

April 21, 2009

Jennifer Cummings  
6731 Weld County Road 41  
Ft Lupton, Colorado 80621

RE: Stable Isotope and Gas Composition Analytical Results for Your Water Well  
Section 29 – Township 2 North – Range 65 West  
Weld County, Colorado

Dear Ms. Cummings:

On April 3, 2009 Terracon Inc. of Wheat Ridge, Colorado (Terracon), under direction of the Colorado Oil and Gas Conservation Commission (COGCC), sampled your water well and submitted these samples for laboratory analysis. The purpose of this water sampling was to determine if natural gas drilling and production activities in your area might have impacted your well water. The COGCC has not yet received the results of the general water quality samples collected from your well. We anticipate receiving those results within the next few weeks and will submit those results under another cover letter. Because you observed that gas from your water well could be ignited, the COGCC collected a sample of gas from your water well for compositional analysis and submitted to Isotech Laboratories, Inc. (Isotech) in Champaign, Illinois. A discussion of these sample results and a copy of the Isotech report is enclosed.

### **GAS COMPOSITION**

The gas produced from the oil/gas wells around your home is “thermogenic” methane. Thermogenic methane gas is formed by the thermal breakdown of organic material in rocks resulting from high temperatures created by deep burial. With the methane are other higher carbon number compounds (“heaver”) such as propane (C3), iso-butane (iC4), normal butane (nC4), iso-pentane (iC5), normal pentane (nC5), and hexane (C6). Biogenic methane gas occurs in most near-surface environments and is a principal product of the decomposition of buried organic material. In Weld County many of the coal zones in the Laramie/Fox Hills aquifer, in which your water well is completed, contain biogenic methane gas.

Laboratory results of the gas sample collected from your water well show that methane (80.88 percent) and ethane (0.041 percent) were detected along with nitrogen (16.14 percent), oxygen (1.57 percent), carbon dioxide (1.08 percent), and argon (0.287percent). The nitrogen, oxygen, argon, and carbon dioxide are components of air and the presence of methane (C1) with ethane (C2) is typical of the naturally occurring biogenic gas in the Laramie/Fox Hills aquifer. No “heaver” carbon compounds (those C3 through C6 gasses discussed above) are present that would indicate the presence of thermogenic gas.

### **Isotopic Analysis of Methane**

- The deuterium/hydrogen isotope ratio for the methane in the water sample from your water well is -285.9 parts per mil (‰).
- The carbon-13/carbon-12 isotope ratio for the methane in the water sample from your water well is -72.29 ‰.

### **Isotopic Cross-Plot**

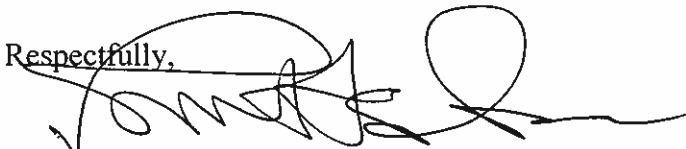
I have included a cross-plot of the stable methane isotopes for your water well sample to help discuss the sample results for your well. On the cross-plot you will notice the area near the top right corner as defined a "Thermogenic Gas". This is the area of the cross-plot that the natural gas produced by the gas wells in the Denver Basin and where the production gas sample plot. Your well plots in the area to the left defined as "Sub-surface/ Near Surface Microbial Gas" which is methane gas of a biogenic origin.

### **CONCLUSION**

Based on the analysis of the gas content and stable isotopes of methane for the gas from your water well, the methane gas present is the product of natural bacteriological activity and unrelated to any oil & gas activities in your area.

The additional water quality sample results for your well are anticipated to be finished within the next few weeks. As discussed above, the COGCC will send you those sample results under a separate cover letter. If you have any questions or would like to discuss these matters further, please contact me at the COGCC in Denver via e-mail ([robert.chesson@state.co.us](mailto:robert.chesson@state.co.us)) or by phone at 303-894-2100, extension 5112.

Respectfully,



Robert H. Chesson, C.P.G., P.G.  
Environmental Protection Specialist

Enclosures

cc: Dave Neslin – COGCC w/o enclosures  
Debbie Baldwin – COGCC w/o enclosures  
Mikel Cox – Noble Energy  
Paul Schneider – Kerr McGee/Anadarko

Lab #: 159784 Job #: 11250  
 Sample Name: Cummings Water Well Co. Lab#:  
 Company: Colorado Oil & Gas Conservation  
 Date Sampled: 4/03/2009  
 Container: Dissolved Gas Bottle  
 Field/Site Name:  
 Location: Fort Lupton, CO  
 Formation/Depth:  
 Sampling Point:  
 Date Received: 4/06/2009 Date Reported: 4/09/2009

Component	Chemical mol. %	Delta 13C per mil	Delta D per mil	Delta 15N per mil
Carbon Monoxide -----	nd			
Hydrogen Sulfide -----	nd			
Helium -----	nd			
Hydrogen -----	nd			
Argon -----	0.287			
Oxygen -----	1.57			
Nitrogen -----	16.14			
Carbon Dioxide -----	1.08			
Methane -----	80.88	-72.29	-285.9	
Ethane -----	0.0410	-38.65		
Ethylene -----	nd			
Propane -----	nd			
Iso-butane -----	nd			
N-butane -----	nd			
Iso-pentane -----	nd			
N-pentane -----	nd			
Hexanes + -----	nd			

Total BTU/cu.ft. dry @ 60deg F & 14.7psia, calculated: 820  
 Specific gravity, calculated: 0.642

Remarks: Analysis is of gas extracted from water by headspace equilibration. Analysis has been corrected for helium added to create headspace. Helium dilution factor = 0.56

Isotope data for ethane generated using online GC-C-IRMS method.

nd = not detected. na = not analyzed. Isotopic composition of carbon is relative to VPDB. Isotopic composition of hydrogen is relative to VSMOW. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %. Chemical analysis based on standards accurate to within 2%

Typical Compositional Ranges of Methanes - Cummings Water Well

