681	
MelPeak 4-8-10 - Production CSG	431853	2/13/2019	4:00 PM	7th Shipment		0.00	0.00	20.62	79.15	0.09	0.00	0.00	0.06	0.02	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.998	
Melbon Ranch 4J-17H - Surface CSG	457070	2/11/2019	10:30 AM	7th Shipment		0.00	89.30	0.54	9.44	0.01	0.00	0.00	0.54	0.11	0.00	0.04	0.00	0.00	0.01	0.00	0.00	0.01	0.165	
Melbon Ranch 4K-17H - Production CSG	457073	2/11/2019	10:00 AM	7th Shipment		0.00	0.00	0.55	2.07	2.18	0.00	0.08	81.42	12.52	0.00	0.72	0.00	0.09	0.23	0.05	0.05	0.04	0.662	
Melbon Ranch 4K-17H - Surface CSG	457073	2/11/2019	10:00 AM	7th Shipment		0.00	0.00	0.89	5.27	0.02	0.00	0.10	88.20	4.61	0.00	0.85	0.00	0.04	0.02	0.00	0.00	0.00	0.613	
Nelson 23-32 - Production CSG	251795	1/31/2019	1:30 PM	7th Shipment		0.00	0.06	0.32	1.72	1.94	0.00	0.08	74.34	12.10	0.00	5.47	0.00	0.92	2.34	0.43	0.26	0.01	0.794	
Pratt 4-2-29 - Production CSG	420035	1/30/2019	12:00 PM	7th Shipment		0.00	0.00	1.09	4.19	1.63	0.00	0.09	72.64	11.33	0.00	5.75	0.00	0.87	2.10	0.28	0.02	0.01	0.753	
Pratt 4-2-29 - Surface CSG	420035	1/30/2019	12:00 PM	7th Shipment		0.00	0.01	0.34	2.17	0.01	0.00	0.10	82.57	8.39	0.00	4.29	0.00	0.53	1.07	0.19	0.20	0.14	0.681	
Regnier 33-19 - Production CSG	275675	1/31/2019	8:30 AM	7th Shipment		0.00	0.77	1.29	4.96	1.42	0.00	0.07	72.13	11.86	0.00	5.12	0.00	0.62	1.35	0.19	0.17	0.04	0.735	
Regnier 33-19 - Surface CSG	275675	1/31/2019	8:30 AM	7th Shipment		0.00	0.01	0.58	15.58	0.01	0.00	0.09	74.76	4.30	0.00	2.96	0.00	0.58	0.71	0.20	0.14	0.08	0.699	
Regnier 4-4-19 - Production CSG	289889	1/30/2019	3:30 PM	7th Shipment		0.00	1.11	1.63	6.32	0.65	0.00	0.09	68.11	11.65	0.00	6.31	0.00	1.03	2.30	0.44	0.33	0.02	0.772	
Regnier 4-4-19 - Surface CSG	289889	1/30/2019	3:30 PM	7th Shipment		0.00	0.00	0.52	4.14	0.01	0.00	0.10	84.25	4.77	0.00	3.84	0.00	0.83	0.96	0.26	0.18	0.13	0.672	

GEOMARK PRODUCED GAS ISOTOPE ANALYSIS

Crestone Peak Resources Crestone Peak Resources Produced Gases, Colorado

Sample ID	Cylinder ID	COGCC ID	Sampling Date	Sampling Time	Shipment	Casing Pressure (psia)	Hydrocarbon Gas Composition							
							C1 Conc. (mole %)	C2 Conc. (mole %)	C3 Conc. (mole %)	iC4 Conc. (mole %)	nC4 Conc. (mole %)	iC5 Conc. (mole %)	nC5 Conc. (mole %)	C6+ Conc. (mole %)
Baker C Unit 1 - Production CSG		246126	2/6/2019	8:00 AM	7th Shipment		78.49	13.17	5.59	0.71	1.66	0.21	0.16	0.01
Baker C Unit 1 - Surface CSG		246126	2/6/2019	8:00 AM	7th Shipment		82.89	8.05	5.53	0.79	1.65	0.38	0.39	0.31
Coslett 32-22 - Production CSG		420875	2/6/2019	10:30 AM	7th Shipment		80.86	12.37	4.63	0.53	1.13	0.20	0.20	0.08
Coslett 32-22 - Surface CSG		420875	2/6/2019	10:30 AM	7th Shipment		84.57	9.54	4.19	0.43	0.83	0.16	0.16	0.12
Coslett 4-0-22 - Production CSG		420763	2/6/2019	12:00 PM	7th Shipment		81.29	12.23	4.72	0.51	0.99	0.12	0.10	0.04
Coslett 4-0-22 - Surface CSG		420763	2/6/2019	12:00 PM	7th Shipment		83.70	9.04	4.81	0.63	1.24	0.24	0.22	0.13
Coslett 6-4-22 - Production CSG		420684	2/6/2019	11:00 AM	7th Shipment		80.10	12.70	5.06	0.59	1.21	0.16	0.14	0.05
Coslett 6-4-22 - Surface CSG		420684	2/6/2019	11:00 AM	7th Shipment		82.69	10.20	4.91	0.58	1.22	0.16	0.17	0.05
Costigan 43-20 - Production CSG		301574	1/31/2019	9:30 AM	7th Shipment		80.26	12.36	4.76	0.62	1.50	0.20	0.24	0.05
Costigan 43-20 - Surface CSG		301574	1/31/2019	9:30 AM	7th Shipment		82.94	9.37	4.31	0.67	1.67	0.48	0.42	0.14
Davis 1B-9H - Production CSG		428589	2/1/2019	1:00 PM	7th Shipment		77.90	12.67	5.21	0.77	1.74	0.47	0.56	0.68
Davis 1B-9H - Surface CSG		428589	2/1/2019	1:00 PM	7th Shipment		82.49	10.12	4.30	0.62	1.28	0.43	0.38	0.39
Davis 1C-9H - Production CSG		428455	2/1/2019	2:00 PM	7th Shipment		78.83	12.92	5.07	0.66	1.40	0.33	0.37	0.42
Davis 1C-9H - Surface CSG		428455	2/1/2019	2:00 PM	7th Shipment		86.22	8.28	3.70	0.56	0.80	0.20	0.13	0.11
McHeik 4-8-10 - Production CSG		431853	2/13/2019	4:00 PM	7th Shipment		58.22	14.46	10.10	1.87	5.64	2.06	3.12	4.52
Melbon Ranch 4K-17H - Surface CSG		457070	2/11/2019	10:30 AM	7th Shipment		76.32	15.07	5.42	0.42	0.82	0.16	0.16	1.61
Melbon Ranch 4K-17H - Production CSG		457073	2/11/2019	10:00 AM	7th Shipment		85.59	13.16	0.76	0.10	0.24	0.05	0.06	0.04
Melbon Ranch 4K-17H - Surface CSG		457073	2/11/2019	10:00 AM	7th Shipment		94.10	4.92	0.91	0.05	0.02	0.00	0.00	0.00
Nelson 23-32 - Production CSG		251795	1/31/2019	1:30 PM	7th Shipment		77.54	12.62	5.71	0.96	2.45	0.45	0.28	0.01
Pratt 4-2-29 - Production CSG		420035	1/30/2019	12:00 PM	7th Shipment		78.11	12.18	6.18	0.94	2.26	0.31	0.02	0.01
Pratt 4-2-29 - Surface CSG		420035	1/30/2019	12:00 PM	7th Shipment		84.80	8.61	4.40	0.55	1.10	0.19	0.21	0.14
Regnier 33-19 - Production CSG		275675	1/31/2019	8:30 AM	7th Shipment		78.85	12.97	5.59	0.68	1.48	0.21	0.18	0.04
Regnier 33-19 - Surface CSG		275675	1/31/2019	8:30 AM	7th Shipment		89.28	5.14	3.53	0.69	0.85	0.24	0.17	0.09
Regnier 4-4-19 - Production CSG		289889	1/30/2019	3:30 PM	7th Shipment		75.51	12.92	7.00	1.14	2.56	0.46	0.37	0.02
Regnier 4-4-19 - Surface CSG		289889	1/30/2019	3:30 PM	7th Shipment		88.48	5.01	4.03	0.87	1.00	0.27	0.19	0.14

GEOMARK
 PRODUCED GAS ISOTOPE ANALYSIS

Crestone Peak Resources Crestone Peak Resources Produced Gases, Colorado

Sample ID	Cylinder ID Number	COGCC ID	Sampling Date	Sampling Time	Shipment	Casing Pressure (psia)	BTU Content		Calculated Ratios			
							Total Gas (BTU/lb3)	Hydrocar. Gas (BTU/lb3)	Total HC Gas (ppm by mole)	Wetness (C2 - nC5) / (C1 - nC5)	C1/C2 Ratio (mole/mole)	iC4/nC4 Ratio (mole/mole)
Baker C Unit 1 - Production CSG	246126	246126	2/6/2019	8:00 AM	7th Shipment		1,194	1,259	948,808	21.50	6	0.43
Baker C Unit 1 - Surface CSG	246126	246126	2/6/2019	8:00 AM	7th Shipment		1,181	1,244	949,182	16.85	10	0.48
Cosslett 32-22 - Production CSG	420875	420875	2/8/2019	10:30 AM	7th Shipment		1,167	1,226	951,911	19.07	7	0.47
Cosslett 32-22 - Surface CSG	420875	420875	2/8/2019	10:30 AM	7th Shipment		1,154	1,188	971,489	15.33	9	0.51
Cosslett 4-0-22 - Production CSG	420763	420763	2/6/2019	12:00 PM	7th Shipment		1,145	1,216	941,381	18.68	7	0.51
Cosslett 4-0-22 - Surface CSG	420763	420763	2/6/2019	12:00 PM	7th Shipment		1,160	1,211	957,525	16.19	9	0.51
Cosslett 6-4-22 - Production CSG	420884	420884	2/8/2019	11:00 AM	7th Shipment		1,081	1,234	875,301	19.96	6	0.49
Cosslett 6-4-22 - Surface CSG	420884	420884	2/8/2019	11:00 AM	7th Shipment		1,154	1,214	950,183	17.26	8	0.47
Costigan 43-20 - Production CSG	301574	301574	1/31/2019	9:30 AM	7th Shipment		1,167	1,239	942,094	19.70	6	0.42
Costigan 43-20 - Surface CSG	301574	301574	1/31/2019	9:30 AM	7th Shipment		1,204	1,231	978,578	16.94	9	0.40
Davis 1B-9H - Production CSG	428589	428589	2/1/2019	1:00 PM	7th Shipment		1,170	1,297	902,047	21.56	6	0.44
Davis 1B-9H - Surface CSG	428589	428589	2/1/2019	1:00 PM	7th Shipment		1,172	1,233	950,936	17.19	8	0.48
Davis 1C-9H - Production CSG	428455	428455	2/1/2019	2:00 PM	7th Shipment		1,217	1,268	960,126	20.83	6	0.47
Davis 1C-9H - Surface CSG	428455	428455	2/1/2019	2:00 PM	7th Shipment		1,090	1,173	929,103	13.69	10	0.69
McPeak 4-8-10 - Production CSG	431853	431853	2/13/2019	4:00 PM	7th Shipment		2	1,766	1,320	39.02	4	0.33
Melbon Ranch 4J-17H - Surface CSG	457070	457070	2/11/2019	10:30 AM	7th Shipment		9	1,304	7,059	22.45	5	0.51
Melbon Ranch 4K-17H - Production CSG	457073	457073	2/11/2019	10:00 AM	7th Shipment		1,079	1,134	951,248	14.37	7	0.41
Melbon Ranch 4K-17H - Surface CSG	457073	457073	2/11/2019	10:00 AM	7th Shipment		996	1,063	937,215	5.89	19	2.46
Nelson 23-32 - Production CSG	251795	251795	1/31/2019	1:30 PM	7th Shipment		1,237	1,290	958,767	22.46	6	0.39
Pratt 4-2-29 - Production CSG	420035	420035	1/31/2019	12:00 PM	7th Shipment		1,188	1,275	929,963	21.99	6	0.41
Pratt 4-2-29 - Surface CSG	420035	420035	1/30/2019	12:00 PM	7th Shipment		1,164	1,196	973,696	15.08	10	0.50
Regnier 33-19 - Production CSG	275675	275675	1/31/2019	8:30 AM	7th Shipment		1,148	1,254	914,792	21.12	6	0.46
Regnier 33-19 - Surface CSG	275675	275675	1/31/2019	8:30 AM	7th Shipment		965	1,153	837,298	10.63	17	0.82
Regnier 4-4-19 - Production CSG	289889	289889	1/30/2019	3:30 PM	7th Shipment		1,193	1,323	902,013	24.47	6	0.45
Regnier 4-4-19 - Surface CSG	289889	289889	1/30/2019	3:30 PM	7th Shipment		1,114	1,170	952,189	11.40	18	0.87