Miller Water Well

Proj# 2059

Document 2527149

Bill Barrett Corporation

June 16, 2010

Ms. Linda Spry O'Rourke
COGCC
1120 Lincoln St., Ste 801
Denver, CO 80203

Re: Bill Barrett Corporation Proposed Investigation Activities for the Miller Water Well Issue

Dear Ms. O'Rourke;

The Bill Barrett Corporation (BBC) has been voluntarily proceeding with investigation activities related to the recent occurrence of thermogenic methane gas in the Miller water well in Section 31, Township 6S and Range 91W in Garfield County, Colorado.

Please find the attached proposed scope of work prepared by LT Environmental (LTE) after discussions with BBC and COGCC. As we discussed yesterday by phone, we believe that the first step should be looking for direct correlation between bradenhead gas from the two wells with slightly elevated bradenhead pressure and the gas detected in the Miller water well. It is questionable whether this will provide an accurate delineation regarding an exact correlation but it may still provide valuable information.

In addition, LTE will complete soil gas surveys on the four pads with wells close to the subject water well (Miller 1, 7, GGU 11-32, and GGU Barge 1). LTE will also complete a soil gas survey in the area of the Miller water well as well as a survey of all structures in the area for combustible gas levels. Any gas samples collected will be analyzed in an approximate 7-day turnaround.

We will compile the data from these investigatory activities and provide it to COGCC as soon as practicable after completion. We will provide notice to LTE as soon as this scope of work has been reviewed and approved by the COGCC. LTE can begin within five business days of that notice.

Please call me at 303-312-8191 or email at *SDonato@BillBarrettCorp.com* if you have any questions or concerns.

Sincerely,

BILL BARRETT CORPORATION

Scot A. Donato, P.G.
Manager, Governmental Affairs

SAD/bh

cc: Scott Ghan; BBC, Brian Dodek; LTE, File

1099 18TH STREET
SUITE 2300
DENVER, CO 80202
P 303.293.9100
F 303.291.0420

COMPLIANCE / ENGINEERING / REMEDIATION

LT Environmental Inc.
820 Megan Avenue, Unit B
Rifle, Colorado 81650
T 970.285.9985 / F 970.285.2467

June 16, 2010

Mr. Scott Ghan
Environmental Health & Safety Coordinator
Bill Barrett Corporation
112 Red Feather Trail
Silt, Colorado 81652

RE: Miller Water Well Soil Gas Surveys
Garfield County, Colorado

Dear Mr. Ghan:

LT Environmental, Inc. (LTE) is pleased to provide Bill Barrett Corporation (BBC) with this proposal to conduct soil gas surveys associated with the Miller Water Well located in Garfield County, Colorado. This proposal and associated scope of work are based on your email request dated June 8, 2010 and phone conversations with you and BBC on June 9, 2010 and with BBC and COGCC on June 15, 2010.

Site Background

LTE understands that the Colorado Oil and Gas Conservation Commission (COGCC) staff has requested soil gas surveys to evaluate recently discovered thermogenic methane gas in the Miller water well.

Scope of Work

LTE has proposed a scope of work to address the COGCC's concerns that is based on our experience in addressing similar issues in the Piceance, San Juan, Raton, and DJ Basins of Colorado. Details pertaining to our field methods, rationale for this scope of work, and experience are summarized at the end of this proposal. The scope of work has been divided into the following five tasks.

Task 1 – Evaluation of Geochemical Data From Surrounding Production Wells

LTE recommends that BBC further assess Bradenhead casing integrity in those wells with potential pressure buildup. Our understanding is that this has been completed by BBC in conjunction with the COGCC. LTE recommends collecting gas samples from the Bradenhead at production wells in question. It is our understanding that this task has also been completed.

Once representative samples have been collected from these wells, LTE will contract a highly qualified professional to analyze the compositional and isotopic signatures from the various potential sources (production/casing gas) at the production wells. This data will be compared to

the Miller water well geochemical data to determine if any correlations can be made between the production/casing gas and the thermogenic gas now documented in the water well.

Task 2 – Soil Gas Survey at the Miller Water Well

LTE will perform a soil gas survey in the vicinity of the Miller water well. LTE has assumed that BBC has acquired property access to conduct all the surveys proposed herein. LTE will create a sampling grid centered on the water well that is 500 feet by 500 feet with a grid node spacing of 100 feet. This sampling grid results in 36 soil gas survey locations. In addition to the grid, LTE will measure soil gas concentrations at approximately 5 to 10 locations within 20 feet of the water well. This survey protocol will assess the potential that the water well is acting as a preferential migration pathway for gas to the surface and allow for the evaluation of potential risk to human health and the environment from flammable gas in the area surrounding the wellhead. This approach has been utilized by LTE at other well locations across Colorado for the COGCC and oil and gas operators assessing similar conditions. LTE will collect a maximum of 2 soil gas samples for analysis of gas composition; carbon and hydrogen isotopes of methane; and carbon isotopes of ethane and propane (also known as the NG-2 suite of analyses) using Cali-bond® sample bags. Soil gas samples will be collected at survey points with the highest measured gas concentration. If no combustible gases are measured during the survey, no soil gas samples will be collected for laboratory analysis.

Task 3 – Soil Gas Survey at Miller Residence and Associated Structures

One of the potential risks to human health and safety from gas seeps and gas entrained in water well systems is the accumulation of flammable gases in confined areas and other structures such as water well houses, residences, garages, and sheds. As part of this scope of work, LTE will conduct a soil gas survey of all the structures on the Miller property. The soil gas survey will include survey points around the perimeter of each structure and measurements of ambient air conditions within the interior portions of each structure, particularly basements. A minimum of 4 exterior survey points will be measured at each structure identified (essentially one point on each side of a 4-sided structure). Additional survey points will be measured as needed around each structure to reasonably assess the potential for gas seeps in close proximity to the structures given anticipated variations in structure size. For the interior portions of the structures, LTE will measure the ambient concentrations of combustible gases in each room of each structure. Measurements will be collected near the ceiling of each room due to density of the gas and the propensity of the gas to accumulate in higher areas.

Soil gas samples will be collected from each area where elevated combustible gases have been detected and sent to Isotech Laboratories (Isotech) in Champaign, Illinois for NG-2 analysis. Air samples from within structures will not be collected as part of this work. If indoor air screening identifies the presence of combustible gases, a more rigorous indoor air sampling program will be recommended.

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Task 4 – Soil Gas Surveys at Four Production Well Pads

LTE will conduct soil gas surveys at each of four production well pads in the vicinity of the Miller Water Well (Barge #1, GGU 11-32, Miller 7, and Miller 1). LTE will conduct a soil gas survey at each pad using a grid sampling method with the sample grid measuring 300 feet by 300 feet centered on the production well(s) on each well pad. The grid node spacing will be 100 feet resulting in 16 survey points per pad. An additional 5 to 10 survey points will be measured within 20 feet of each production well casing on each pad. LTE will collect a maximum of 2 soil gas samples for NG-2 analyses using Cali-bond® sample bags at each production well pad. Soil gas samples will be collected at survey points with the highest measured gas concentration. If no combustible gases are measured during the survey, no soil gas samples will be collected for laboratory analysis.

Task 5 – Report Preparation

Upon completion of the field activities, LTE will prepare a written summary of the procedures and results of the investigation. The report will summarize the laboratory analytical results in tabular format. Figures will be created using our Geographic Information System (GIS) to illustrate the survey locations across the study area. Gas concentrations will be illustrated with graduated symbols for each measurement location.

Schedule

LTE can begin the proposed scope of work within 5 days of a notice to proceed. LTE must be allowed sufficient time to call in utility locates for each survey area in accordance with Colorado Law.

The field work will require approximately 2 days to complete. A comprehensive draft report will be delivered in electronic format within 10 days of the receipt of laboratory analytical results. Expedited turnaround will be requested. Rush service at 7 days incurs a 100% laboratory upcharge. A final report will be delivered to BBC within 2 days following receipt of comments on the draft report.

Planned Field Methods

LTE's field methods for soil gas survey can vary depending on project objectives. LTE has the capability of conducting a traditional soil gas survey using a slide hammer, probe, and tubing and measuring gas concentrations using a combustible gas meter, flame-ionization detector, or landfill gas meter.

The traditional soil gas survey method described above is preferred for gas seep screening applications where no known seeps exist and the project requires screening for the presence or absence of gas seeps. This method has some inherent bias in sampling and can falsely elevate

actual seep conditions but is sufficient for initial screening. As part of this method, a slide hammer is used to drive a 0.5-inch diameter steel rod into the soil to a depth of approximately 3 feet to 4 feet below ground surface (bgs). Polyethylene tubing with perforations along the bottom 6-inches is inserted into the boring and sealed with native material at the surface. The field meter is connected to the tubing and allowed to measure the gas concentrations. LTE records the peak concentration reported by the field meter over a period of approximately 1 minute to 2 minutes of monitoring. LTE utilizes a GPS to record the geographic position and the gas concentration at each survey point. LTE will report the field concentrations of methane from each survey point on a map with graduated symbols to display ranges in concentration.

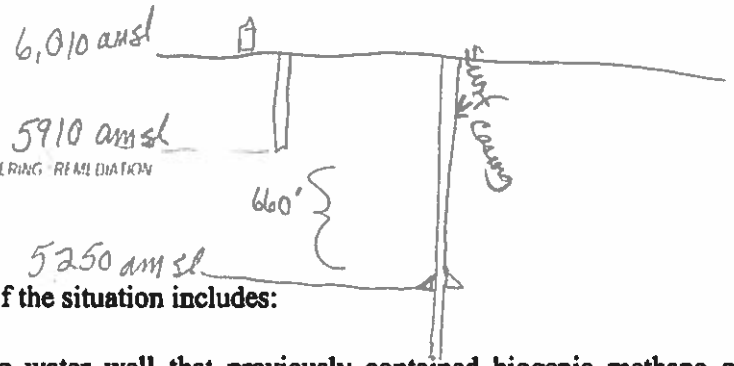
LTE also owns and operates one of 30 portable gas flux meters in the United States. This unit is ideal for quantifying gas seep fluxes across a given area. The unit is designed to measure gas mass flow rates seeping from the ground surface. A portable accumulation chamber is used to measure the increasing concentration of methane, hydrogen sulfide, and carbon monoxide over time without destruction of the gas; without influence to ambient conditions; and with a very high degree of accuracy and precision. The flux rates measured are modeled over the survey area to quantify total gas emissions on a mass per area per day basis.

Soil gas sampling is performed using the borehole and tubing method and a hand pump to inflate a mylar lined Cali-bond® sample bag with soil gas from the subsurface. The sample bags are shipped by a licensed Department of Transportation (DOT) hazardous materials shipper to Isotech. Laboratory analysis (NG-2) includes gas composition which reports mole percent concentrations of hydrogen, nitrogen, oxygen, carbon dioxide, helium, argon, neon and hydrocarbons in the C1 through C6 carbon range. Isotopic analysis of carbon and hydrogen isotopes of methane and carbon isotopes of ethane and propane will also be conducted and reported in the analytical report as part of the NG-2 suite. Results will also be reported in air-free concentration as is frequently requested by the COGCC.

Though it is unlikely that surface water will need to be sampled during this investigation, LTE will be prepared to conduct surface water sampling if seep conditions within surface water are observed. The inverted bottle/water displacement gas sampling method for surface water uses a laboratory provided bottle preserved with benzalkonium chloride that is flooded, inverted, and placed over the visible seep to capture the rising gas. The gas collected in the bottle displaces the water and fills the bottle with gas for analysis. The bottle is shipped inverted with a water seal to prevent leakage of the gas during shipping.

Scope of Work Rationale

The proposed scope of work is based on LTE's experience with similar situations in the Piceance, DJ, Raton, and San Juan Basins. When developing the scope of work, we considered the geologic conditions; potential sources of impact; potential conduits for migration of gas; and potential risk to human health and safety.



Our current understanding of the situation includes:

- The Miller domestic water well that previously contained biogenic methane gas was recently found to contain thermogenic methane gas;
- Domestic water well is located within 0.5 miles of six natural gas production well pads;
- The domestic water well is 100 feet deep with a top elevation of 6,010 feet above mean sea level (amsl) and a bottom of well elevation of 5,910 feet amsl. No groundwater elevation data is reported in available records;
- Production wells in the vicinity of the Miller Water Well produce from the Williams Fork and Rollins Formations. The top of the Williams Fork production interval, being the shallowest, is at an elevation of approximately 1,100 feet amsl, Bradenhead casing is generally installed from the ground surface (6,010 feet amsl) to approximately 5,250 feet amsl;
- There are no mapped fractures/faults in the vicinity of the project area;
- The geologic formations outcropping in the project area are the Wasatch and Ohio Creek Formations. Low lying areas and valleys are known to contain deposits classified as Young Gravels. Other than the Wasatch, these formations and deposits are generally not known to be charged with thermogenic natural gas. Gas seeps that have been identified as being sourced from the Ohio Creek Formations or the Young Gravel deposits are not common in the region, if any. It is well documented that the Wasatch Formation contains thermogenic gas in this area; and
- BBC has identified production wells in the project area with potential pressure buildup in the bradenhead casing during recent bradenhead shut-in tests. BBC operates its wells in this area with the bradenhead valves in the open position.

Based on our understanding, the potential sources of the thermogenic gas detected in the Miller Water Well include the following:

- Wasatch, Williams Fork and/or Rollins Formations; conduit
- Natural gas production wells; and/or
- Other unknown source such as coalbeds in formations between the interval accessed by the water well and the Williams Fork and Rollins Formations.

Based on the geologic conditions and existing infrastructure the potential conduits for gas migration include the following:

Natural Gas Bearing Interval to the Aquifer

- Seepage of thermogenic gas directly from the Wasatch, Williams Fork and/or Rollins Formations to the aquifer accessed by the Miller Water Well via natural fractures and faults in bedrock comprised generally of sandstone and shale;

- Incomplete seals on production well casings and/or Bradenhead casings allowing the well to become a preferential pathway of migration through the borehole annulus into overlying aquifers;

- Seepage of other gas bearing units such as coalbeds in the aquifer or degassing from units below the aquifer;

Aquifer to the Ground Surface

- Incomplete seals on the Miller well allowing the well to become a preferential pathway of migration through the borehole annulus to the ground surface which may accumulate in nearby structures; and/or

- Groundwater aquifer charged with gas from the Wasatch, Williams Fork and/or Rollins Formations or an unknown source not described here allows for migration of thermogenic gas to the ground surface via natural fractures and faults or diffuse off-gasing through unconsolidated materials.

There are no health standards for methane in ground water. The potential risk to human health, safety, and the environment from thermogenic gas may include the following:

- Ingestion of petroleum hydrocarbons associated with thermogenic gas dissolved in groundwater accessed by the Miller Water Well, though none have been identified to date;

- Accumulation of flammable gas in structures (including water well system) creating a potentially hazardous atmosphere or explosion hazards; and/or

- Displacement of oxygen in the root zone of vegetation at the ground surface resulting in stressed and/or dead vegetative conditions.

Given the aforementioned information pertaining to potential sources, potential conduits of migration, and potential risk to human health and the environment, LTE developed a scope of work that we believe could most efficiently and effectively assess these factors and address the COGCC's concerns regarding the Miller Water Well.

LTE's plan to conduct soil gas surveys on each of the four production pads in the vicinity of the Miller Water Well will evaluate whether the production wells are conduits for migration of gas from the Williams Fork and/or Rollins Formations to the overlying aquifer accessed by the well. LTE has recently completed soil gas surveys at a well pad location south of Silt, Colorado in the Piceance Basin. This incident involved investigation of fugitive gas detected through routine bradenhead pressure testing. LTE has also conducted similar soil gas survey activities implementing a similar scale and scope of work for the COGCC at 79 abandoned production wells in southeast and southwest Colorado and at more than 20 production well sites for other oil and gas operators in Colorado in response to complaints from nearby landowners about gas in water wells.

? LTE's plan to conduct soil gas surveys at the Miller Water Well and nearby structures will evaluate whether the water well is a conduit for gas seeps at the ground surface and assess the potential risk to human health and safety. LTE has conducted similar surveys for the COGCC following explosions at residences and gas seeps identified in the San Juan and Raton Basins and in the gas field in Florence, Colorado. LTE has also conducted similar surveys for oil and gas operators in the DJ, Raton, and San Juan Basins addressing impacts to water wells and observed gas seeps at the ground surface.

For the last 14 years, LTE has conducted similar scales of survey in the San Juan Basin for 5 different oil and gas operators in response to COGCC Orders (112-156 and 112-157) and conditions of approval (COAs) on well drilling permits. Conducting soil gas surveys to identify gas seeps across large portions of the Wasatch and Ohio Creek Formations is not the most effective use of resources given the geologic conditions that would be required to facilitate seepage in these areas. The depth of the potential source and lack of evidence of seepage in the area support LTE's approach.

LTE's plans for laboratory sampling are sufficient to characterize any gas seeps identified. LTE's experience in conducting composition and isotopic analysis of gas at gas seeps for the COGCC and oil and gas operators shows that variation in composition depends on the flow rate, which is most affected by the influence of air into the sample stream. Collecting multiple samples of gas composition from a single seep area is a costly method to simply determine extent. If gas seeps No (are identified, the use of LTE's portable gas flux meter is better suited to understand and measure the magnitude and extent of a given seep. Variations in isotopic makeup of the methane gas are generally dependent on the source or sources contributing to the seep. It is generally unnecessary to continue to conduct isotopic analysis on a gas seep if it has already been determined to be thermogenic gas and we understand the gas signature. Multiple sources of gas for a single seep generally blend and exhibit one signature. It is atypical to see multiple isotopic signatures within the same seep. In other words, if we collect one sample for isotopic analysis from a seep around a water well and it is determined to be thermogenic, we wouldn't expect other samples from the same seep around the water well to be biogenic gas.

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LTE Experience and Qualifications

LTE is the leader in conducting soil gas surveys for gas seeps in the Rocky Mountain Region and is the only company in Colorado to have accurately measured flux rates from coalbed methane gas seeps over an area of approximately 50 square miles. We have been monitoring gas seeps in production basins in Colorado since 1996. We have collected gas survey measurements at more than 40,000 locations in Colorado alone at coal outcrops, active and abandoned production well sites, impacted water well sites, orphaned production well sites, leaking pipelines, and former landfill sites. We have specialized equipment, knowledge, and expertise to measure seepage concentrations, flow rates, and extent. We have designed, installed, and operated the only system in the United States that mitigates seepage from a coalbed methane seep and, at the same time, generates electricity from the captured gas and transfers the energy created to the electrical grid. We have extensive experience assessing impacts to water wells from oil and gas operations and designing and installing treatment systems for impact water wells.

LTE appreciates the opportunity to provide environmental services to BBC. If you have any questions regarding this proposal, please contact me at (303) 433-9788.

Sincerely,

LT ENVIRONMENTAL, INC.

John D. Peterson, P.G.
Principal/Senior Geologist