Complaint 200097599

02057350

Lindblom, Steven

From: Mark Beeunas [beeunas@oiltracers.com]
Sent: Monday, March 26, 2007 4:39 PM
To: Lindblom, Steven
Subject: Updated Final Results- Darryl Adams water well complaint
Attachments: Figures 1-8 Update.ppt; Tables 1-3.xls

Steve,

After looking at the Adams data again and in comparison with the Leming data I would like to modify the original conclusions. In summery, I originally gave equal weight (more or less) to the possibilities that the gases in the Adams well are either oxidized microbial gas or coal derived gas. I now think that the most likely possibility is that the gases from the Adams water wells are principally microbial in origin.

Updated Final Results - Darryl Adams Water Well Complaint

The attached data table and figures support the following conclusions:

- The gases collected from the Darryl Adams water well are generally similar but do not exactly match chemically or isotopically any recently collected gases from the subject gas wells or other San Juan Basin gases presented by Rice (1993).
- More specifically, the gases from the Darryl Adams water well are on the order of 10 times dryer, suggesting a predominately microbial origin.
- **Based on the relationships presented in the accompany figures and the observations summarized above, the hydrocarbon gases from the Darryl Adams water well most likely represents an oxidized microbial methane.**

Mark A. Beeunas
Vice President
OilTracers, LLC
1432 N. Coral Bells Drive
Tucson, AZ 85745

Telephone: 520-247-8957
FAX: 520-743-9874
www.oiltracers.com

Table 1: Chemical and Stable Isotopic Compositional Data for Gases (Darryl Adams Water Well Complaint)

Sample Name	Isotech Lab No.	Volume %																Wetness	per mil (‰)							
		He	H_2	Ar	O_2	CO_2	N_2	CO	C_1	C_2	C_2H_4	C_3	iC_4	nC_4	iC_5	nC_5	C_6+	C_1/C_2+ (%)	$\delta^{13}CO_2$	$\delta^{13}C_1$	δDC_1	$\delta^{13}C_2$	$\delta^{13}C_3$	$\delta^{13}iC_4$	$\delta^{13}nC_4$	$\delta^{13}iC_5$	$\delta^{13}nC_5$
Darryl Adams 061804-5 Preheat	71742	0.000	0.000	1.010	2.04	7.29	59.19	0.000	30.46	0.01	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.02	0.00	-45.3	-236.90						
Darryl Adams Water Well	105152	0.000	0.000	1.130	4.59	8.60	62.43	0.000	25.05	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	-19.33	-45.4	-231.40						
Ignacio 33-8-2 A	105155	0.003	0.000	0.000	0.00	4.06	0.02	0.000	95.39	0.49	0.000	0.027	0.005	0.002	0.000	0.000	0.000	0.54	-5.47	-35.5	-185.30	-20.53					
Ignacio 33-8-2 Bradenhead	105153	0.000	0.010	0.000	0.62	0.02	7.64	0.000	75.53	6.49	0.000	1.570	0.305	0.179	0.062	0.028	0.000	1.70	2.93	10.31		-43.1	-191.10	-27.66	-24.06	-25.53	-23.40
Ignacio 33-8-2 Production	105154	0.003	0.005	0.000	0.00	3.84	0.02	0.000	95.60	0.49	0.000	0.034	0.006	0.003	0.002	0.000	0.000	2.28		0.55	-5.91	-35.3	-166.00	-21.74			
SemlerA#1	72582	0.000	0.000	0.000	0.01	1.88	0.08	0.000	97.33	0.57	0.000	0.000	0.000	0.000	0.000	0.000	0.012			0.58	17.34	-41.7	-199.90				
Simmons A#1	72584	0.000	0.000	0.000	0.00	3.09	0.03	0.000	96.73	0.14	0.000	0.000	0.000	0.000	0.000	0.000	0.007			0.15	18.77	-41.8	-224.80				
Simmons GU A2 Bradenhead	105156	0.000	0.439	0.000	0.00	0.00	0.05	0.000	96.37	0.12	0.000	0.010	0.004	0.004	0.002	0.000	0.000	1.03		0.14		-42.7	-218.20	-20.74			
Simmons GU A2 Production	105157	0.000	0.000	0.000	0.00	2.25	0.01	0.000	97.61	0.13	0.000	0.008	0.002	0.000	0.000	0.000	0.000			0.14	19.05	-41.8	-225.70				
So Ute AWW1	72583	0.000	0.000	0.000	0.01	1.60	0.08	0.000	96.17	0.13	0.000	0.000	0.000	0.000	0.000	0.000	0.013			0.15	18.54	-42.0	-230.80				

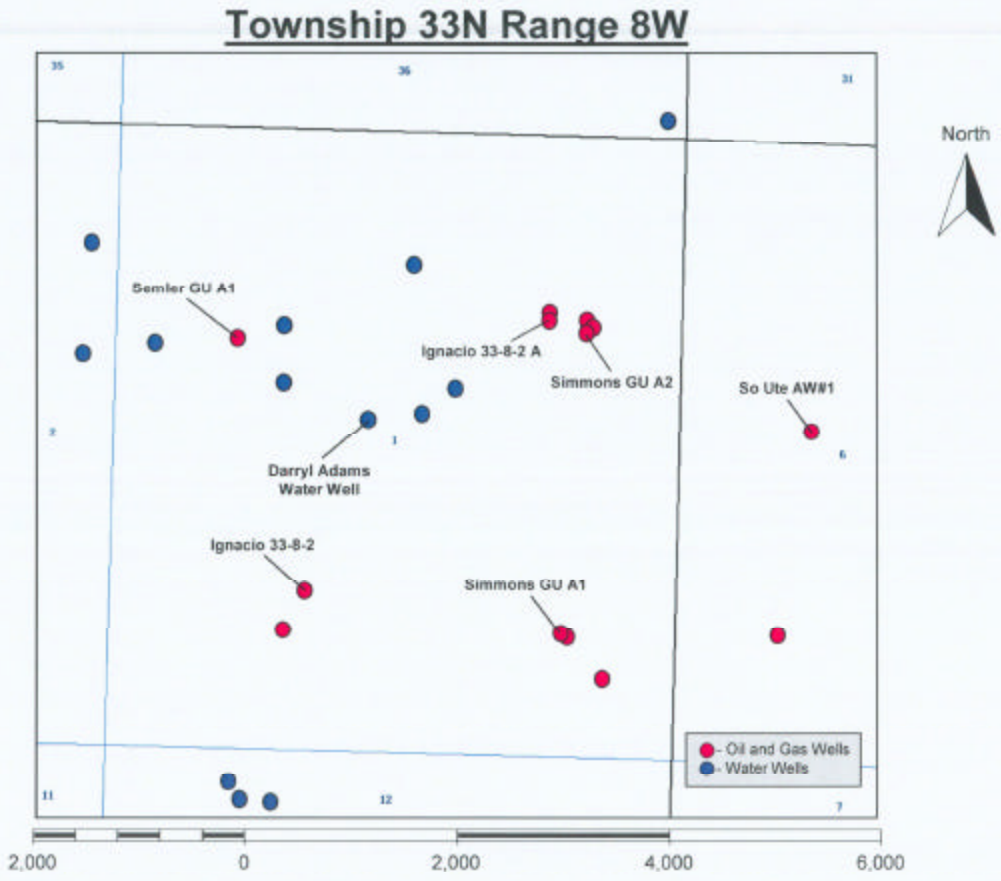

Figure 1: Base map showing the approximate locations of the Darryl Adams water well, the subject gas wells and other gas and water wells. This map is centered approximately 15 miles southeast of Durango and 3 miles northeast of Ignacio, Colorado. The well locations posted on this map were derived from the Colorado Oil and Gas Conservation Commission's online GIS map server: http://oil-gas.state.co.us/infosys/Maps/gismain.cfm.

Table 2: Normalized Chemical Compositional Data (Darryl Adams Water Well Complaint)

Well Name	Isotech Lab No:	Air Free Volume %										Normalized Volume % (100% = C_1 + C_2 + C_3 + iC_4 + nC_4 + iC_5 + nC_5 + nC_6 + CO_2)									Normalized Volume % (100% = C_1 + C_2 + C_3 + iC_4 + nC_4 + iC_5 + nC_5 + nC_6)							
		C_1	C_2	C_3	iC_4	nC_4	iC_5	nC_5	C_{6+}	CO_2	N_2	Sum	C_1	C_2	C_3	iC_4	nC_4	iC_5	nC_5	CO_2	Sum	C_1	C_2	C_3	iC_4	nC_4	iC_5	nC_5	Sum
Darryl Adams SR1804-5 Pretest	71742	80.75	0.02	0.00	0.000	0.000	0.000	0.00	0.02	19.22	0.00	100.00	80.67	0.02	0.00	0.00	0.00	0.00	0.00	19.31	100.00	99.98	0.02	0.00	0.00	0.00	0.00	0.00	100.00
Darryl Adams Water Well	105152	78.76	0.00	0.00	0.000	0.000	0.000	0.00	0.00	21.24	0.00	100.00	78.65	0.00	0.00	0.00	0.00	0.00	0.00	21.35	100.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Ignacio 33-8-2 A	105155	95.39	0.49	0.03	0.095	0.002	0.000	0.00	0.00	4.06	0.02	99.99	95.42	0.49	0.03	0.09	0.00	0.00	0.00	4.06	100.00	99.48	0.51	0.03	0.00	0.00	0.00	0.00	100.00
Ignacio 33-8-2 Bradenhead	105153	79.84	7.05	1.48	0.331	0.194	0.059	0.03	0.04	0.02	0.49	89.57	89.07	7.91	1.67	0.37	0.22	0.10	0.03	0.03	100.00	99.59	7.92	1.67	0.37	0.22	0.10	0.03	100.00
Ignacio 33-8-2 Production	105154	95.60	0.49	0.03	0.090	0.003	0.002	0.00	0.00	3.84	0.02	99.99	95.63	0.49	0.03	0.01	0.00	0.00	0.00	3.84	100.00	99.45	0.51	0.03	0.01	0.00	0.00	0.00	100.00
Sentech#1	72582	97.46	0.57	0.00	0.000	0.000	0.000	0.00	0.01	1.88	0.08	100.00	97.55	0.57	0.00	0.00	0.00	0.00	0.00	1.88	100.00	99.42	0.58	0.00	0.00	0.00	0.00	0.00	100.00
Simmons #1	72584	96.73	0.14	0.00	0.000	0.000	0.000	0.00	0.01	3.09	0.03	100.00	96.76	0.14	0.00	0.00	0.00	0.00	0.00	3.09	100.00	99.85	0.15	0.00	0.00	0.00	0.00	0.00	100.00
Simmons GU A2 Bradenhead	105156	99.37	0.12	0.02	0.054	0.054	0.002	0.00	0.00	0.30	0.05	99.56	99.86	0.12	0.02	0.00	0.00	0.00	0.00	0.00	100.00	99.86	0.12	0.02	0.00	0.00	0.00	0.00	100.00
Simmons GU A2 Production	105157	97.61	0.13	0.00	0.000	0.000	0.000	0.00	0.00	2.25	0.01	100.00	97.62	0.13	0.00	0.00	0.00	0.00	0.00	2.25	100.00	99.86	0.13	0.00	0.00	0.00	0.00	0.00	100.00
So Ute AWWI	72583	98.18	0.13	0.00	0.000	0.000	0.000	0.00	0.01	1.68	0.08	100.00	98.27	0.13	0.00	0.00	0.00	0.00	0.00	1.60	100.00	99.87	0.13	0.00	0.00	0.00	0.00	0.00	100.00

Table 3: Calculated Ratios (Darryl Adams Water Well Complaint)

Well Name	Isotech Lab No.	Calculated Ratios													
		$\%C_{2+}$	$C_1/(C_2+C_3)$	Ar/C_1	O_2/Ar	N_2/Ar	O_2/N_2	$100 * CO_2/\Sigma HC$	$C_1/(C_1+C_2)$	$C_2/(C_2+C_3)$	$C_3/(C_3+C_4)$	$C_4/(C_4+C_5)$	$i\text{-}C_4/(i\text{-}C_4+n\text{-}C_4)$	$i\text{-}C_5/(i\text{-}C_5+n\text{-}C_5)$	Total HC
Darryl Adams 081804-5 Pretest	71742	0.02	4172.60	0.03	2.02	58.60	0.03	23.92	1.00	1.00					30.47
Darryl Adams Water Well	105152	0.00		0.05	4.06	55.25	0.07	27.15	1.00						25.05
Ignacio 33-8-2 A	105155	0.54	184.86				0.00	4.23	0.99	0.95	0.81	1.00	0.76		95.91
Ignacio 33-8-2 Bradenhead	105153	10.31	9.35		7.26	88.84	0.08	0.03	0.92	0.83	0.74	0.81	0.63	0.75	82.02
Ignacio 33-8-2 Production	105154	0.55	182.97				0.00	3.99	0.99	0.94	0.80	0.85	0.70	1.00	96.13
SemlerA#1	72582	0.58	171.96				0.13	1.92	0.99	1.00					97.91
Simmons A#1	72584	0.15	671.74				0.00	3.19	1.00	1.00					96.88
Simmons GU A2 Bradenhead	105156	0.14	763.80				0.00	0.00	1.00	0.88	0.68	0.82	0.51	1.00	99.51
Simmons GU A2 Production	105157	0.14	728.98				0.00	2.30	1.00	0.97	1.00				97.74
So Ute AW#1	72583	0.13	761.01				0.13	1.63	1.00	1.00					98.31

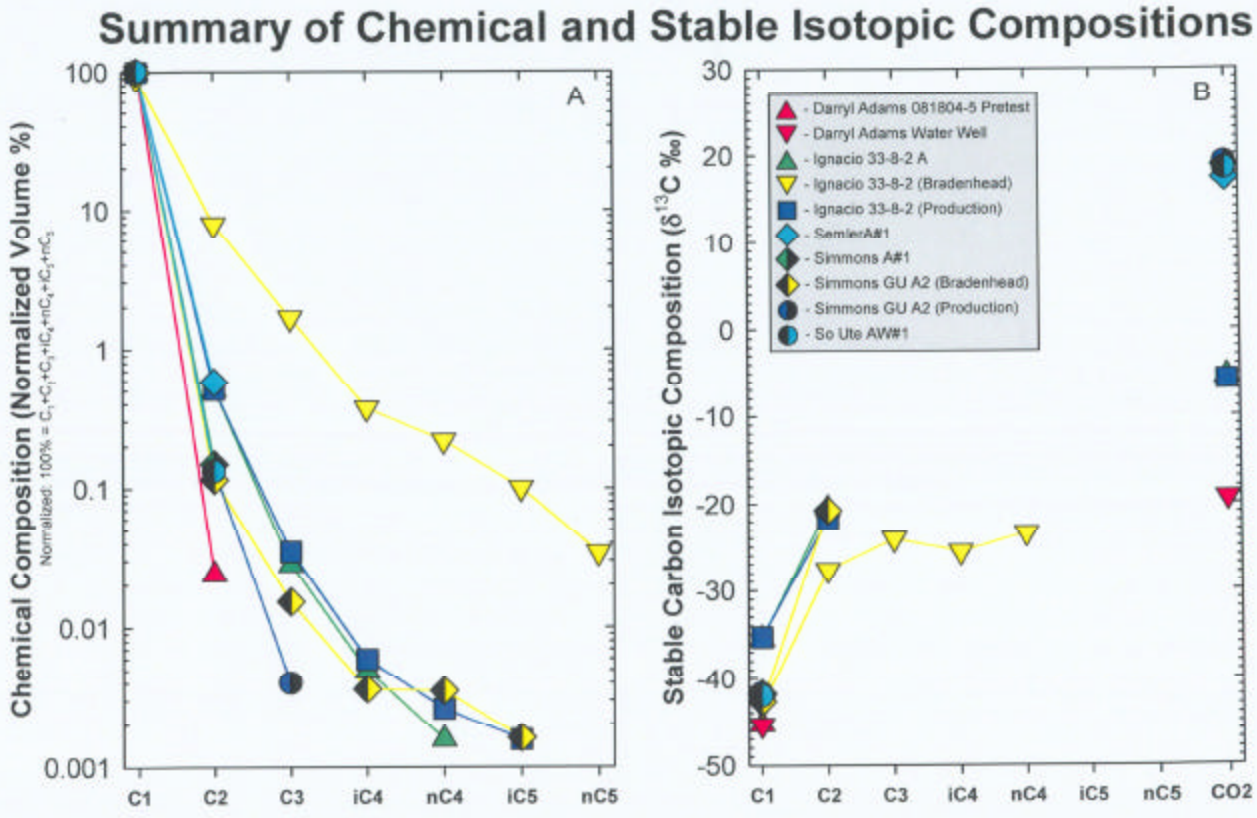

Figure 2: On these plots, the chemical (A) and stable isotopic (B) compositions of the subject gas samples are summarized. The gas from the Ignacio 33-8-2 (Bradenhead) contains significantly more wet gas constituents (C_2, C_3, etc.) than any other gas. The gas from the Darryl Adams water well is the driest having less wet gas constituents than any of the other gases.

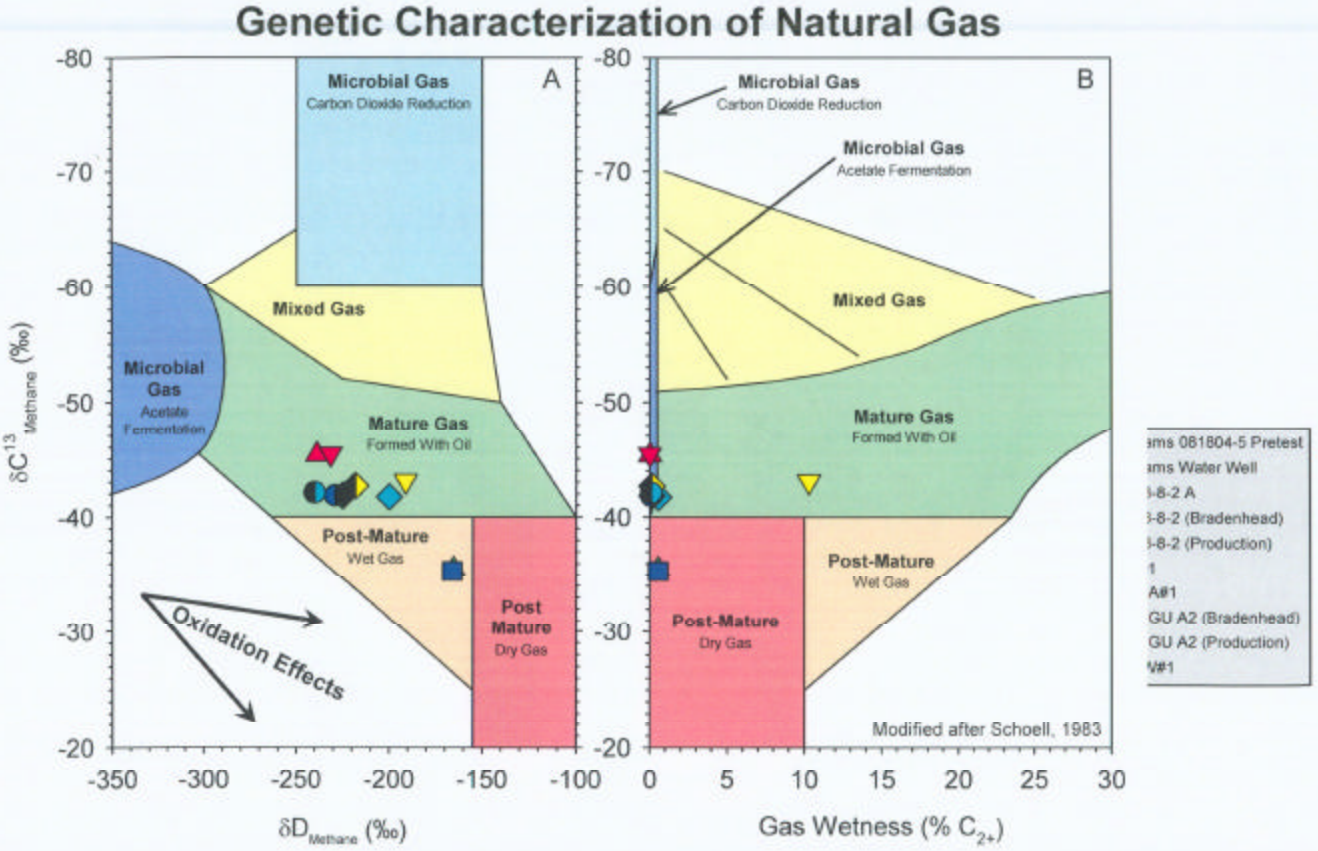

Figure 3: The stable carbon and hydrogen isotopic composition (δC^{13} and δD) of methane provides information about its genetic origin (Schoell, 1983; Whiticar et al., 1986 and Coleman et al., 1990). On plot A the hydrocarbon gases from Darryl Adams and most of the subject gas wells cluster within the "Mature Gas" region with the gases from the Ignacio 33-8-2 A and Ignacio 33-8-2 (Production) gas well plotting in "Post Mature" region. The very low gas wetness (C2+ < 0.02%) of the gases from the Darryl Adams water well suggests they represent microbial (acetate fermentation) methane that was generated within the shallow aquifer and subsequently oxidized (arrows illustrate the direction the carbon and hydrogen isotopic compositions can change as methane is oxidized).

San Juan Basin Data (Rice, 1993)

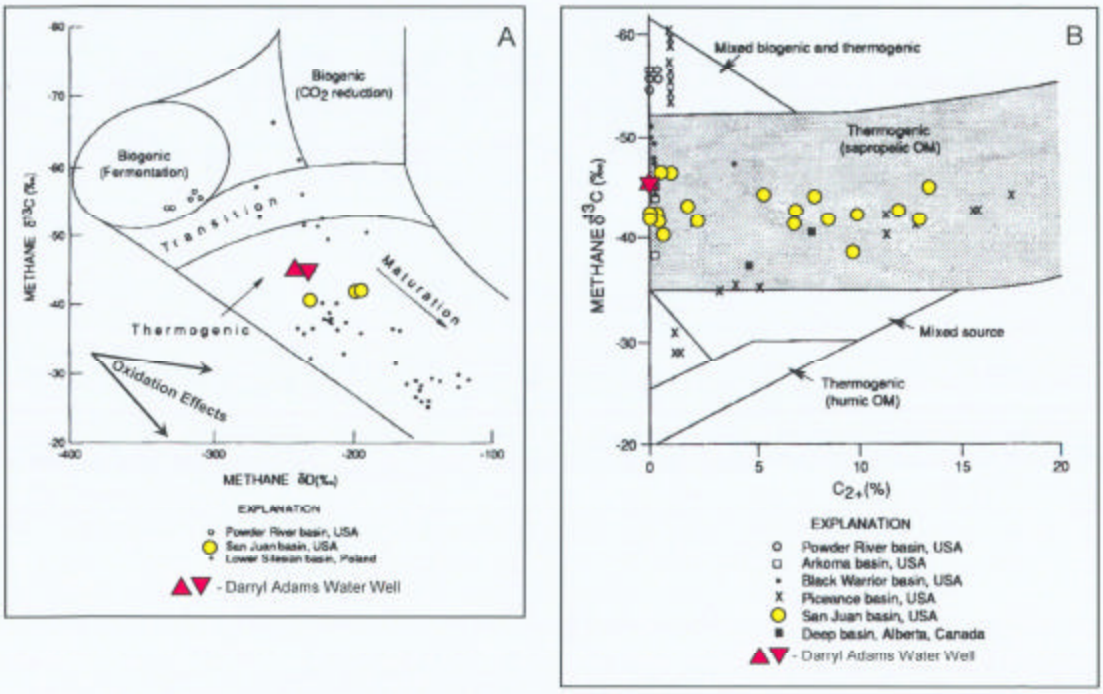

Figure 4: Plots A and B above are from Rice (1993) and summarize the chemical and stable isotopic compositions of various western states coal gases. Plots A and B above are equivalent to the compositional plots A and B shown in Figure 3. Highlighted by the yellow colored circles are gases from the San Juan basin (Rice, 1993). The gases collected from the Darryl Adams water well are generally similar but do not exactly match chemically or isotopically any recently collected gases from the subject gas wells or other San Juan Basin gases presented by Rice (1993).

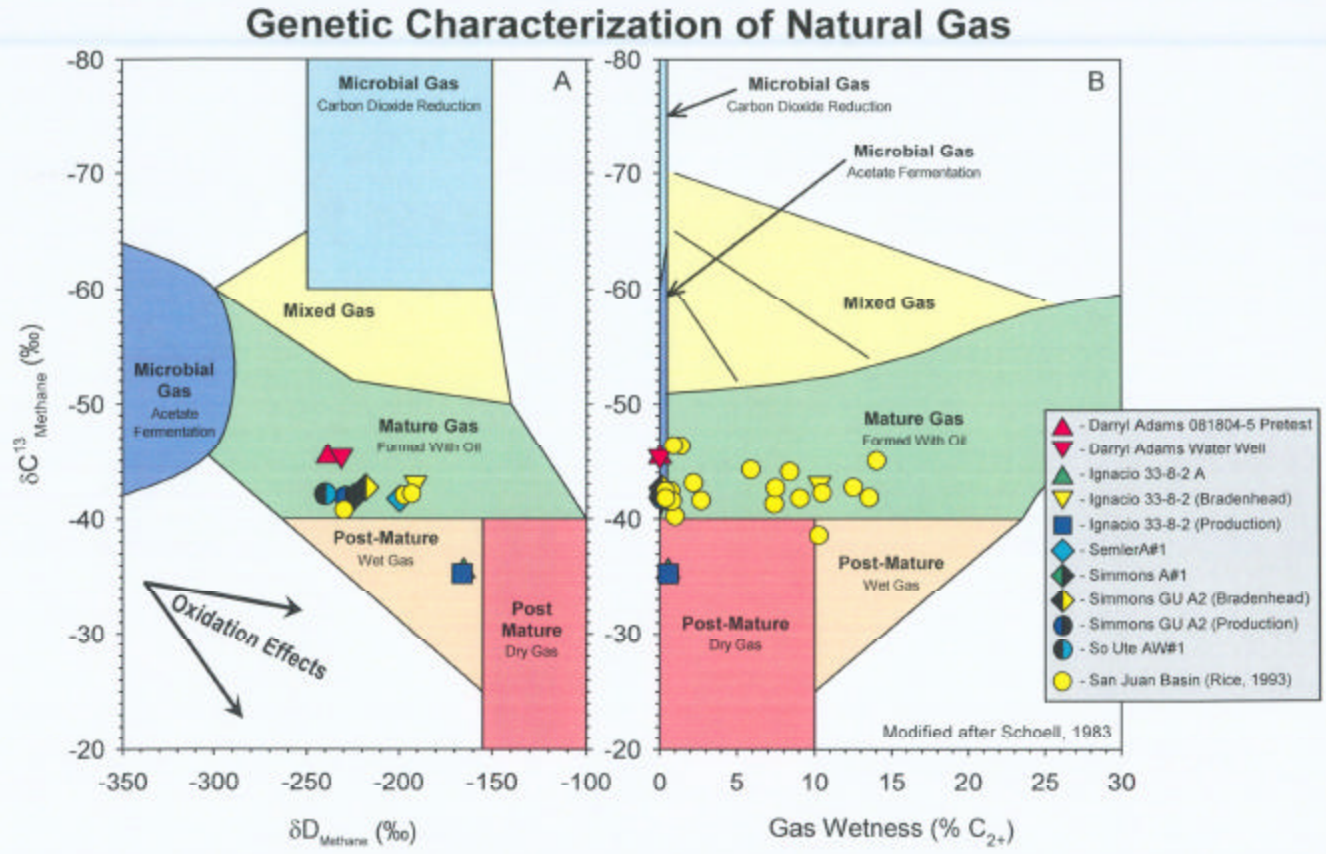

Figure 5. Plots A and B above summarize the data from Figures 3 and 4. Highlighted by the yellow colored circles are gases from the San Juan basin in Rice (1993). The gases from the Darryl Adams water well, in general, plot near or within the range of San Juan basin gases including those recently collected from the subject gas wells. The gases collected from the Darryl Adams water well are generally similar but do not exactly match chemically or isotopically any recently collected gases from the subject gas wells or other San Juan Basin gases presented by Rice (1993).

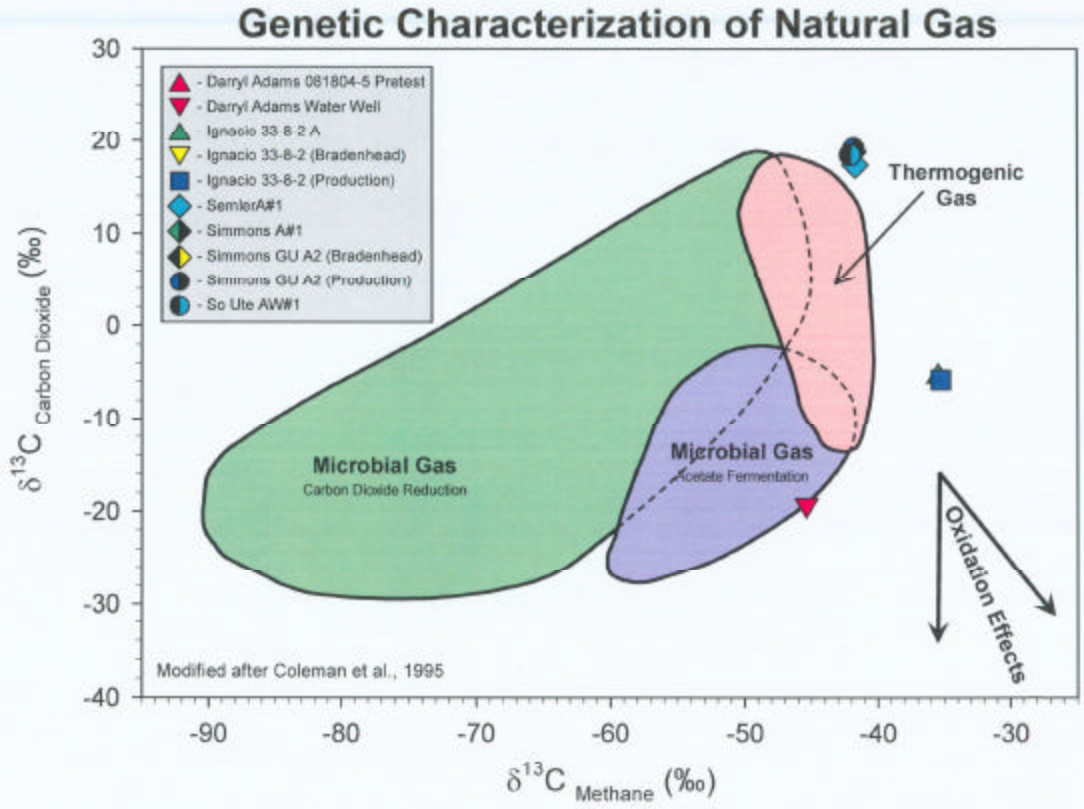

Figure 6: Cross plot of the carbon stable isotopic compositions of methane versus carbon dioxide shows the areas where methane and associated carbon dioxide generated by different processes typically plot (adapted from: Coleman et al., 1990; and Whiticar et al., 1986). These data indicate that the gas from the Darryl Adams water well represents microbial (acetate fermentation) methane, however oxidation of methane can cause the methane to become isotopically less negative and the associated carbon dioxide more negative (arrows illustrate the direction the carbon and hydrogen isotopic compositions can change as methane is oxidized). It is also possible that this gas represents a dry coal bed gas that has been oxidized, shifting its isotopic composition into the microbial gas region. These data do not uniquely distinguish between these two possibilities.

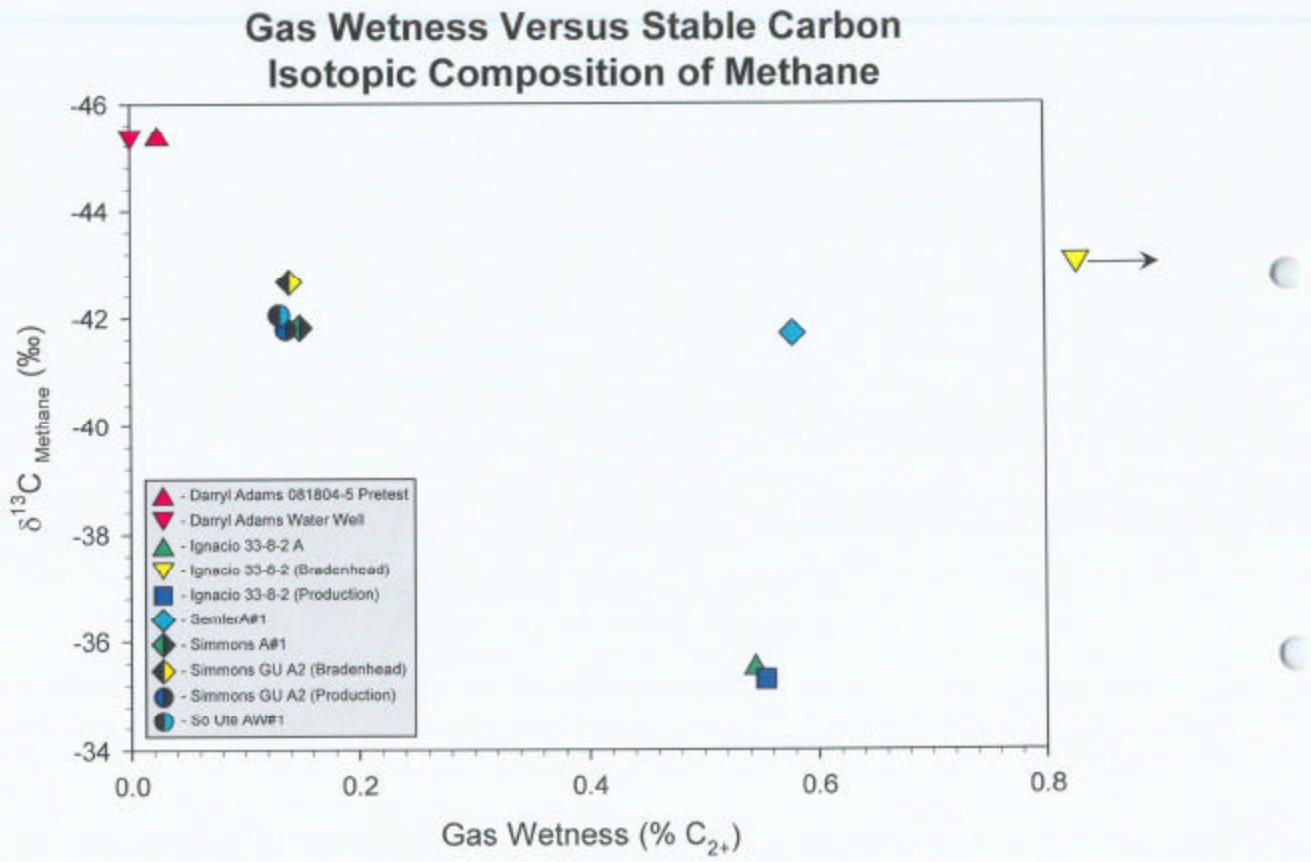

Figure 7: An expanded view of Plot B from Figure 3 better illustrates the chemical and stable isotopic compositional relationships between the gas from the Darryl Adams water well and those from the subject gas wells. These data show that the gases from the Darryl Adams water well are on the order of 10 times dryer, suggesting a predominately microbial origin.

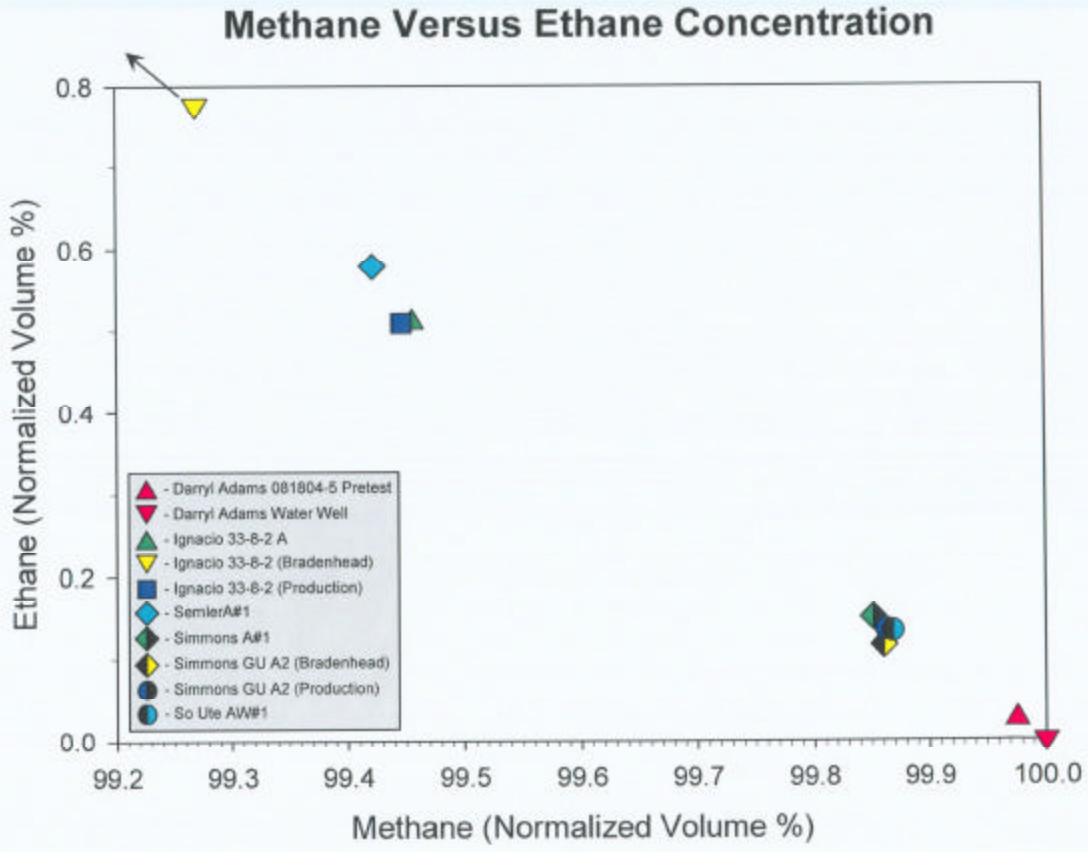

Figure 8: A cross plot of methane concentration versus ethane concentration also illustrates that the gases from the Darryl Adams water well are on the order of 10 times dryer, suggesting a predominately microbial origin.