



DEPARTMENT OF NATURAL RESOURCES
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September 29, 2006

704701

Ms. Karen Vasseur
12960 Hayesmount Road
Commerce City, Colorado 80022

RE: Water Quality Analytical Results for Your Water Well
Section 26 - Township 1 South - Range 65 West
Adams County, Colorado; Complaint No. 200095595

Dear Ms. Vasseur:

On September 6, 2006 the Colorado Oil and Gas Conservation Commission (COGCC) sampled your water well and submitted the samples for laboratory analysis. The purpose of this water sampling was to evaluate overall water quality for your well water and investigate if oil & gas activities in your area, specifically unauthorized disposal of fresh-water drilling mud into an adjacent former gravel pit, may have impacted your well. The water samples were submitted to Severn Trent Laboratories, Inc. (STL) in Arvada, Colorado, for analysis of inorganic chemical constituents, organic compounds associated with petroleum hydrocarbons, methane gas, and pH. Copies of the laboratory analytical reports are enclosed.

This letter summarizes the analytical laboratory results of the water samples collected from your well on September 6, 2006. The Water Quality Control Commission (WQCC) of the Colorado Department of Public Health and Environment (CDPHE) has established drinking water standards for the protection of human health. The analytical results from the water samples from your wells have been compared to applicable ground water and/or drinking water standards and are summarized below. Please keep in mind that these water standards were established for public drinking water supplies. Often people use and consume ground water from private wells that can exceed these standards.

COMPARISON OF INORGANIC ANALYTICAL RESULTS TO STANDARDS
(Please see enclosed STL Report)

- **Total Dissolved Solids (TDS):** CDPHE has established a TDS standard for human drinking water of 500 milligrams per liter (mg/l). The standard is called the secondary maximum contaminant level (SMCL) and is based on the aesthetic quality of the water (such as taste and odor) and is intended as a guideline for public water supply systems and is not an enforceable standard. Although CDPHE does not have an agricultural standard for TDS, other agencies recommend concentrations below 2,000 mg/l for irrigation, and below 5,000 mg/l for most

livestock watering. TDS concentrations are related to the presence of naturally occurring elements and chemical compounds such as chloride, sodium, potassium, calcium, magnesium, and sulfate.

TDS was detected in the water sample from your water well at a concentration of 440 mg/l, which below the CDPHE (SMCL) water standard, below than the recommended maximum concentration for irrigation, and below the recommended maximum concentration for most livestock watering.

- Sodium (Na): Although CDPHE does not have a standard for sodium, people on salt restricted diets should be aware of the Na concentration in the water they drink. A concentration of drinking water with a concentration of sodium less than 20 mg/l is recommended by some for people on salt restricted diets or for people suffering from hypertension or heart disease. Sodium occurs naturally in the ground water in many areas at concentrations that exceed the recommended level.

Sodium was detected in the water sample from your well at a concentration of 69 mg/l, which is greater than the recommended level for people on salt restricted diets.

- Chloride (Cl): The CDPHE chloride standard (SMCL) for drinking water is 250 mg/l. Chloride concentrations in excess of 250 mg/l usually produce a noticeable taste in drinking water.

Chloride was detected in the water sample from your water well at a concentration of 18 mg/l, which is below the CDPHE (SMCL) water standard.

- Sulfate (SO₄): The CDPHE sulfate standard for drinking water is 250 mg/l (SMCL). Although CDPHE does not have an agricultural standard for sulfate, other agencies recommend a concentration below 1,500 mg/l for livestock watering. Waters containing high concentrations of sulfate, typically caused by the leaching of natural deposits of magnesium sulfate (Epsom salts) or sodium sulfate (Glauber's salt), may be undesirable because of their laxative effects. Sulfate occurs naturally in the ground water in many areas in Colorado at concentrations that exceed the drinking water standard.

Sulfate was detected in the water sample from your water well at a concentration of 140 mg/l, below the CDPHE SMCL water standard and below the recommended concentration for livestock watering.

- Total Nitrate (NO₃) + Nitrite (NO₂) as Nitrogen (N): The CDPHE total nitrate (NO₃) + nitrite (NO₂) as nitrogen (N) for standard for human drinking water is 10 mg/l. Nitrate and nitrite are common contaminants in ground water from agricultural sources, such as fertilizer and animal, including human, wastes. They are known to cause infant cyanosis or "blue baby disease" in humans and, at concentrations greater than 100 mg/l as nitrogen (N), may be

dangerous to livestock. High concentrations of nitrate and nitrite in ground water are known to occur in agricultural areas in Colorado.

Total nitrate/nitrite, as N was not detected in the sample from your well.

- Iron (Fe): The CDPHE standard for human drinking water for iron is 0.3 mg/l (SMCL). Small amounts of iron are common in ground water. Iron may produce a brownish-red color in laundered clothing, can leave reddish stains on fixtures, and impart a metallic taste to beverages and food made with it. After a period of time iron deposits can build up in pressure tanks, water heaters, and pipelines, reducing the effective flow rate and efficiency of the water supply.

Iron was detected in the water sample from your well at a concentration of 0.11 mg/l, which is less than the CDPHE SMCL.

- Selenium (Se): The CDPHE selenium standard for human drinking water is 0.05 mg/l and the agricultural standard is 0.02 mg/l. Excessive selenium (Se) (concentrations greater than 0.05 mg/l) can cause loss of hair and/or fingernails as well as adverse effects on the central nervous system. Selenium (Se) occurs naturally in the ground water in many areas of Colorado at concentrations that exceed the drinking water standard.

Selenium was not detected in the water sample from your well.

- Calcium (Ca), Potassium (K), Bromide (Br), Magnesium (Mg), Bicarbonate (HCO_3) and Carbonate (CO_3) were also tested for in your water. There are no standards from CDPHE for these parameters. In addition, the COGCC also collected samples for metals and the Table 1 (attached) presents the analytical laboratory results. Please note that Primary standard (P) is the CDPHE Human Health Standard and the Secondary standard (S) is the CDPHE secondary maximum contaminant level (SMCL).

Table 1
VASSEUR WATER WELL

| METAL/INORGANIC | September 6, 2006 Sample Concentration (in Milligrams per liter [mg/l]) | CDPHE Water Quality Standard (P – Primary S-Secondary) |
|-----------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Arsenic (Ar) | ND | 0.05 (P) |
| Barium (Ba) | 0.045 | 2.0 (P) |
| Cadmium (Cd) | ND | 0.005 (P) |
| Chromium (Cr) | ND | 0.1 (P) |
| Lead (Pb) | ND | 0.05 (P) |
| Silver (Ag) | ND | 0.05 (S) |
| Manganese (Mn) | 0.049 | 0.05 (S) |
| Potassium (K) | ND | NS |
| Magnesium (Mg) | 17 | NS |
| Calcium (Ca) | 590 | NS |
| pH | 7.9 pH units | NS |

NS – no standard

ND – not detected in the sample

CDPHE – Colorado Department of Public Health and Environment

ORGANIC COMPOUNDS ASSOCIATED WITH PETROLEUM HYDROCARBONS
(please see enclosed STL METHOD E 602/SW 8021B, BTEX DATA REPORT)

- Benzene: CDPHE's basic ground water standard for benzene is 5 micrograms per liter ($\mu\text{g/l}$). **Benzene was not detected in the sample from your water well.**
- Toluene: CDPHE's basic ground water standard for toluene is 1,000 $\mu\text{g/l}$. **Toluene was not detected in the sample from your water well.**
- Ethylbenzene: CDPHE's basic ground water standard for ethylbenzene is 680 $\mu\text{g/l}$. **Ethylbenzene was not detected in the sample from your water well.**
- Total Xylenes (sum of m,p, and o-xylene): CDPHE's basic ground water standard for total xylenes is 10,000 $\mu\text{g/l}$. **Total xylenes were not detected in the sample from your water well.**

METHANE GAS CONCENTRATION

- **Methane was not detected in the sample from your water well.**

Methane gas alone is physiologically inert and non-toxic to humans. Normal breath exhalation contains 1 to 99 ppm of methane (parts per million [ppm] is the same units as mg/l). The presence of methane in drinking water does not present a known health hazard to humans or other animals via ingestion; however, methane in domestic water supplies can be associated with

undesirable and potentially serious side effects. The following discussion is provided as background information.

Methane gas dissolved in water “exsolves” when exposed to the atmosphere and dissipates rapidly because it is lighter than air. This is often responsible for the “fizzing” observed in water wells that may contain methane gas. If the methane occurs at a high enough concentration and if it is allowed to accumulate in a confined space, such as a well pit, crawl space, closet, etc., an explosion hazard can be established. In addition, if methane concentrations in well water are high, then pockets of free gas form within the water and cause the well pump to cavitate and no longer bring water to the surface.

Methane gas is common in water wells in Colorado. It occurs naturally and the source of the methane is commonly from one or more of the sources listed below.

1. Methane is commonly found as a gas in coal or black shale seams in the subsurface.
2. Methane is often found as a byproduct of the decay of organic matter and the presence of bacteria in water wells can provide the conditions favorable for the production of methane either from the activity or decay of bacteria.

As the result of extensive testing for methane gas in water wells throughout Colorado, concentrations of methane gas below 1 mg/l are considered harmless, with concern for possible hazards from the methane increasing at concentration levels in well water at 7 mg/l and higher.

DRILLING MUD SAMPLE

As part of the COGCC’s investigation of the drilling mud disposal into the former gravel pit, a sample of the recently disposed drilling mud was also collected on September 6, 2006. The sample was submitted to the laboratory for characterization. The following table (Table 2) displays the analytical results for the drilling mud sample.

**TABLE 2
 DRILLING MUD SAMPLE**

| Analyte | September 6, 2006 Sample Concentration (in Milligrams per liter [mg/kg]) | COGCC Soils Standard (mg/kg) |
|----------------------------------|-----------------------------------------------------------------------------------|------------------------------------|
| Gasoline Range Organics (GRO) | 1.8 | 1,000 |
| Diesel Range Organics (DRO) | 150 | 1,000 |
| Xylenes (total) | 0.11 | NS |
| Benzene | ND | NS |
| Ethylbenzene | ND | NS |
| Toluene | ND | NS |
| Barium (Ba) | 48 | 180,000 |
| Iron (Fe) | 4,800 | NS |
| Chromium (Cr) | 5.3 | 1,500 |
| Lead (Pb) | 5.8 | 300 |
| Alkalinity (total) | 56 | NS |
| Manganese (Mn) | 71 | NS |
| Potassium (K) | 980 | NS |
| Sodium (Na) | 710 | NS |
| Magnesium (Mg) | 1,800 | NS |
| Calcium (Ca) | 5,500 | NS |
| Chloride (Cl) | 180 | NS |
| Sulfate (SO ₄) | 480 | NS |
| Arsenic (As) | ND | 41 |
| Cadmium (Cd) | ND | 26 |
| Bromide (Br) | ND | NS |
| pH | 10 pH units | 6 - 9* |
| Sodium Adsorption Ratio (SAR) | 2.12 | Less than 12* |

*- reclamation standard
 ND - not detected
 NS - no standard

All compounds of interest are below COGCC standards and are at concentrations well below any concerns either from direct contact or leachability to shallow ground water.

CONCLUSION

There are no indications of any oil & gas related impact to your water well. Because your water well exceeded the health advisory for sodium (Na₀), and because you or your livestock and/or pets drink your water, you may wish to discuss the possible health effects of continued consumption with your physician and/or veterinarian.

The sample collected of the drilling mud from the pit had concentrations of all compounds of interest well below any level of concern from either direct contact or potential leachability to ground water. I have attached some photographs of the pit that I took on September 6, 2006.

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) or by phone at 303-894-2100, extension 112.

Respectfully,

A handwritten signature in black ink, appearing to read 'Robert H. Chesson', written in a cursive style.

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

Enclosures

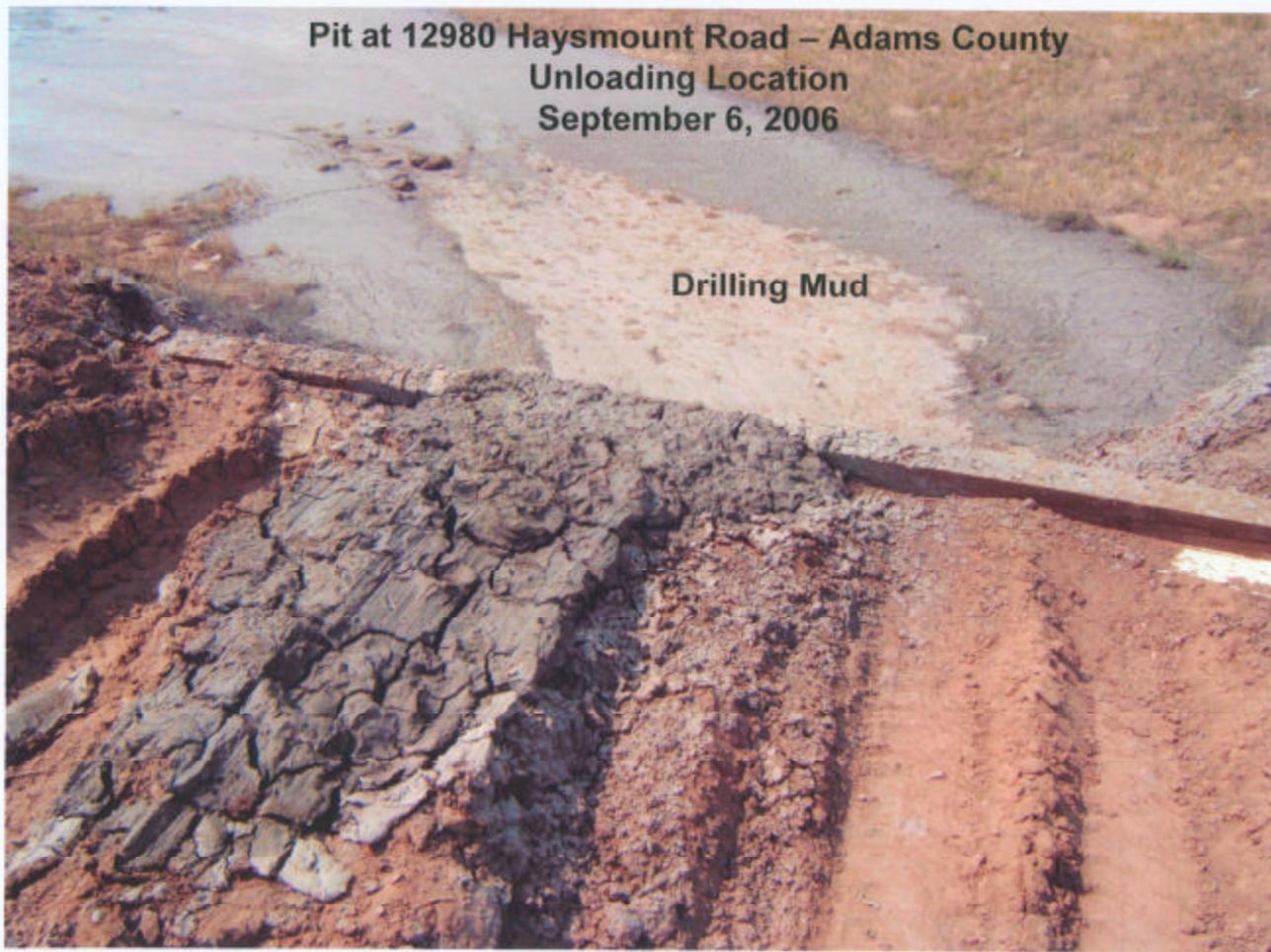
cc: Brian Macke – COGCC w/o enclosures
Debbie Baldwin – COGCC w/o enclosures
David Dillon – COGCC w/o enclosures
Jim Precup – COGCC w/o enclosures

**Pit at 12980 Haysmount Road – Adams County
September 6, 2006**

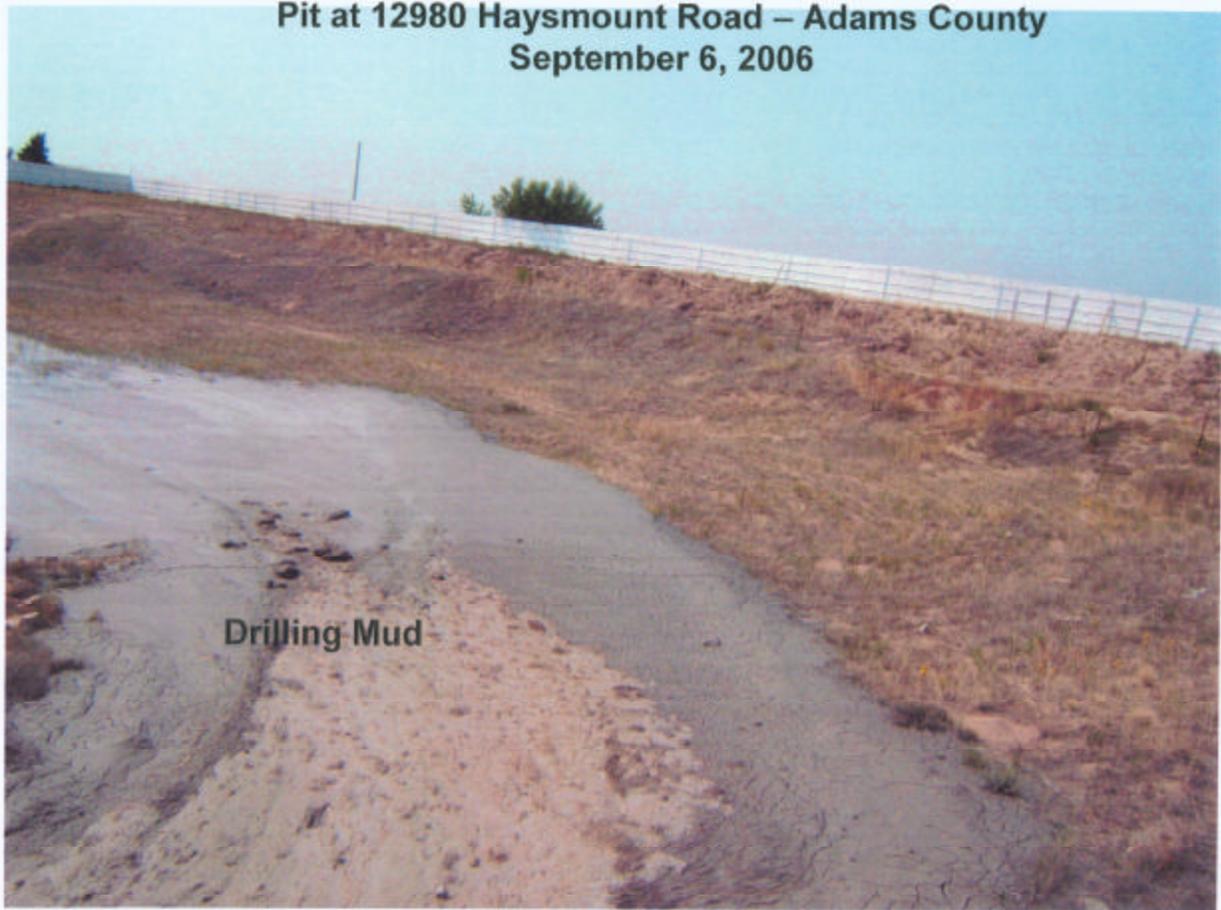


**Pit at 12980 Haysmount Road – Adams County
Unloading Location
September 6, 2006**

Drilling Mud



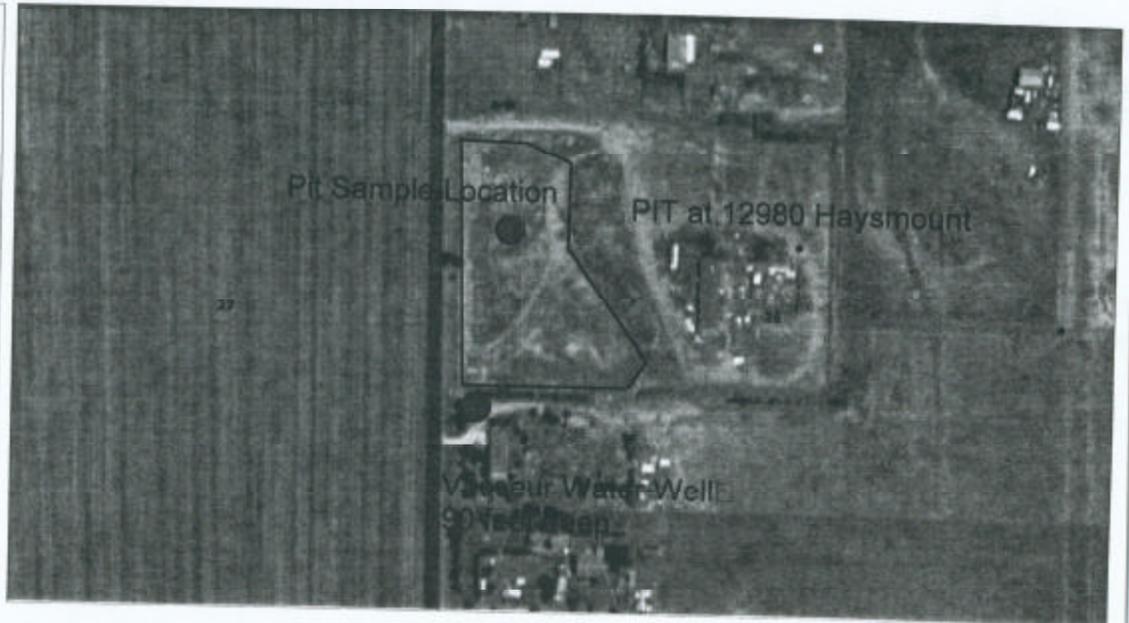
**Pit at 12980 Haysmount Road – Adams County
September 6, 2006**



Drilling Mud

COGCC GIS Online

-  Red Lines
- OIL AND GAS WELLS**
 -  Oil and Gas Wells
 -  Directionals
-  **ONSITE INSPECTION**
- CITIES TOWNS PLACES**
 -  Towns and Places
- ROADS AND RRS**
 -  Major Highways
- WATER RESOURCES**
 -  Water Wells
- COGCC POLICIES/RULES**
 -  PiceanceOrder139-43Buffer
 -  Piceance DOE Notice
- SAN JUAN BASIN**
 -  Fruitland PC
-  **MUNICIPAL BOUNDARIES**
-  AERIAL PHOTO



VASSEUR WATER WELL (90' DEEP). WHITE
FENCE IN BACKGROUND IS ON EDGE OF PIT.





PIT AT 12980 HAYSMOUNT (AT ENTRANCE)



PIT AT 12980 HAYS MOUNT. WHITE
FENCE BOUNDARY WITH VASSEUR
PROPERTY.



PIT AT 12980 HAYSMOUNT RD