



August 12, 2009

Ms. Karen Spray  
Colorado Oil and Gas Conservation Commission  
1120 Lincoln Street, Suite 801  
Denver, Colorado 80203

RE: February 3, 2009 Methane Seep Survey and Other Activities  
Bondad, Colorado

Dear Ms. Baldwin:

LT Environmental, Inc. (LTE) is pleased to provide the Colorado Oil and Gas Conservation Commission (COGCC) with this letter summarizing the results of the 19<sup>th</sup> methane seep survey conducted on July 28, 2009 at the Bondad Gas Seep Site (Site) located in Bondad, Colorado. This is the 11th survey since drilling and re-completion activities were conducted at the Bryce 1-X (API #05-067-09087) well between late July 2006 and early August 2006.

## BACKGROUND

At the request of the COGCC, LTE conducted an initial methane gas seep survey of the Site in response to an explosion of a residence located at 4034 US Highway 550 (the former Yoakum residence). The results of the initial soil gas survey are presented in the *Methane Seep Survey Report* (March 2005). Additional soil gas surveys were performed on the following dates:

- April 19, 2005;
- June 10, 2005;
- November 1, 2005;
- December 2, 2005;
- January 30, 2006;
- April 6, 2006;
- June 28, 2006;
- August 28, 2006;
- September 21, 2006;
- December 13, 2006;
- April 20, 2007;
- July 20, 2007;
- September 24, 2007;
- January 22, 2008;
- May 13, 2008; and
- October 14, 2008; and
- February 3, 2009.

All project reports are available on the COGCC website at [www.oil-gas.state.co.us](http://www.oil-gas.state.co.us).

LTE conducted a geophysical survey of the seep area in April 2005 which identified several areas suspected of containing buried structures with the potential to act as conduits for methane



gas. Exploratory excavation activities were conducted in these suspect areas in August 2005 and the abandoned Bryce 1-X well was uncovered in the main gas seep area. In November, 2005, LTE provided oversight during the excavation, inspection, and initial remediation of the Bryce 1-X well and sandstone bedrock surface. Reports summarizing the geophysical survey, exploratory excavation activities, and the Bryce 1-X well remediation activities are also available on the COGCC website.

## **SITE DESCRIPTION**

The Site is located in Bondad, Colorado, approximately 20 miles south of Durango, Colorado (Figure 1). The Site, located approximately 0.25 miles north of the confluence of the Animas River and the Florida River, consists of several tracts of land covering more than 100 acres. The surrounding land use consists of several residential properties, agricultural properties, a fire station, U.S. Highway 550, the Animas River to the west, and the Florida River to the east. The majority of land in the area is privately owned.

## **METHANE GAS SEEP SURVEY**

### **Methodology**

On July 28, 2009, LTE was on site to conduct the 19<sup>th</sup> methane gas seep survey of the Site. The scope of the survey was similar to the previous surveys conducted at the Site. During the soil gas survey, tubing was lowered into each borehole and gas measurements were collected directly from the shallow surface soil approximately one foot below ground surface (bgs). LTE measured the concentration of methane, carbon monoxide, hydrogen sulfide, and oxygen at each sampling location.

LTE created a sampling grid to cover the mapping area systematically and to provide a means to delineate the extent of the gas seepage. LTE collected a soil gas measurement at the corners of each square in the grid. Each sample location was recorded using a Trimble GeoXT<sup>®</sup> global positioning system (GPS) instrument.

LTE measured the methane concentration in the soil around the exterior of the three houses in the mapping area, and near the water wells associated with each of the structures. LTE also measured for methane outside the fire station.

### **Soil Gas Survey Results**

LTE personnel advanced a total of 54 subsurface probes across the project area. Results of this survey indicate that methane gas was not detected at any of the measurement locations. To ensure that equipment was working properly, the gas meter was tested two times during the survey with a known concentration of methane calibration gas. The gas meter was functioning properly at the time of the soil gas survey.



Methane was not detected around the residences or near the water wells associated with these structures. Methane was not detected outside the fire station. Figure 1 shows all methane survey locations monitored during the July 28, 2009 methane seep survey.

### **Methane Seep Survey Comparison**

LTE prepared a map illustrating the historical areal extent of methane seepage identified during previous gas survey events (Figure 2). Comparison of the July 28, 2009 data to the historical information indicates that methane is no longer present in the shallow soil of the primary seep area.

The table below presents the number of points reporting detectable concentrations of methane, the average methane concentrations, and the estimated size of the primary seep area during each of the soil gas survey events.

**Table 1. Primary Seep Area Size Comparison**

<b>Survey Date</b>	<b>Number of Survey Points With Methane</b>	<b>Estimated Seep Area (acres)</b>	<b>Average Subsurface Methane Concentration (%)</b>
Feb-05	112	10.3	23
Apr-05	45	10.6	33
Jun-05	37	8.1	21
Nov-05	45	8.8	32
Dec-05	25	5.7	21
Jan-06	31	7.3	10
Apr-06	32	7.7	29
Jun-06	23	5.7	25
Aug-06	13	2.7	2
Sep-06	13	2.4	3
Dec-06	10	2.2	0.63
Apr-07	14	3.1	0.96
Jul-07	1	0.08	1
Sep-07	0	0.0	0
Jan-08	0	0.0	0.0
May-08	0	0.0	0.0
Oct-08	0	0.0	0.0
Feb-09	0	0.0	0.0
Jul-09	0	0.0	0.0



## CONCLUSIONS AND RECOMMENDATIONS

The results of the July 28, 2009 survey indicate that the methane seepage at the ground surface is no longer present and has not been present since September 2007. It is LTE's opinion that continued surveys for methane seepage are no longer necessary at this site.

The primary methane seep appears to have been caused by gas migrating from the Fruitland Formation up the well bore of the Bryce 1-X well. The gas moved vertically upward along the well bore and then migrated laterally into permeable layers and aquifers of the Nacimiento Formation where well casing was absent and/or structurally compromised. It appears that the plugging of the Bryce 1-X well has eliminated the gas seepage at the ground surface.

LTE appreciates the opportunity to provide environmental services to the COGCC. If you have any questions regarding this report or would like additional information, please contact us at (970) 884-5215.

Sincerely,

LT ENVIRONMENTAL, INC.

A handwritten signature in black ink, appearing to read 'Travis Lavery'.

Travis Lavery  
Staff Geologist

A handwritten signature in black ink, appearing to read 'John D. Peterson'.

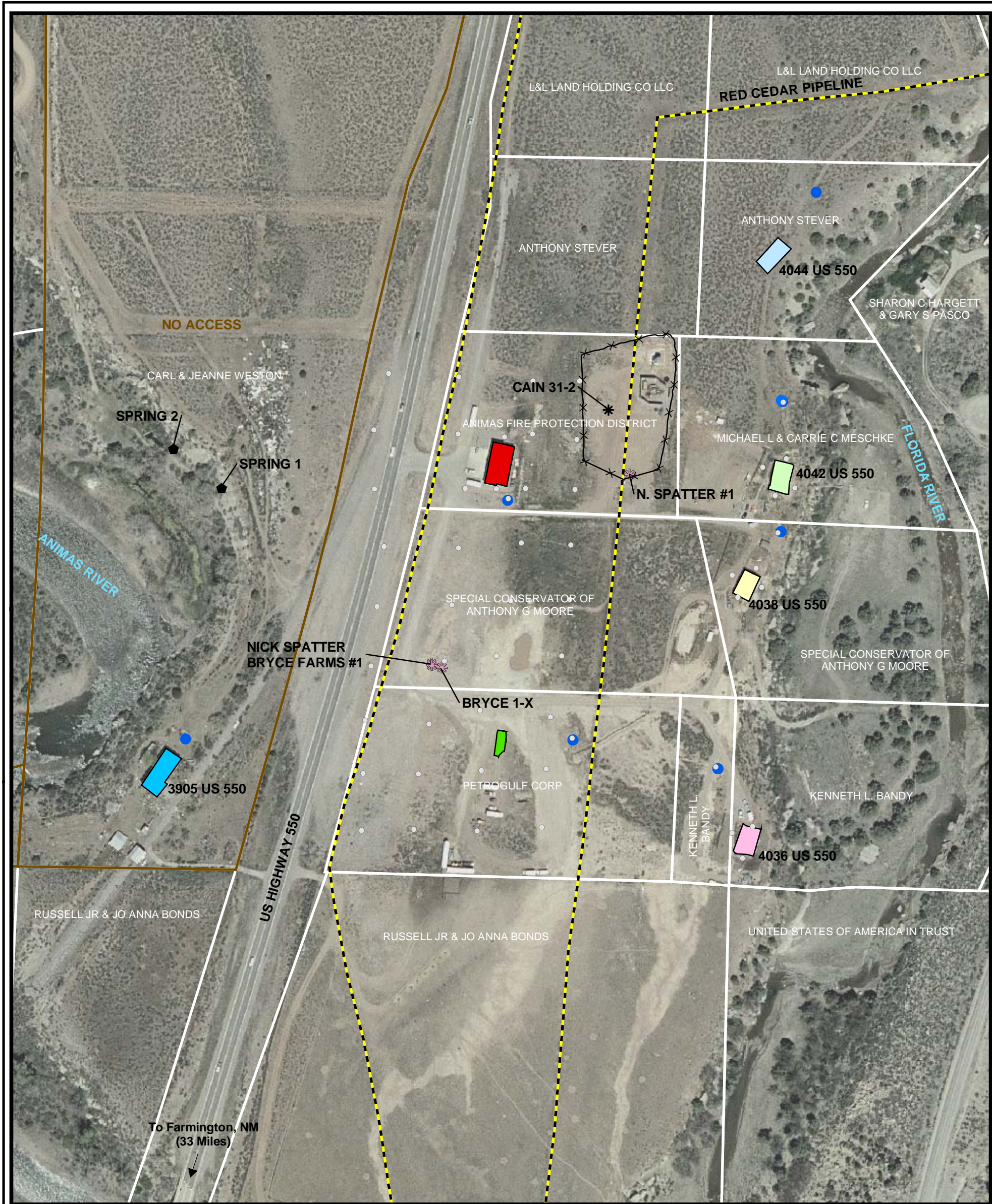
John D. Peterson, P.G.  
Principal/Senior Geologist

Attachments

## FIGURES







**LEGEND**

- |                           |                                   |
|---------------------------|-----------------------------------|
| ● Water Supply Well       | <b>Structures</b>                 |
| ◆ Springs                 | Williams Residence                |
| * Gas Well                | Fire Station                      |
| ✱ Former Oil and Gas Well | Meschke (former Wilson) Residence |
| <b>Utilities</b>          | Buddhue Residence                 |
| --- Buried Gas Pipeline   | Bandy (former Grant) Residence    |
| --- No Access             | Former Yoakum Residence           |
|                           | Weston Residence                  |
- Landowner and Property Boundaries Labeled in White

- Subsurface Methane Measurements**
- 0 - 500 parts per million (ppm)
  - 501 ppm - 5%
  - 6% - 15%
  - 16% - 25%
  - 26% - 50%
  - 51% - 75%
  - 75% - 100%

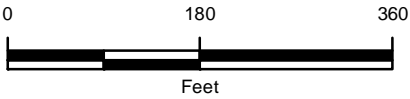
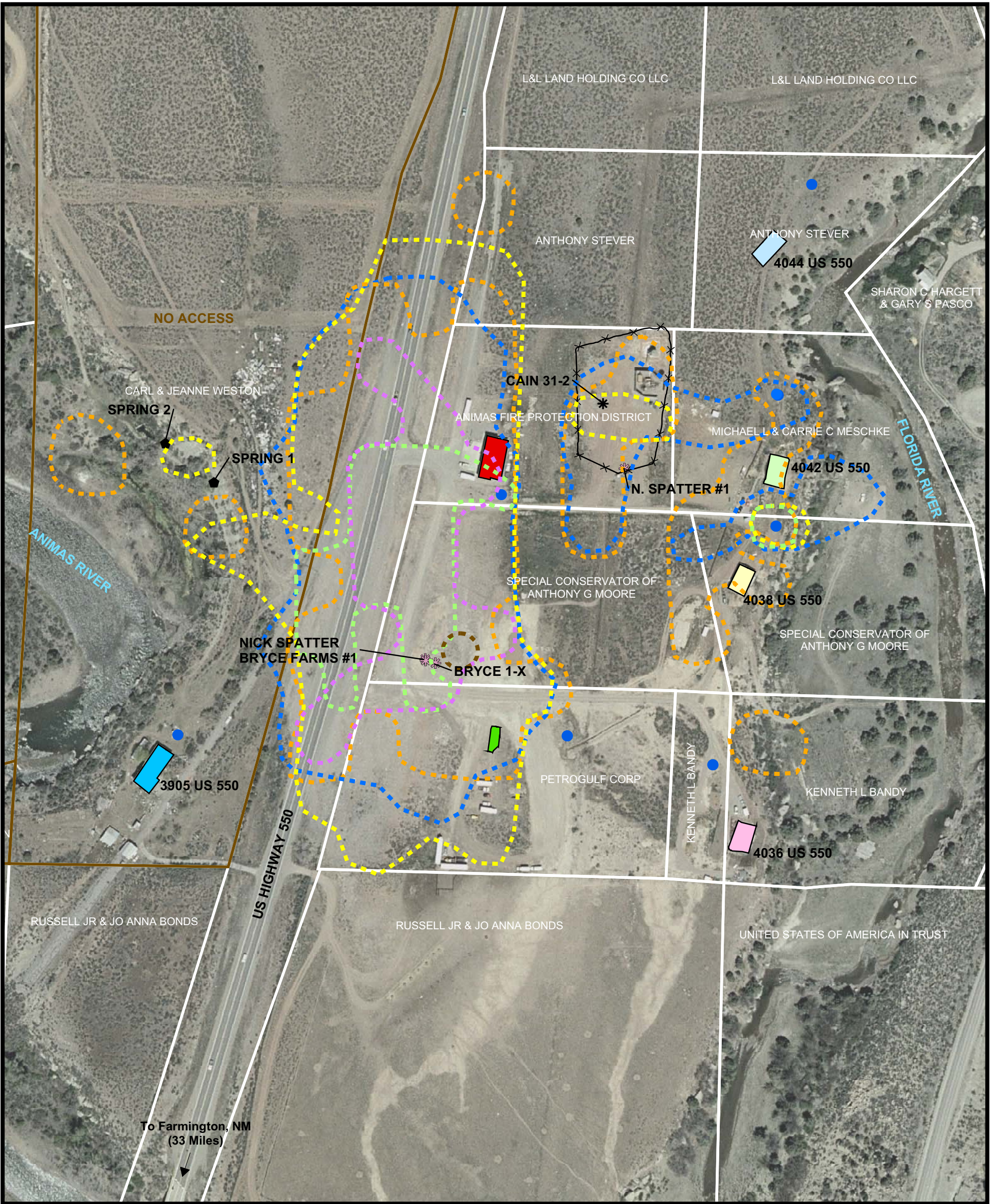


FIGURE 1  
SUBSURFACE METHANE MEASUREMENTS  
JULY 2009  
BONDAD GAS SEEP  
BONDAD, CO  
COLORADO OIL AND GAS CONSERVATION COMMISSION







**LEGEND**

**Extent of Methane Seepage**

- July 2009 - No Seep Detected
- February 2009 - No Seep Detected
- October 2008 - No Seep Detected
- May 2008 - No Seep Detected
- January 2008 - No Seep Detected
- September 2007 - No Seep Detected
- July 2007
- April 2007
- September 2006
- April 2006
- November 2005
- April 2005

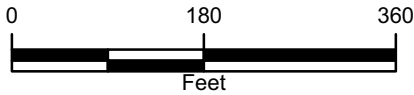
Landowner and Property Boundaries Labeled in White

No Access

**Structures**

- Williams Residence
- Fire Station
- Meschke (former Wilson) Residence
- Buddhue Residence
- Bandy (former Grant) Residence
- Former Yoakum Residence
- Weston Residence

- Water Supply Well
- Springs
- Gas Well
- Former Oil and Gas Well



**FIGURE 2**  
**HISTORICAL SUBSURFACE METHANE MEASUREMENTS**  
**APRIL 2005 - JULY 2009**  
**BONDAD GAS SEEP**  
**BONDAD, CO**  
COLORADO OIL AND GAS CONSERVATION COMMISSION

