

# **2016 OUTCROP ZONE REPORT**

## **FRUITLAND FORMATION OUTCROP ZONE ARCHULETA COUNTY, COLORADO**

**DECEMBER 2016**

**Prepared for:**

**PETROX RESOURCES, INC.  
Meeker, Colorado**

**and**

**ELM RIDGE RESOURCES, INC.  
Dallas, Texas**



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**2016 Fruitland Outcrop Monitoring Report**  
**LTE Project Number: 0191 16001**

**Prepared  
by:**



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December 20, 2016

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December 20, 2016

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## EXECUTIVE SUMMARY

This 2016 Outcrop Zone Report meets the requirements set forth by the United States Forest Service (USFS) and the Bureau of Land Management (BLM) in Decision Point 5 of the Record of Decision (ROD) in order to obtain approval of an application for permit to drill (APD) for coalbed methane (CBM) production of federal minerals in the Project Area. The Project Area includes approximately 18 miles of the Fruitland Formation (Kf) outcrop starting on the west end at the La Plata County-Archuleta County boundary near Beaver Creek and extends southeast along the Kf outcrop to the Southern Ute Indian Tribe (SUIT) Reservation boundary at Cabezon Canyon. In addition to the Kf outcrop, the Project Area includes a 1.5-mile buffer inward from the Kf and Kirtland Shale (Kk) boundary, known collectively as the “outcrop zone”.

The ROD was developed in response to the 2006 Final Environmental Impact Statement (FEIS) for the Northern San Juan Basin (NSJB). In July 2011, Petrox Resources, Inc. (Petrox) drilled a horizontal lateral of the Candelaria 10U#3 CBM production well from fee minerals through 172 feet of federal minerals within the Kf in the northeast quarter of the northwest quarter of Section 15U, Township 34 North, Range 5 West in Archuleta County, Colorado. The APD for the Candelaria 10U#3 CBM production well was approved February 2, 2012.

In addition to compliance with the ROD, the monitoring program detailed in this report meets the requirements of Sections 1, 2, and 4 of the Conditions of Approval (COA) for the Candelaria 10U#3 fee CBM production well (Permit), issued by the Colorado Oil and Gas Conservation Commission (COGCC).

Currently, Elm Ridge Resources, Inc. (Elm Ridge) does not have any active CBM production wells nor do they have any APDs planned within the outcrop zone.

The objective of this 2016 Outcrop Zone Report is to characterize the Project Area and evaluate the existing conditions of current and future CBM production of federal minerals in the Fosset Gulch Unit within the outcrop zone. The 2016 reconnaissance survey represents the sixth evaluation of the Project Area for development of the Fosset Gulch Unit.

Baseline conditions within the Project Area indicate conditions have not changed within the Project Area since 2004, despite ongoing CBM production since 1990 by Elm Ridge in the nearby Pargin Mountain Unit. As stated in Decision Point 5 of the ROD, oil and gas producers are allowed to monitor-as-you-go after CBM wells are drilled and begin production. This approach appears warranted as there are 13 years of outcrop monitoring baseline data, the construction and monitoring of seven COGCC monitoring wells, the installation and monitoring of BLM soil vapor tubes, and historical/ongoing reservoir pressure data which all provide sufficient monitoring of the Kf outcrop, which has concluded there is virtually no methane seeping to the ground surface or active coal fires.

Throughout the lifecycle of CBM production in the Fosset Gulch Unit, Petrox and Elm Ridge will evaluate conditions to determine if production is contributing to methane seepage, coal fires, surface water depletion, or pressure changes in monitoring wells at or near the Kf outcrop. If CBM production is determined to be adversely impacting any of these conditions, Petrox and/or

Elm Ridge will evaluate the mitigation strategies discussed in the ROD and work with the BLM, USFS, and/or COGCC to implement effective mitigation measures.

Based on the monitoring results, evaluation of this report, and technical working group (TWG) (comprised of comprised of the BLM, USFS, COGCC, the SUIT, Petrox, and LT Environmental, Inc. (LTE)) meetings, LTE, Petrox, and Elm Ridge recommend the following to monitor the Project Area:

- Conduct annual surveys of methane flux at the ground surface where surface water transects the Kf outcrop utilizing 400-foot grid spacing during those years that the regional reconnaissance is not conducted. During regional reconnaissance years (last conducted in 2014), grid spacing will be reduced to the previously conducted 200-foot spacing flux survey;
- Reduce the frequency of methane flux measurement at nearby abandoned production wells, specifically the Big Horn-Schomburg #1 abandoned production well, to one event every three years;
- Reduce the frequency of natural springs sampling along the Kf outcrop to every other year;
- Field verify suspect methane seeps along the Kf outcrop using scheduled regional reconnaissance methods of aerial fly-overs and field verification on a 3-year cycle (last conducted in 2014 and next scheduled for 2017);
- Reduce the frequency of abandoned coal mine surveys to every other year;
- Summarize and evaluate the BLM soil vapor monitoring tube data, if available, with statistical analysis using the Mann-Kendell test;
- Summarize and evaluate the COGCC monitoring well pressure data with an emphasis on monitoring wells Fosset Gulch MW 34-5-14-1 (API 05-007-06264) and Fosset Gulch MW 34-5-14-2 (API 05-007-06265);
- Summarize and evaluate annual natural gas and water production data from each Petrox/Elm Ridge CBM production well within the Fosset Gulch Unit; and
- Present this 2016 Outcrop Zone Report, prepared by LTE, to the TWG during its annual review.

## **1.0 INTRODUCTION**

This 2016 Outcrop Zone Report has been prepared at the request of Petrox Resources, Inc. (Petrox) and Elm Ridge Resources, Inc. (Elm Ridge) for the Project Area within the eastern half of the Northern San Juan Basin (NSJB) in Archuleta County, Colorado. The Project Area includes approximately 18 miles of the Fruitland Formation (Kf) outcrop starting on the west end at the Archuleta County-La Plata County boundary near Beaver Creek and extends southeast along the Kf outcrop to the Southern Ute Indian Tribe (SUIT) Reservation boundary at Cabezón Canyon. In addition to the Kf outcrop, the Project Area includes a 1.5-mile buffer from the Kf and Kirtland Shale (Kk) boundary, known collectively as the “outcrop zone”. Figure 1 illustrates the Project Area.

### **1.1 BACKGROUND**

This report meets the requirements set forth by the United States Forest Service (USFS) and the Bureau of Land Management (BLM) in Decision Point 5 of the Record of Decision (ROD) in order to obtain approval of an application for permit to drill (APD) for coalbed methane (CBM) production of federal minerals in the Project Area. The ROD was developed in response to the 2006 Final Environmental Impact Statement (FEIS) for the NSJB.

In July 2011, Petrox drilled a horizontal lateral of the Candelaria 10U#3 CBM production well from fee minerals through 172 feet of federal minerals in the northeast quarter of the northwest quarter of Section 15U, Township 34 North, Range 5 West in Archuleta County, Colorado. The APD from the BLM for the Candelaria 10U#3 was approved February 2, 2012.

In addition to compliance to the ROD, the monitoring program detailed in this report meets the requirements of Sections 1, 2, and 4 of the Conditions of Approval (COA) for the Candelaria 10U#3 CBM production well (Permit), issued by the Colorado Oil and Gas Conservation Commission (COGCC). Outcrop monitoring has been conducted by Petrox and Elm Ridge in Archuleta County since 2004.

Currently, Elm Ridge does not have any active CBM production wells nor do they have any APDs planned within the outcrop zone.

As stipulated in the ROD, the technical working group (TWG), comprised of the BLM, USFS, COGCC, the SUIT, Petrox, and LT Environmental, Inc. (LTE), met in September 2012, December 2012, March 2013, and December 2014 to discuss the annual outcrop zone reports as well as future plans Petrox and Elm Ridge have for drilling within the outcrop zone. No TWG meetings have been held since December 2014.

### **1.2 PROJECT OBJECTIVE**

The objective of this 2016 Outcrop Zone Report is to continue to characterize the Project Area and evaluate the existing conditions for current and future CBM production of federal minerals within the outcrop zone. This 2016 Outcrop Zone Report marks the sixth year of evaluating the Project Area conditions based on the BLM Decision Point 5 of the ROD and will continue to be revised annually as new CBM production wells are drilled and monitoring continues. As

discussed in Decision Point 5 of the ROD, Project Area conditions will be evaluated through a monitor-as-you-go approach, which allows the oil and gas producer to monitor the Project Area while they drill and produce CBM production wells. The 2016 monitoring event marks the 13<sup>th</sup> year of monitoring the Kf outcrop per Sections 1, 2, and 4 of the COA for the Permit approved by the COGCC.

### **1.3 SCOPE OF WORK**

The scope of work for this 2016 Outcrop Zone Report included the following tasks:

- Document changes to baseline conditions, if any, within the Project Area, which could include reservoir, geological, and/or hydrological data;
- Describe the monitoring and mitigation programs for the Project Area;
- Summarize the monitor-as-you-go results for the current monitoring program (2016);
- Evaluate the Project Area as it relates to CBM production of federal minerals; and
- Prepare this report.

### **1.4 ORGANIZATION OF REPORT**

This report is organized into six sections including this introduction (Section 1.0). The documentation of project baseline conditions is described in Section 2.0. The monitoring and mitigation programs are discussed in Section 3.0. The monitor-as-you-go results are summarized in Section 4.0. The outcrop evaluation is detailed in Section 5.0. References are presented in Section 6.0. Figures, tables, and appendices follow the text in separate sections.

## 2.0 DOCUMENTATION OF PROJECT BASELINE CONDITIONS

Baseline conditions have been described in detail in the previous four Outcrop Zone reports, which can be viewed on the COGCC website at <http://cogcc.state.co.us/>.

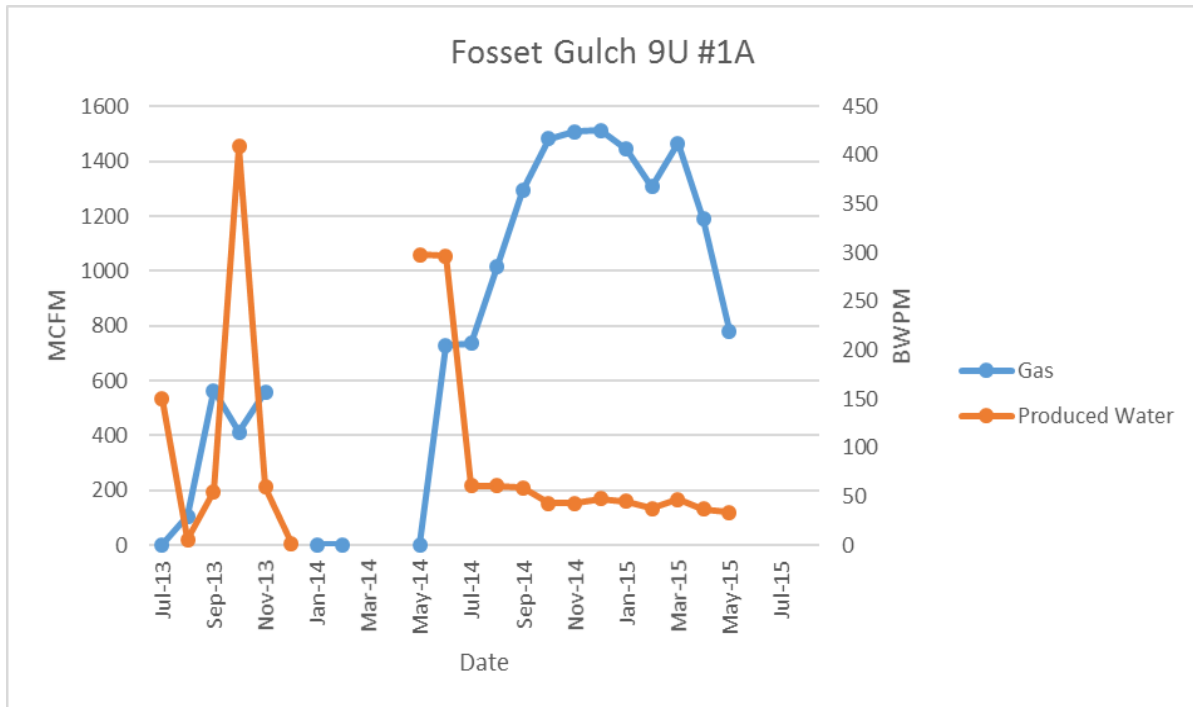
As stated in Decision Point 5 of the ROD, reporting of monthly gas and production data is to be included in the outcrop zone report. The table below summarizes total gas production rates and total produced water rates for the four Petrox CBM production wells (Fosset Gulch Unit (FGU) 9U#1, FGU 9U#4, Candelaria 33-5 FEE 10U#3 (lateral), and FGU 9U#2) within the Fosset Gulch Unit in Archuleta County from May 2014 through September 2016. No 2016 data was available for the FGU 9U#1A at the time this report was written:

**Gas and Produced Water Production Rates, Fosset Gulch Unit, Archuleta County, Colorado**

Month	Gas Production (Thousand Cubic Feet Per Month)	Water Production (Barrels per Month)
May 2014	12,548	922
June 2014	25,403	963
July 2014	26,278	492
August 2014	22,921	478
September 2014	19,973	462
October 2014	21,707	462
November 2014	20,019	444
December 2014	18,731	415
January 2015	14,921	359
February 2015	12,710	292
March 2015	12,997	319
April 2015	13,422	222
May 2015	9,349	271
June 2015	15,267	192
July 2015	13,602	215
August 2015	10,772	207
September 2015	12,317	202
October 2015	11,973	206
November 2015	10,598	208
December 2015	9,558	211
January 2016	6,254	177
February 2016	8,594	325
March 2016	6,942	149
April 2016	9,549	171
May 2016	6,837	146
June 2016	7,163	171
July 2016	10,356	173
August 2016	9,549	171
September 2016	7,614	138



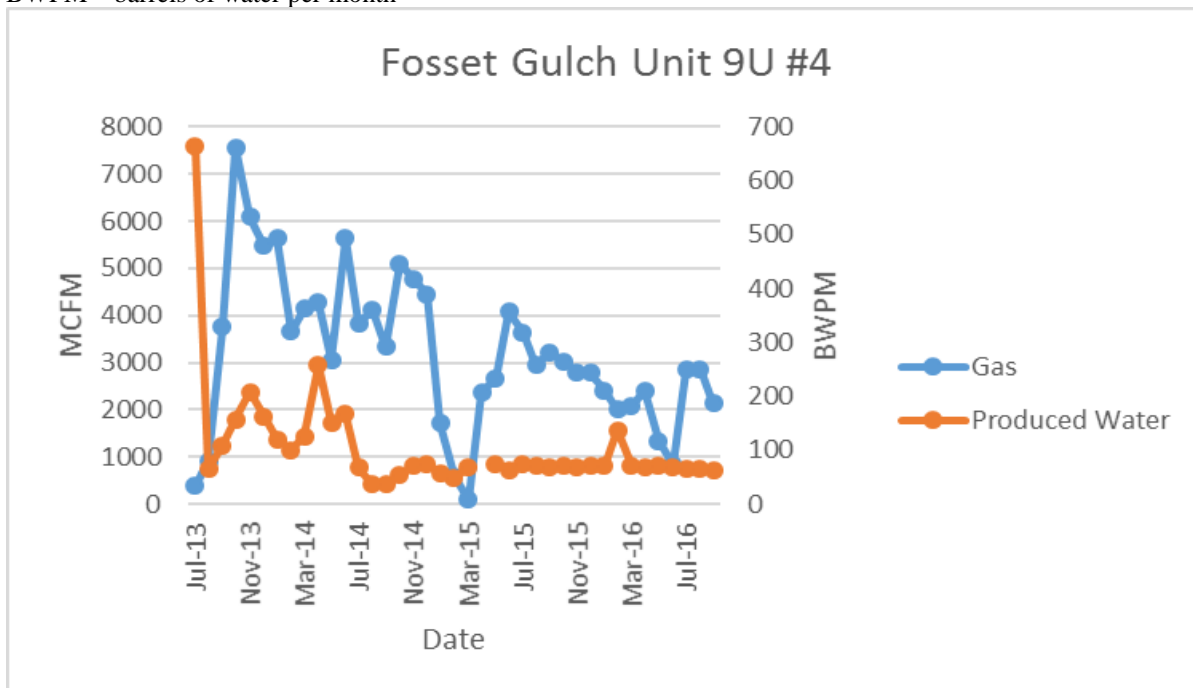
Below are graphical representations of monthly gas and water production rates for each Fosset Gulch Unit production well:



**Notes:**

MCFM – thousand cubic feet per month

BWPM – barrels of water per month

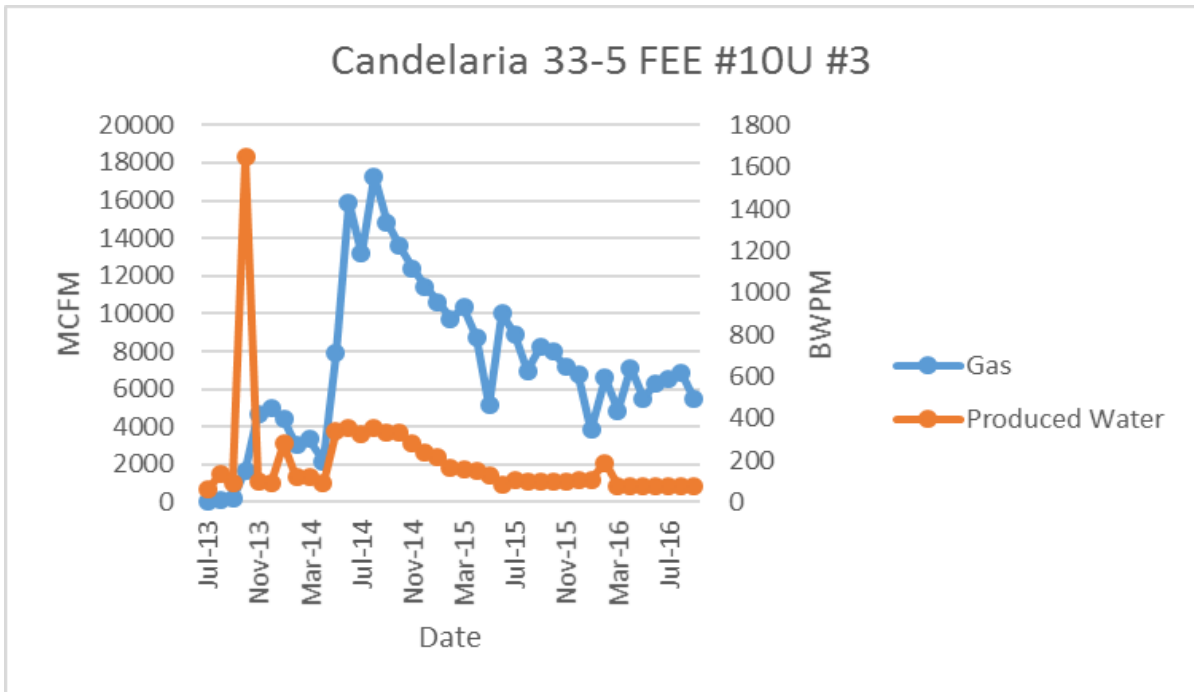


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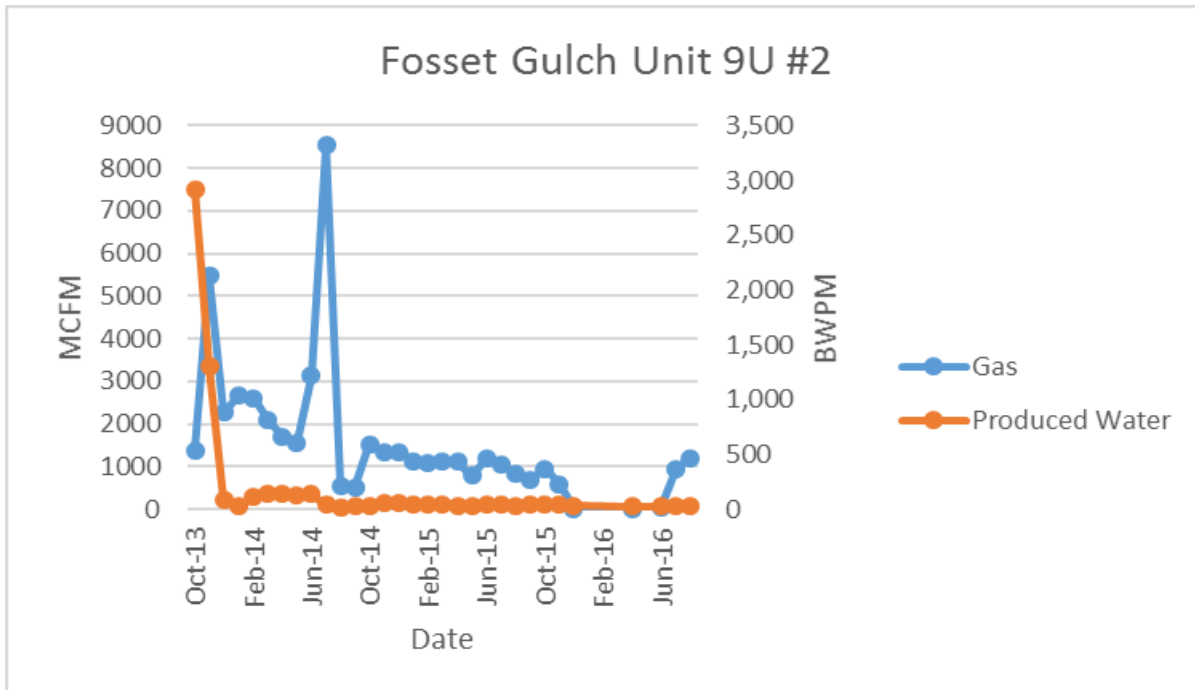




**Notes:**

MCFM – thousand cubic feet per month

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MCFM – thousand cubic feet per month

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The water production rates for the four Fosset Gulch Unit CBM production wells continue to agree with the theory that the Kf is recharged by surface water infiltration of face cleats at the Kf outcrop. Face cleats tend to be parallel to the Kf outcrop in the Project Area, are resistive (sealed), and allow for limited recharge of the aquifer as seen by the limited water production.

### 3.0 MONITORING AND MITIGATION

Monitoring of the Kf outcrop has been in conducted since 2004 and is currently conducted using a variety of methods to characterize baseline conditions and identify changes if they occur. These data collection systems provide a consistent and repeatable data set with which changes to Kf outcrop conditions can be easily identified should they occur. The current program is being conducted with the approval of the COGCC and the TWG.

Petrox and Elm Ridge have contracted LTE to conduct the following monitoring tasks to comply with the Permit:

- Conduct annual surveys of methane flux at the ground surface where surface water transects along the Kf outcrop;
- Measure methane flux at the nearby Big Horn- Schomburg #1 abandoned production well;
- Identify and sample natural springs along the Kf outcrop;
- Conduct annual abandoned coal mine subgas and coal fire surveys;
- Evaluate COGCC monitoring well data;
- Evaluate BLM soil vapor tube (SVT) data; and
- Field verify suspect methane seeps along the Kf outcrop using scheduled regional reconnaissance methods of aerial fly-overs for color infrared imagery acquisition and field verification on a 3-year cycle.

These tasks have been incorporated into the annual monitoring program and are discussed in detail in subsequent sections of this report.

#### 3.1 MONITORING HISTORY

Below is a brief summary of monitoring activities that have occurred to-date in the Project Area:

- In September 2004, LTE conducted an initial investigation of the Kf outcrop in Archuleta County, which consisted of an aerial fly-over reconnaissance and field inspections of identified suspect areas defined by stressed and dead vegetation;
- In 2005, similar data were collected with the addition of color infrared aerial imagery acquisition and sampling of natural springs along the Kf outcrop;
- In 2006, additional inspections of surface water in drainage transects of the Kf outcrop, collection of subsurface gas measurements from gas monitoring probes, and soil gas surveys at two abandoned production well sites were included to expand the data set;

- Since 2007, equipment capable of measuring the flux of soil gas moving across the soil surface to the atmosphere has been used in conjunction with the above described monitoring to quantify changes in methane seepage volumes;
- Since 2011, BLM SVT data and COGCC monitoring well pressure data have been reviewed and evaluated;
- TWG meetings have been held in September 2012, December 2012, March 2013, and December 2014. The meetings included members of BLM, USFS, COGCC, the SUI, Petrox, and LTE.

Detailed information for each year can be reviewed in the respective yearly report, which is available on the COGCC website at <http://cogcc.state.co.us/>.

## **3.2 DETAILED MAPPING**

### **3.2.1 Property Access**

Prior to conducting field activities, land information is obtained from the Archuleta County Assessor's office. Parcel data is cross-referenced with the Kf outcrop geometry to identify owners of parcels located on the Kf outcrop. Much of the outcrop land is federal land with unrestricted access. An attempt to contact private landowners along the Kf outcrop in the Project Area is made prior to the initiation of field activities.

### **3.2.2 Drainage Transects**

LTE conducts drainage transect surveys along the Kf outcrop in the Project Area (Figure 1) at the following locations:

- Beaver Creek;
- Squaw Creek;
- Little Squaw Creek;
- Pole Gulch;
- Peterson Gulch (West and East);
- Candelaria Ranch;
- Piedra River;
- Stollsteimer Creek; and
- Cabezon Canyon.

In the past, drainage transect surveys have been limited and/or not conducted at the Candelaria Ranch, Piedra River, and Cabezon Canyon due to property access denial.

### **3.2.3 Field Mapping**

The grids for detailed mapping areas consist of a varying number of squares, ranging in area from 2,500 square feet to 40,000 square feet. The grid mapping system has proven to be systematic, consistent, repeatable, representative, and successful in delineating the lateral extent of seepage for similar projects within the NSJB. Grid spacing was expanded to a 400-foot spacing for 2013 and for subsequent years when regional reconnaissance events are not conducted (2016). During regional reconnaissance years (last conducted in 2014), grid spacing is reduced to the 200-foot spacing as conducted from 2007 to 2012. A 50-foot grid spacing is used for the Big Horn-Schomburg #1 abandoned production well survey. This approach is cost efficient and effective in achieving early methane seepage detection, if it ever becomes present. A detailed description of the flux meter and mapping process can be found in the 2013 Outcrop Zone Report. Specifications of flux mapping equipment are included in Appendix B.

LTE conducted detailed flux mapping along seven locations where surface water drainages transect the Kf outcrop in the Project Area from July 22 through August 12, 2016. Results of the 2016 mapping event are discussed in Section 4.2.

### **3.3 ABANDONED PRODUCTION WELL SURVEY**

In 2005, LTE conducted an initial subsurface soil gas survey and installed a permanent gas monitoring probe in the vicinity of the Big Horn-Schomburg #1 abandoned production well located near the Kf outcrop in the southeast quarter of Section 14U, Township 34 North, Range 5 West (Figure 1). The production well was drilled and abandoned in 1961 and reference information indicates the Kf is close to, or outcrops at, this location (USFS/BLM, 2006). Geologic maps from the FEIS indicate the abandoned production well is located in the transition zone between the Kf and the Kk.

Since 2010, LTE has conducted an annual soil gas flux survey at the Big Horn-Schomburg #1 abandoned production well. LTE personnel collect methane flux points in the same manner as flux surveys conducted for the drainage transects. If methane is detected in soil, the seep area is then delineated in all four directions. Additionally, flux points are collected next to the abandoned production well monument utilizing the flux meter.

The 2016 abandoned production well survey was conducted on July 22, 2016. Results of the 2016 event are discussed in Section 4.3.

### **3.4 REGIONAL RECONNAISSANCE**

Regional reconnaissance surveys of the Kf outcrop are conducted on three year intervals starting in 2008 (2008, 2011, and 2014) to supplement the detailed mapping of drainage transects. The next regional reconnaissance will be conducted in 2017.

Detailed information for the 2014 reconnaissance survey was reported in the 2014 Outcrop Zone Report, which is available on the COGCC website at <http://cogcc.state.co.us/>. New methane seeps and coal fires were not identified in 2014. The next regional reconnaissance survey will be conducted in 2017.

### **3.5 ABANDONED COAL MINE SURVEYS**

Abandoned coal mine surveys were implemented in 2011 to comply with Decision Point 5 of the ROD. The purpose of surveying the abandoned coal mines along the Kf outcrop is to monitor mines as a potential preferential pathway for methane seepage and locations of surface and/or near-surface coal fires. The surveys are conducted using traditional subsurface soil gas techniques as described in previous reports. Locations of abandoned coal mine survey sites are illustrated on Figure 1.

Abandoned coal mine surveys have been conducted on an annual basis since 2011. Based on the third TWG meeting, the frequency of the surveys was increased to quarterly in 2013. After one year of quarterly monitoring had been completed, the results indicated that the frequency of subsequent surveys should be reduced to annually. If during subsequent surveys, data suggests inconsistent readings, the TWG will convene to discuss the data and possible additional actions.

The 2016 abandoned coal mine surveys were conducted August 15 through August 18, 2016. The results of the 2016 event are discussed in Section 4.4.

### **3.6 NATURAL SPRING SURVEY**

At each accessible and flowing natural spring, field personnel collect water samples and monitor for methane near the natural springs using a portable four gas meter. Field personnel locate the position of the natural spring using a Global Positioning System (GPS). An estimated water discharge rate is measured using a graduated cylinder and stopwatch. When possible, water quality measurements, including pH, electrical conductivity (EC), and temperature are collected at each sampled natural spring.

Laboratory analytical water samples are collected at each accessible and flowing natural spring in bottles and containers prepared by the subcontracted analytical laboratories. Each sample bottle is labeled, indicating project and sample identification, the date and time of sample collection, and the sampler's initials. Samples are delivered directly or shipped to the laboratories under chain-of-custody protocols.

Water samples from the natural springs are collected and analyzed for the following:

- Major cations [dissolved sodium (Na), calcium (Ca), magnesium (Mg), potassium (K), and iron (Fe)] by United States Environmental Protection Agency (EPA) Method 200.7/4500;
- Alkalinity (carbonate/bicarbonate) by EPA Method 2320 B;
- Major anions [chloride (Cl), sulfate (SO<sub>4</sub>), bromide (Br), and fluoride (F)] by EPA Method 200.7/4500;
- pH by EPA Method 150.1;
- Specific conductance by EPA Method 120.1;

- Nitrate/Nitrite as Nitrogen (N) by EPA Method 353.3;
- Total dissolved solids (TDS) by EPA Method 2540 C;
- Dissolved methane by Method RSK 175; and
- Sodium Adsorption Ratio (SAR) by United States Department of Agriculture (USDA) Handbook 60.

Natural spring water samples are collected and then submitted to Four Corners Geoscience, Inc. for analysis of dissolved methane. General water chemistry samples are submitted to Green Analytical Laboratories. Figure 1 depicts the locations of known natural springs within the Kf outcrop in the Project Area.

The 2016 natural springs sampling event was conducted in May and August 2016. Results are discussed in Section 4.5.

### **3.7 COGCC MONITORING WELL DATA ANALYSIS**

In 2008, the COGCC initiated a Kf reservoir pressure monitoring well program in the Chimney Rock Area of Archuleta County with the cooperation of the USFS. The monitoring wells supplement data produced by an existing monitoring well network in La Plata County and on the SUIT reservation. The Archuleta County monitoring wells measure formation pressures in the coal seams in the Kf and were installed to establish baseline conditions prior to initiation of CBM development. There are seven monitoring wells within the Project Area (Figure 1). A telemetry system uploads well pressures twice daily from pairs of pressure transducers installed within the wells. The data are documented and interpreted by the COGCC in annual reports available for public review.

Results for the 2016 COGCC monitoring well evaluation are included in Section 4.6.

### **3.8 BLM/USFS SOIL VAPOR TUBE DATA**

The BLM has been collecting subsurface methane concentrations from 67 permanent monitoring SVT probes located along eight transects running perpendicular to the Kf outcrop in Archuleta County (Figure 1). SVT data collection began in November 2001 at the Beaver Meadows and Yellow Jacket Pass transects. The first SVT data were collected from the other six transects in August or October 2004. Subsequent measurements have been collected approximately every other month. The most recent SVT data available to LTE at the time of this report were collected from summer 2016. SVT data collection at the Candelaria Pasture transect ended in August 2006 when the BLM was denied access to the property. When available, analysis of the BLM SVT monitoring data is conducted using the Mann-Kendall test included in the Excel<sup>®</sup> application MAKESENS. Results of the 2016 analysis are discussed in Section 4.7.

### **3.9 ADDITIONAL DATA COLLECTION FOR NEW PRODUCTION WELLS**

Per the agreement between the TWG, Petrox and Elm Ridge will provide chemistry data, downhole pressure data, and new modelling runs using the data for new production wells drilled

in the Fosset Gulch Unit. During the reporting period covered by this Outcrop Zone Report, no new production wells were drilled. Therefore, there is no new data to provide to the TWG at this time.

### 3.10 MITIGATION ALTERNATIVES

The monitoring programs outlined above and detailed in previous Outcrop Zone reports (found on the COGCC website) provide early detection of potential methane seepage, coal fires, and/or affected natural springs on or adjacent to the Kf outcrop within the Project Area. Since field crews walk the major drainages annually and traverse large sections of the outcrop as part of the regional reconnaissance, observations of vegetative conditions, excessive heat emanating from the ground, smoke, and olfactory observations that may indicate the presence of a methane seepage and/or coal fire can be detected at the early onset of such impacts. Natural springs are sampled during the Spring season when most of the natural springs tend to flow.

As agreed upon in the third TWG meeting, triggers for TWG convening to discuss produced water issues will be either high produced water volumes (greater than (>) 100 barrels of water per day/well), fresh water composition (less than (<) 1,000 parts per million), or both. Additional triggers will be developed as CBM production evolves in the Fosset Gulch Unit. Mitigation alternatives will be developed on a case-by-case basis.

In the event methane seepage is identified along the Kf outcrop in Archuleta County, reasonable mitigation efforts, such as reduced or suspended gas production, if clearly demonstrated that such efforts will be effective in mitigating adverse impacts to water resources, vegetation, and/or public health and safety due to fugitive methane gas seeping to the ground surface, will be implemented. LTE has direct experience in conducting mitigation of active methane seeps to address impacts to vegetation, public health and safety, and from unrecovered resources in La Plata County. If appropriate, Petrox will implement similar measures as necessary to mitigate such impacts, should they occur. The measures may include one or more of the potential options discussed in the *Preliminary Evaluation of Methane Seepage Mitigation Alternatives* report (LTE, 2006).

As agreed upon in the third TWG meeting, triggers for TWG convening to discuss potential/known methane seepage include, but are not limited to, methane seepage identified during drainage transect surveys or regional reconnaissance surveys, changes in reservoir permeability, and changes in drainage patterns. Mitigation alternatives will be developed on a case-by-case basis.

Evidence of coal fires have not been observed during the past 11 years of monitoring activities. The treatment of coal fires is both very dangerous and expensive. Near-surface coal fires can be extinguished by an extensive network of injection wells drilled into the affected seam where water, mud, or concrete slurries are used to smother the fire in conjunction with near-surface excavation activities. In La Plata County, efforts to extinguish active coal fires via injection near the Kf outcrop have been ineffective until recently, when one coal fire was extinguished within the SUIT reservation. Petrox and LTE will look into the SUIT's success in extinguishing their coal fire and evaluate the technical feasibility in the event a coal fire ignites along the Kf outcrop in Archuleta County and Petrox is deemed the responsible party.

The TWG will convene if monitoring of the Kf outcrop in the Project Area indicates a potential for surface and/or near-surface coal fires or if coal fires are observed during field activities. Mitigation alternatives will be evaluated on a case-by-case basis.

## 4.0 MONITOR-AS-YOU-GO RESULTS

This section presents the 2016 monitoring results for the Project Area.

### 4.1 PROPERTY ACCESS

LTE personnel were denied access to several properties; as a result, no monitoring activities were conducted on these properties during the 2016 monitoring event. The 2016 status of access to parcels is illustrated on Figure 2 and presented in Table 1.

### 4.2 DRAINAGE TRANSECT SURVEYS

During 2016, LTE conducted inspections from July 22 to August 09, 2016, at the following seven accessible locations where surface water drainages transect the Kf outcrop in Archuleta County:

- Beaver Creek;
- Squaw Creek and Little Squaw Creek;
- Pole Gulch;
- Peterson Gulch;
- Candeleria Ranch
- Piedra River; and
- Stollsteimer Creek.

#### 4.2.1 Water Surface Inspections

Methane was not observed being discharged as bubbles on the water surface at the seven drainage transects inspected during the 2016 monitoring event.

#### 4.2.2 Soil Gas Flux Measurements

Using the flux meter, LTE personnel collected soil gas flux measurements along the seven drainage transects during the 2016 monitoring event. Reportable methane flux (greater than 0.2 moles per square meter per day [ $\text{mol}/\text{m}^2\text{-day}$ ]) was not recorded at any of the 211 measurement points.

#### 4.2.3 Total Methane Volumetric Flux Estimation

There was no reportable methane detected in Archuleta County during the 2016 flux survey and as a result, the total methane volumetric flux is 0.0 thousand cubic feet per day (MCFD).

The methane flux measurement locations for the seven drainage transects are presented on Figure 3. Flux data is summarized in Table 2. The methane flux data are presented Appendix C.

#### 4.2.4 Historical Methane Flux Data Comparison

From 2007 to 2009, total volumetric methane flux was calculated using all methane flux values recorded in the field, regardless of the technical limitations of the flux meter. However, methane flux values below the reporting limit of 0.2 mol/m<sup>2</sup>-day are not considered accurate and/or repeatable by the manufacturer of the flux meter. Therefore, the total volumetric methane flux reported in prior years appears to be inflated with inaccurate data. In 2010, only two methane flux values were detected above the reporting limit. As a result, limited data points with reportable methane flux values cannot be used to accurately calculate total reportable methane volumetric flux. An attempt to calculate the total reportable methane volumetric flux with limited data points would ultimately lead to results that might not reflect the actual methane volumetric flux within Archuleta County.

Reportable methane flux was detected in five locations in 2007 and 2008, and then dropped to three locations in 2009. Reportable methane flux was not recorded in any locations during the 2010 survey. In 2011, only two locations detected reportable methane flux. Every location sampled in 2012, 2013, 2014, 2015, and 2016 were below the reportable detection limit. Limited reportable methane flux values and low historical volumetric methane fluxes detected in Archuleta County appear to be associated with background levels.

#### 4.2.5 Total Carbon Dioxide Volumetric Flux Estimation

As with estimating the total flux of methane at each drainage transect using data collected with the flux meter, LTE interpolated and gridded carbon dioxide flux data along each of the seven drainage transect areas, and then contours and processes the data to estimate total flux. Carbon dioxide flux contours and values are included on Figure D in Appendix D.

For a better perspective of the carbon dioxide flux rates, LTE converted the mass flux values into volumetric flux units of cubic feet per day (CFD), assuming equal areas. The unit conversion is based on the molecular weight of the gas and the density of the gas at approximately 7,000 feet above mean sea level. For carbon dioxide flux, the calculation is as follows:

$\frac{\text{mol CO}_2}{\text{day}} \times \frac{44.01 \text{ g CO}_2}{\text{mol CO}_2} \times \frac{0.0253 \text{ ft}^3 \text{ CO}_2}{\text{g CO}_2} = \frac{\text{ft}^3 \text{ CO}_2}{\text{day}}$
<p>For example,</p> $1.0 \text{ mol/day CO}_2 = 1.11 \text{ CFD CO}_2$
<p><u>Notes:</u>  mol – mole    CO<sub>2</sub> – carbon dioxide                      g – gram                      ft<sup>3</sup> – cubic feet</p>

Since no methane flux was detected along the drainage transects, the carbon dioxide flux values do not appear to correlate with methane concentrations. It appears that carbon dioxide is



naturally occurring along the drainage transects and as a result, carbon dioxide data is not discussed for each transect. Carbon dioxide flux data are included in Appendix C.

### **4.3 ABANDONED PRODUCTION WELL SURVEY**

LTE conducted the 2016 Big Horn-Schomburg #1 abandoned production well site survey on July 22, 2016. LTE collected 18 flux measurements with no reportable methane detected. A single reportable methane flux point was detected in 2007, 2009, and 2011. Figure 3 presents the results of the Big Horn-Schomburg #1 abandoned production well survey. The methane flux data are presented in Table 2 and included in Appendix C.

### **4.4 ABANDONED COAL MINE SURVEYS**

In 2011, LTE identified seven abandoned coal mines along the Kf outcrop. Due to continued property access denial, the Unnamed Abandoned Mine, Chimney Rock Coal site and the Cabezon Project mine were not surveyed in 2016. Subsurface soil gas surveys conducted at the four abandoned coal mines along the Kf outcrop are discussed below. The abandoned coal mine surveys were conducted from August 15 to August 18, 2016. Figures 4 through 9 illustrate subsurface soil gas and temperature measurements. Subsurface soil gas and temperature measurements are presented in Appendix E.

Methane was not detected at any of the abandoned coal mines. Carbon monoxide is a by-product of coal combustion. With limited carbon monoxide and low subsurface temperatures, there does not appear to be active combustion/fires in the vicinity of these four coal mines. As additional verification, LTE did not observe other potential indicators of underground coal fires such as dead vegetation, charred ground, or visible smoke or steam during these surveys.

### **4.5 NATURAL SPRINGS SURVEY**

#### **4.5.1 Sampling Status**

A total of 35 potential natural springs were identified in 2016 on or near the Kf outcrop in Archuleta County. Of the 35 natural springs, 13 natural springs were sampled in 2016. Those natural springs that were not sampled were due to property access denial by landowners or the natural spring was dry or stagnant at the time of sampling.

The locations and sampling status of natural springs are presented on Figure 10. A summary of the natural springs sampled in 2016, along with past sampling status, is presented in Table 3.

#### **4.5.2 Field Measurements and Observations**

Field observations and measurements of temperature, pH, and EC were collected at the sampled natural springs. The 2016 field observations and measurements for the natural springs, including historical measurements, are summarized in Table 4.

Natural spring discharge rates were calculated by dividing the known volume of a container by the time required to fill the container. The flow rates measured in 2016 are similar to the low

flow rates measured during previous monitoring events. Natural spring discharge rates, including historical data, are presented in Table 5.

### **4.5.3 Natural Spring Sampling and Analysis**

The COGCC uses 2 milligrams per liter (mg/L) for methane in domestic water systems as the threshold to conduct further investigation of the origin of the methane in the water. The COGCC considers water systems containing dissolved methane concentrations above 2 mg/L as having an increased risk of desorption from the water and creating potentially explosive conditions in confined spaces. All concentrations of dissolved methane in the natural spring water samples were below the 2 mg/L threshold in 2016. Laboratory analytical results for dissolved methane in natural spring waters, including historical results, are summarized in Table 6.

The water from each of the natural springs sampled are calcium bicarbonate in makeup. Major ion chemistry of the natural springs is summarized in Table 7.

Laboratory analytical reports are presented in Appendix F.

### **4.5.4 Subsurface Soil Gas Measurements**

One set of subsurface soil gas measurements, using traditional subsurface soil gas sampling techniques, was collected at the 13 natural springs sampled in 2016. Methane was not detected in the subsurface at any of the 13 natural spring locations.

## **4.6 COGCC MONITORING WELL DATA ANALYSIS**

The COGCC provided LTE with twice-daily monitoring well pressure and temperature data from December 2010 through October 15, 2016, for each of the 4M/Archuleta monitoring wells. Historical data have been discussed in several reports on 4M project monitoring posted on the COGCC website. A general analysis of results for each well is discussed in the subsequent sections of this report. In general, all monitoring wells indicate the presence of free gas at the outcrop with no surface methane seeps. The locations of the COGCC monitoring wells are depicted on Figure 1.

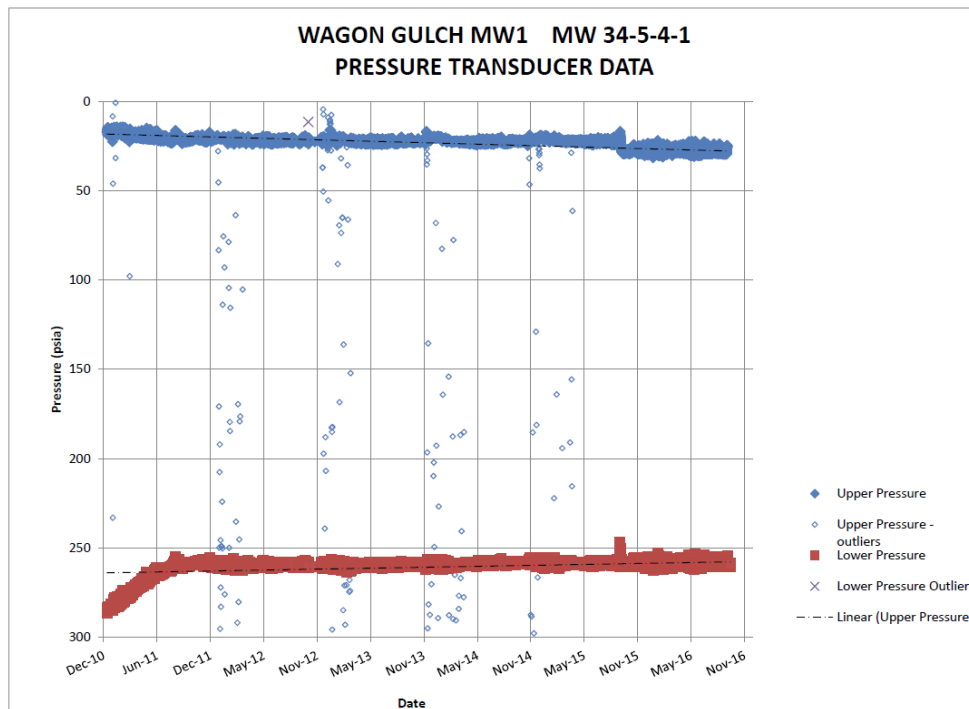
### **4.6.1 Wagon Gulch**

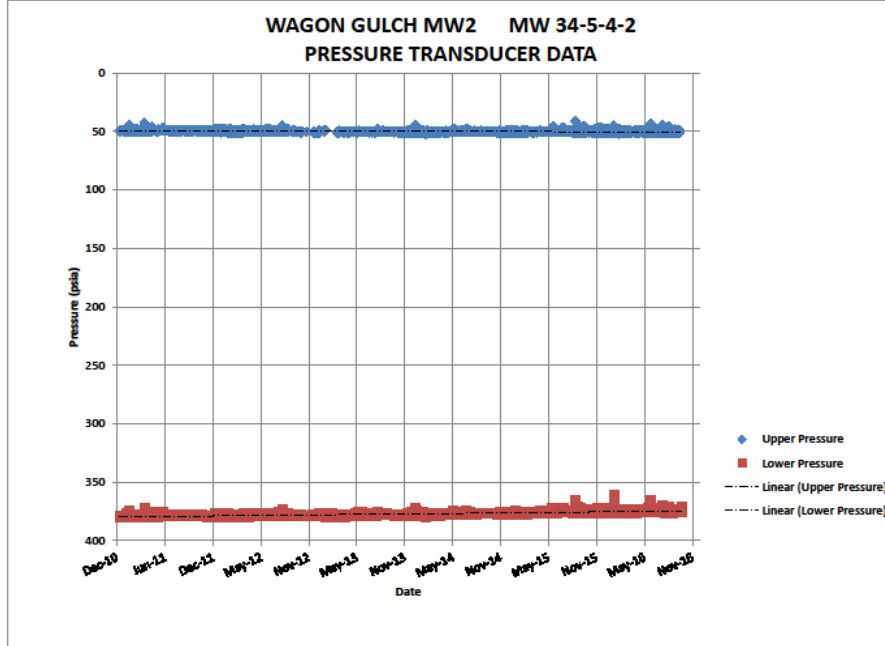
Wagon Gulch monitoring wells MW 34-5-4-1 and MW 34-5-4-2, located in Section 4 of Township 34 North, Range 5 West adjacent to the north central part of the Fosset Gulch Unit, have been monitored since December 2, 2008.

Monitoring well MW 35-5-4-1 did not reach an initial stable pressure for approximately three weeks following installation. From January 2008 through mid-November 2010, wellhead pressures declined following stabilization. At that time, the trend reversed and the wellhead pressure increased slightly through July 2011. From July 2011 to September 2013, the wellhead pressures have remained relatively stable. The graphs below depict upper (wellhead) and lower (bottomhole) transducer data from January 2011 to October 2016. A number of data outliers have been observed in the winter months. The majority of those readings were collected in the early morning hours, and they are attributed to overnight freezing of the transducer, which was

mounted above the ground surface. In late 2015 the upper transducer was lowered to approximately 7 feet below ground surface, and since that time no outliers have been observed. Downhole pressures (from the “lower transducer”) remained stable through 2016. The previous increase in bottomhole pressure from December 2008 to November 2010 indicates a net water level rise in the monitoring well since installation. Between November 2010 and November 2011, water levels decreased by approximately 20 feet and have been relatively stable since that time.

Monitoring well MW 34-5-4-2 was shut in for monitoring on December 4, 2008, but stable pressure transducer readings were not obtained until April 2009. From February 2009 to April 23, 2009, no data were available due to a pressure transducer malfunction as a result of freeze damage. At the time of the 2015 monitoring event, the water level inside the open wellhead was at a height of 2.5 feet above ground level. After the well was shut in following repairs, wellhead pressure buildup returned rapidly. The well has had a relatively constant wellhead pressure of 47 to 48 pounds per square inch, absolute (psia), and a bottomhole pressure of 375 psia between April and October 2009. In 2013, several data gaps were observed at the upper transducer, particularly in February and the first half of March 2013, which may also be due to freezing of the transducer. However, all the measured upper pressures have remained steady with a slight rise to a range of 48 psia to 50 psia at the wellhead. A slight downward trend in the bottomhole pressure has been observed since 2011, with an average bottomhole pressure of approximately 379 psia in January 2011, decreasing to an average of approximately 375 psia in the latter part of 2016.

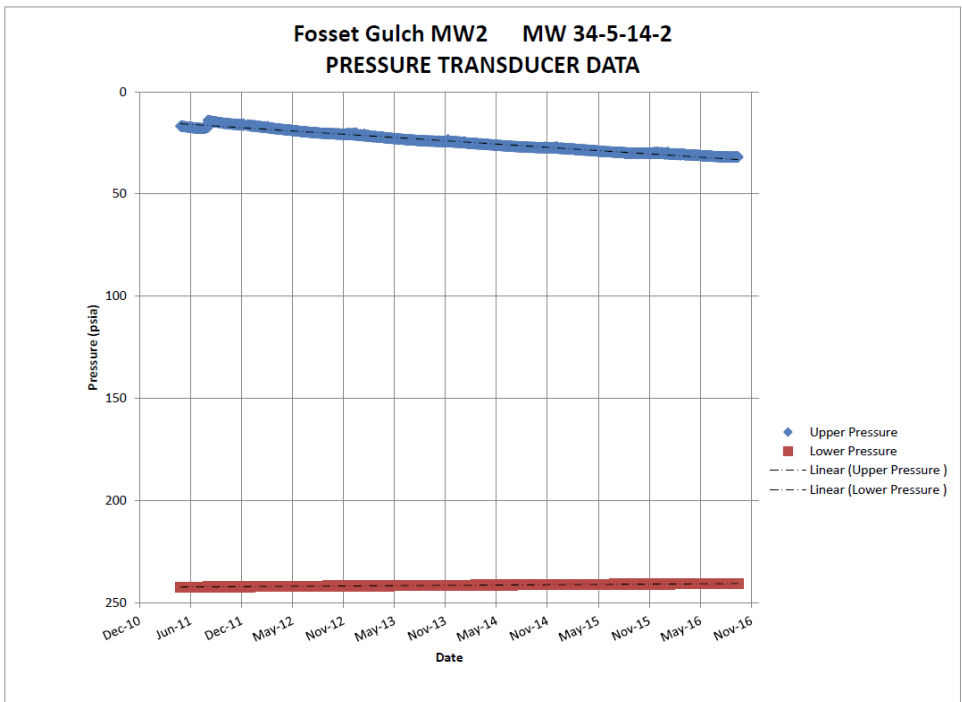
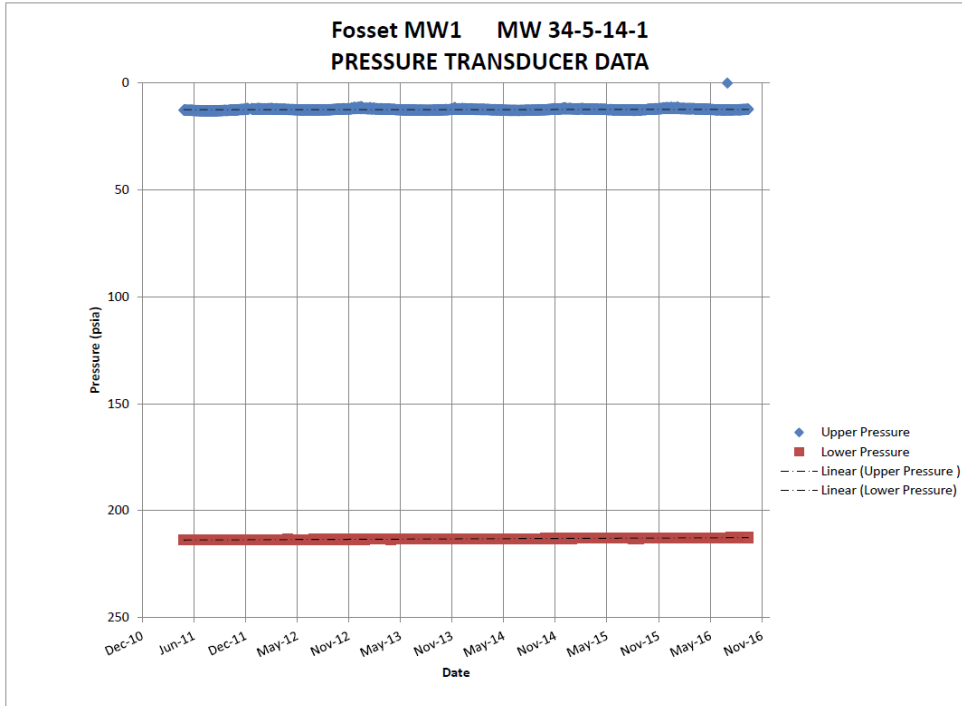




#### 4.6.2 Fosset Gulch

Fosset Gulch monitoring wells MW 34-5-14-1 and MW 34-5-14-2, located in Section 14 of Township 34 North, Range 5 West adjacent to the south central part of the Fosset Gulch Unit, have been monitored by the COGCC since December 4, 2008. Historical data provided in COGCC annual reports indicate a relatively constant wellhead pressure in MW 34-5-14-1 until November 2009 when the water level began a gradual decline of about 8 feet until July 2010. The well was vented in August 2010 and water levels nearly recovered to previous levels. Pressure data from April 2011 through October 2016 are presented in the graphs below and exhibit a slight annual fluctuation from 13 psia in the summertime to 12 psia in the winter months and a gradual decline in bottomhole pressure from 213.8 psia to 212.6 psia over the period from 2011 to 2016.

Monitoring well MW 34-5-14-2 initially displayed wellhead pressure drops immediately corresponding to rises in water levels each time the well was vented to the atmosphere. The most recent venting event took place on August 3, 2011. Wellhead pressures through 2016 do not indicate that any subsequent venting has taken place. From August 2011 to October 2016, the bottomhole pressure has decreased slightly from approximately 242.4 psia to 240.3 psia and the wellhead pressure has gradually increased from approximately 14 psia to 30 psia.



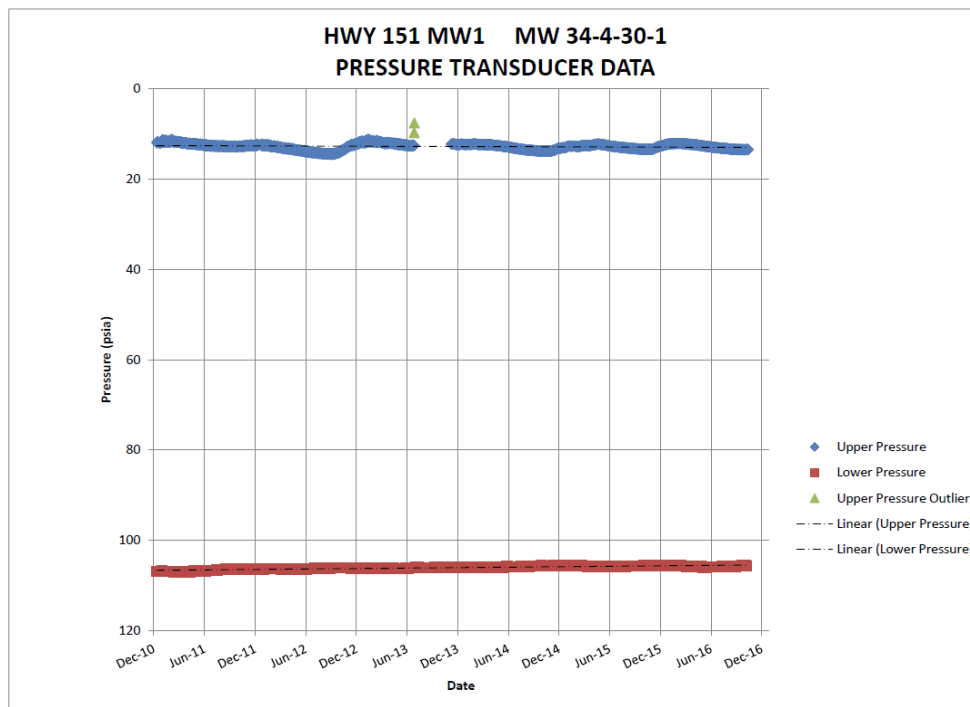
### 4.6.3 Highway 151

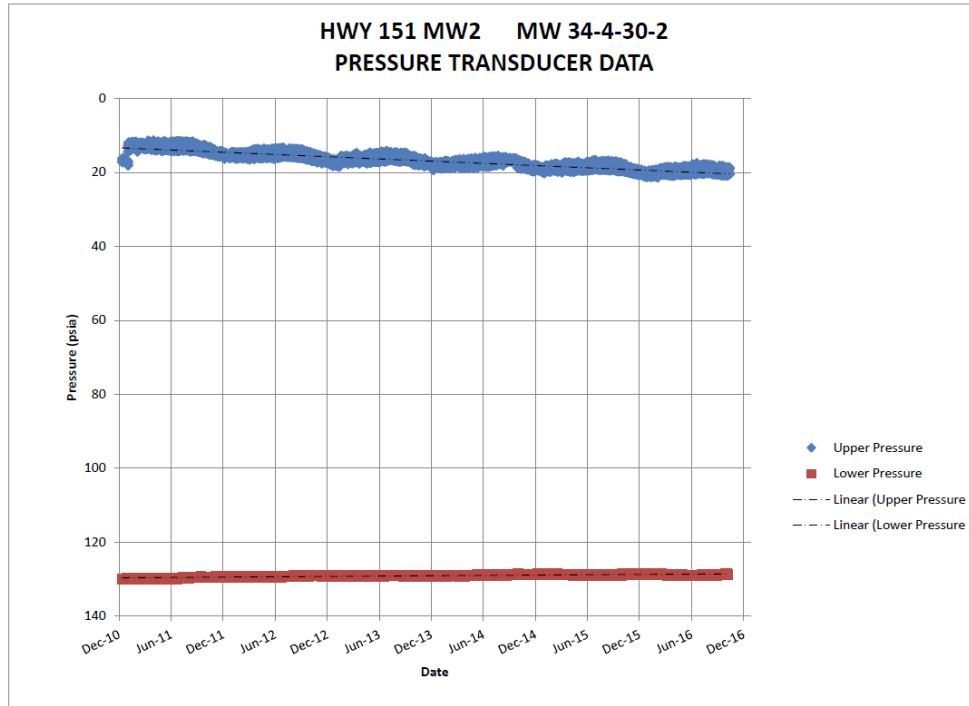
Monitoring wells MW 34-4-30-1 and MW 34-4-31-2, located in Section 30 of Township 34 North, Range West adjacent to the north end of the Fosset Gulch Unit, have been monitored since December 3, 2008. A small drop in wellhead pressure at MW 34-4-30-1 was observed on June 2, 2010, corresponding to wellhead venting. Pressure data from January 2011 through



October 2016 are displayed in the graphs below. Wellhead pressures in monitoring well MW 34-4-30-1 have displayed some seasonal fluctuation, with lower values observed in the winter months and higher values in the summer. Overall the fluctuations range between approximately 11.5 psia and 14.5 psia. The upper transducer readings became erratic in June 2013 and ceased altogether in July 2013. Readings from this transducer resumed on November 26, 2013. A slight decrease in bottomhole pressure has been observed over the period from 2011 to 2016, declining from approximately 106.8 psia to 105.6 psia between January 2011 and October 2016.

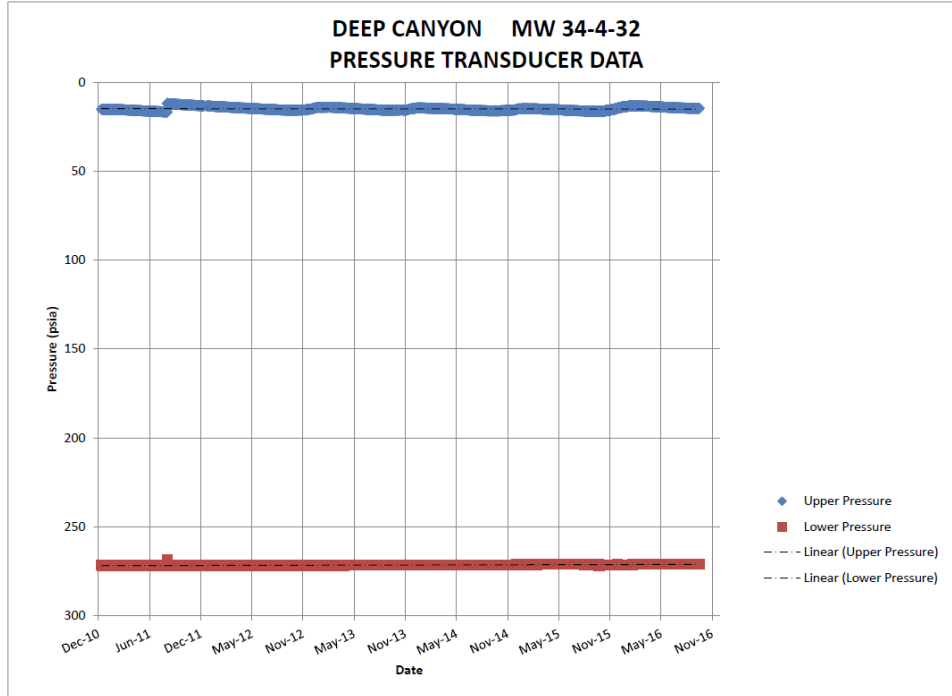
Monitoring well MW 34-4-30-2 displays a slight decline in bottomhole pressure, from approximately 130 psia to 128.6 psia, over the period from 2011 to 2016. Wellhead pressures display annual fluctuations on the order of 2 psia, with lower values in the Fall and higher values in the Spring. There is an overall upward trend over the period from 2011 to 2016, from an average of approximately 13 psia to 20 psia.





#### 4.6.4 Deep Canyon

The Deep Canyon monitoring well MW 34-4-32-1 came online in June 2010. The well pressure stabilized six days after the well was shut in and then displayed a nearly constant bottomhole pressure of 271.9 psia to 271.1 psia through October 2016. A change in the bottomhole pressure was observed on August 3, 2011, corresponding to a venting event, with recovery of bottomhole pressure within one day. Wellhead pressures have increased gradually from June 2010 to August 3, 2011, when pressures dropped from 16.5 to 11.5 psia. Wellhead pressures have recovered slowly over the subsequent 12 months. From October 2012 to February 2013, wellhead pressures fell from approximately 15.5 psia to 14 psia and then recovered to 15.5 psia in September 2013. It appears that another venting event occurred in November 2013, with wellhead pressures recovering to approximately 16 psia in October 2016.



#### 4.6.5 Overall COGCC Monitoring Well Analysis

All COGCC monitoring wells installed within the Kf outcrop as part of the 4M/Archuleta Project Area exhibit free gas. This free gas is not produced by withdrawing water out of the Kf and is able to build pressure back after venting. The COGCC monitoring well data indicate free gas is present at the Kf outcrop at depth. This conclusion is consistent with observations of pressure data for Petrox CBM production wells in the area, gas production without dewatering in existing production wells, and the Mansoori modeling results.

#### 4.7 BLM/USFS SOIL VAPOR TUBE DATA ANALYSIS

SVT monitoring data was obtained from the BLM for the period from February 2014 through July 2016 and found that no new methane concentration data had been collected from transects during that period of time. As a result, statistical analysis of the SVT data could not be conducted for this 2016 Outcrop Zone Report.

Historically, methane has been detected in the SVTs, with no methane flux measured in the vicinity of the SVTs, which supports the data reported herein demonstrating free gas is present at depth in the Kf outcrop; however, it is not migrating to the surface as a seep.

#### 4.8 ADDITIONAL DATA COLLECTION REPORTING

As previously stated, no new production wells were drilled during the monitoring period. Therefore, no chemistry data, downhole pressure data, nor modelling data are available at this time.

## 5.0 OUTCROP EVALUATION

This 2016 outcrop evaluation is based on past work within the Project Area and current conditions documented during the 2016 monitoring event. Outcrop evaluations from the previous three Outcrop Zone reports can be viewed on the COGCC website at <http://cogcc.state.co.us/>.

Based on reservoir, geological, and hydrogeological characteristics of the Kf and specifically within the Project Area, the potential for CBM development of federal minerals within the outcrop zone to adversely affect the Project Area appears low with regards to methane seepage and/or coal fires.

Baseline conditions within the Project Area indicate there is no methane seeping to the surface. Conditions have not changed within the Project Area since 2004 despite the presence of free gas in the subsurface at the outcrop. As stated in Decision Point 5 of the ROD, oil and gas producers are allowed to monitor-as-you-go. This approach appears warranted as there are 13 years of data in conjunction with monitoring wells, descriptive reservoir openhole logs, a drainage and performance simulation study, and pressure data history that indicate free gas in the subsurface and no detectable seeps at the ground surface. If methane seeps begin to develop and/or coal fires are observed during the production of CBM within the outcrop zone, then the mitigation strategies discussed in this report and the NSJB ROD will be reviewed and implemented where applicable.

Based on the monitoring results and evaluation of this report, LTE, Petrox, and Elm Ridge recommend the following:

- Conduct annual surveys of methane flux at the ground surface where surface water transects the Kf outcrop utilizing a 400-foot grid spacing during those years that the regional reconnaissance is not conducted. During regional reconnaissance years (next event in 2017), grid spacing will be reduced to the previously conducted 200-foot spacing flux survey;
- Reduce the frequency of methane flux measurement at nearby abandoned production wells, specifically the Big Horn-Schomburg #1 abandoned production well, to one event every three years;
- Reduce the frequency of natural springs sampling along the Kf outcrop to every other year;
- Field verify suspect methane seeps along the Kf outcrop using scheduled regional reconnaissance methods of aerial fly-overs and field verification on a 3-year cycle (next event in 2017);
- Reduce the frequency of abandoned coal mine surveys to every other year;
- Summarize and evaluate the BLM SVT data, if available, with statistical analysis using the Mann-Kendell test;

- Summarize and evaluate the COGCC monitoring well pressure data with an emphasis on monitoring wells Fosset Gulch MW 34-5-14-1 (API 05-007-06264) and Fosset Gulch MW 34-5-14-2 (API 05-007-06265);
- Summarize and evaluate annual natural gas and water production data from each Petrox/Elm Ridge CBM production well within the Fosset Gulch Unit; and
- Present this 2016 Outcrop Zone Report to the TWG during an annual review session.

In addition to modified monitoring plans developed through the TWG, the following action items were discussed and agreed to:

- No new monitoring wells will be required at this time;
- Petrox will incorporate water chemistry data from new production wells drilled prior to bringing them online per the COGCC COAs. The data will be presented in subsequent outcrop zone reports;
- Petrox will collect and provide initial downhole pressure data for all new drill production wells within the outcrop zone prior to bringing them online. The data will be used in evaluating reservoir production efficiency and in evaluating the Mansoori modeling efforts. Modeling data will be incorporated into subsequent outcrop zone reports;
- Petrox will evaluate reservoir pressure data from new drill production wells as they occur and conduct periodic model runs similar to the initial Mansoori effort to monitor the actual reservoir behavior in comparison to the initial predictive effort. The frequency of this activity will be dependent on the data available. Results, when available, will be presented in subsequent outcrop zone reports;
- Petrox will commit to utilizing the Candelaria 10U#4, or other existing/planned production wells, for pressure monitoring for a period of no more the three months following completion of the well within the outcrop zone. The data will be provided in the outcrop zone report; and
- The outcrop zone reports and subsequent monitoring will be utilized for all APDs for Petrox and Elm Ridge within the Fosset Gulch Unit.

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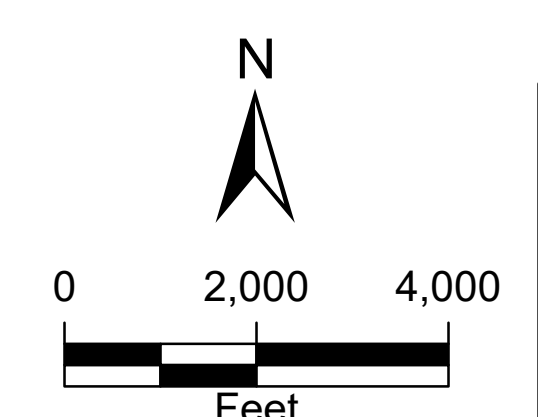
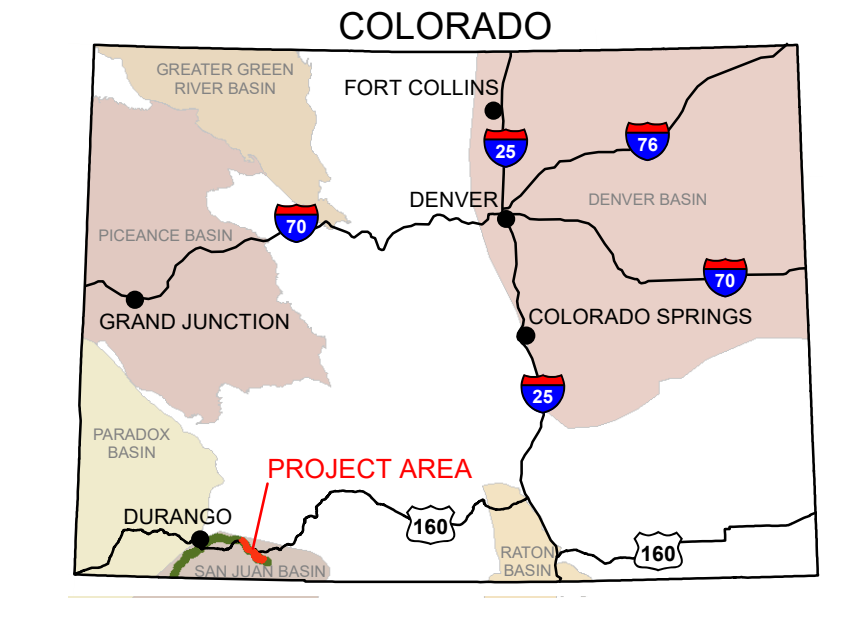
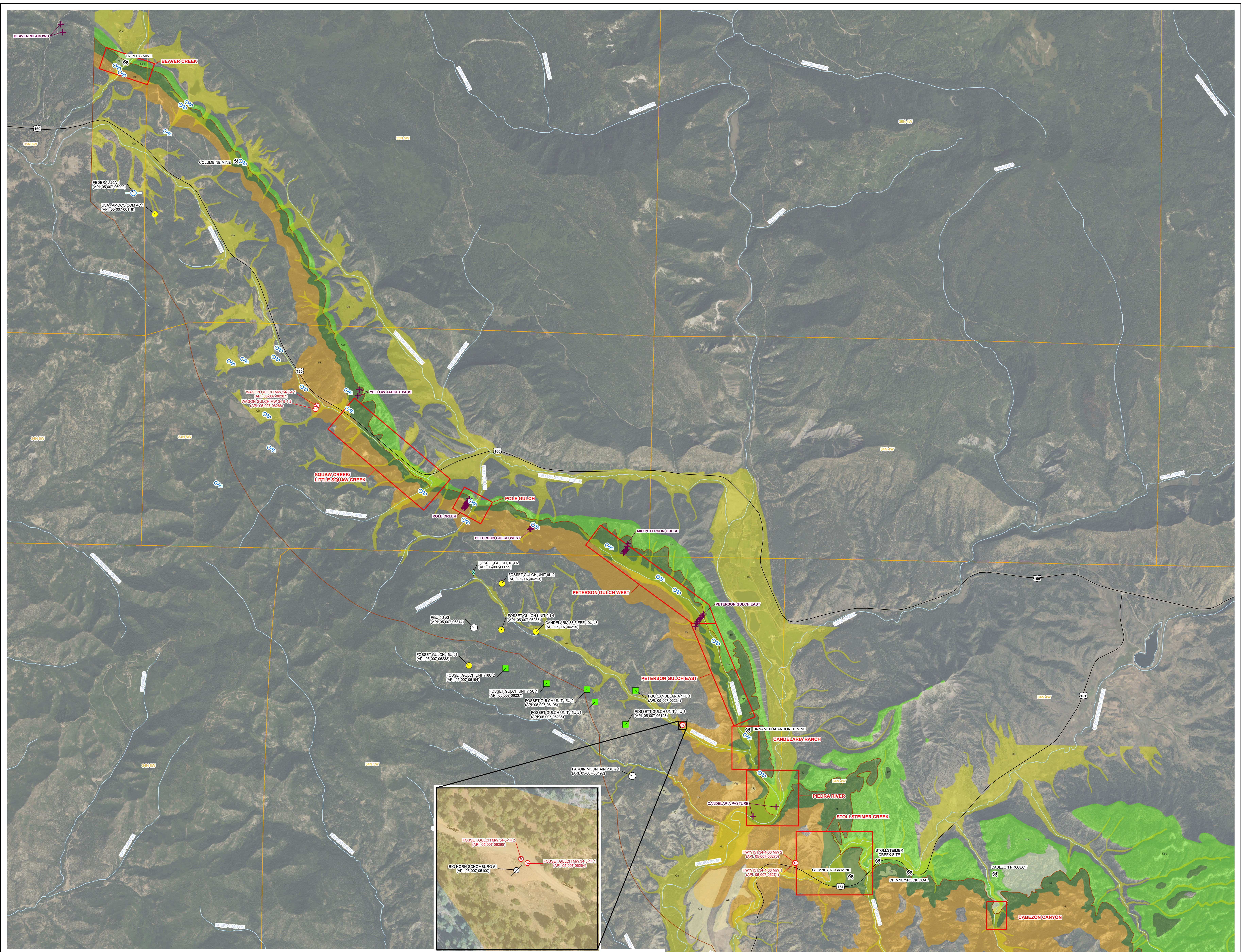
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## FIGURES



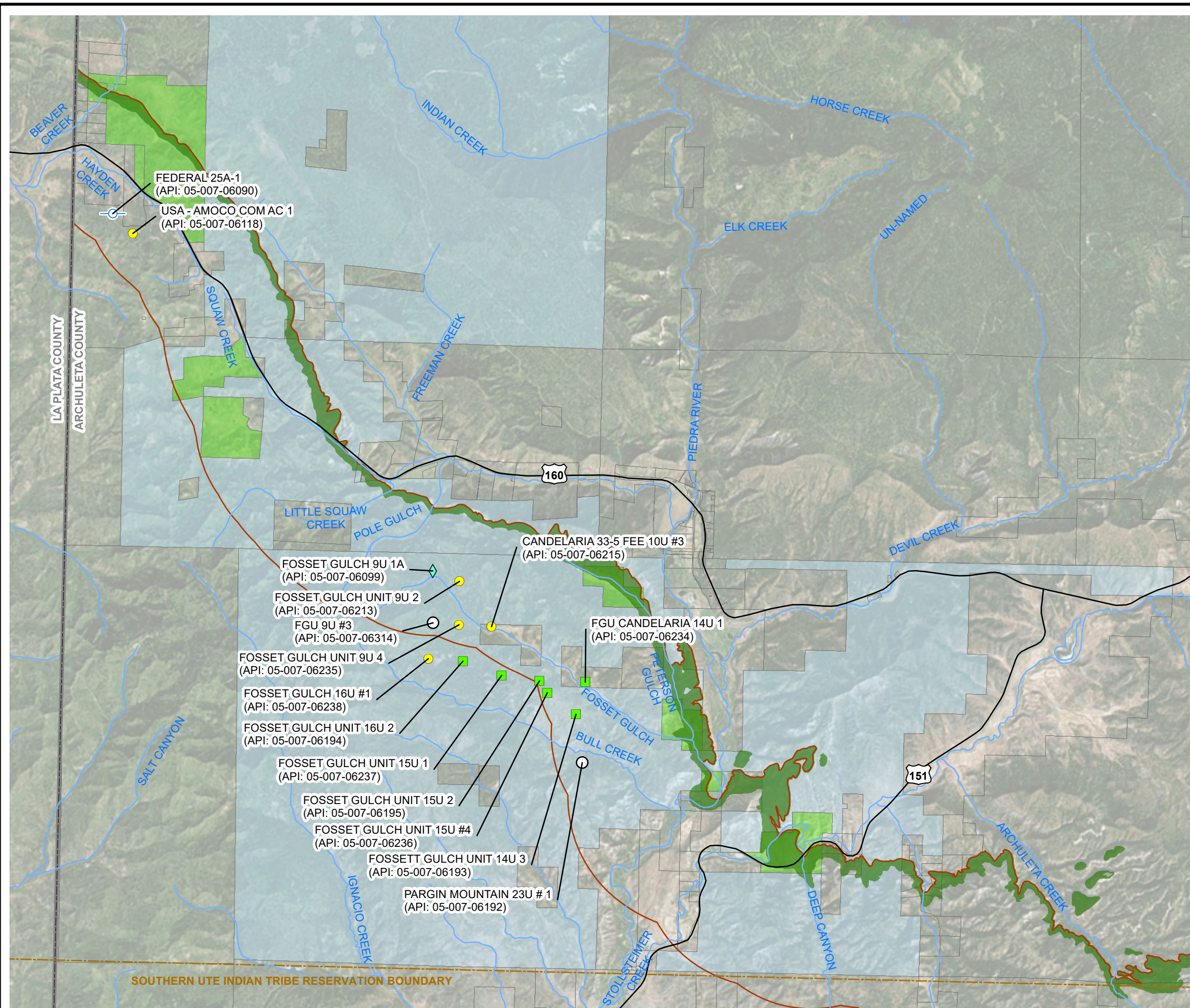


**FIGURE 1**  
**PROJECT AREA MAP**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**

**PETROX RESOURCES AND ELM RIDGE RESOURCES**



P:\San Juan Basin GIS\Archuleta\Fruiland\_CMR\MXD\Subgas\_Flux\2016\2016\_ARCH\_FIG 01 PROJECT AREA MAP.mxd



**LEGEND**

**COALBED METHANE WELLS (PETROX RESOURCES, INC.)**

- PRODUCING
- ◆ DRILLING
- SHUT IN
- WAITING ON INFORMATION
- PROPOSED WELL

- HIGHWAY
- SURFACE WATER
- SOUTHERN UTE INDIAN TRIBE RESERVATION BOUNDARY
- COUNTY BOUNDARY
- BUREAU OF LAND MANAGEMENT OUTCROP ZONE  
(1.5 MILES INWARD FROM Kf-Kk CONTACT)

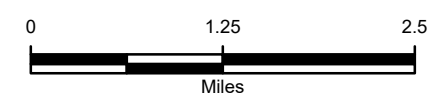
**GEOLOGY - COLORADO GEOLOGICAL SURVEY, 2011**

- FRUITLAND FORMATION (Kf)

**2016 PROPERTY ACCESS STATUS**

- ACCESS APPROVED
- NO RESPONSE

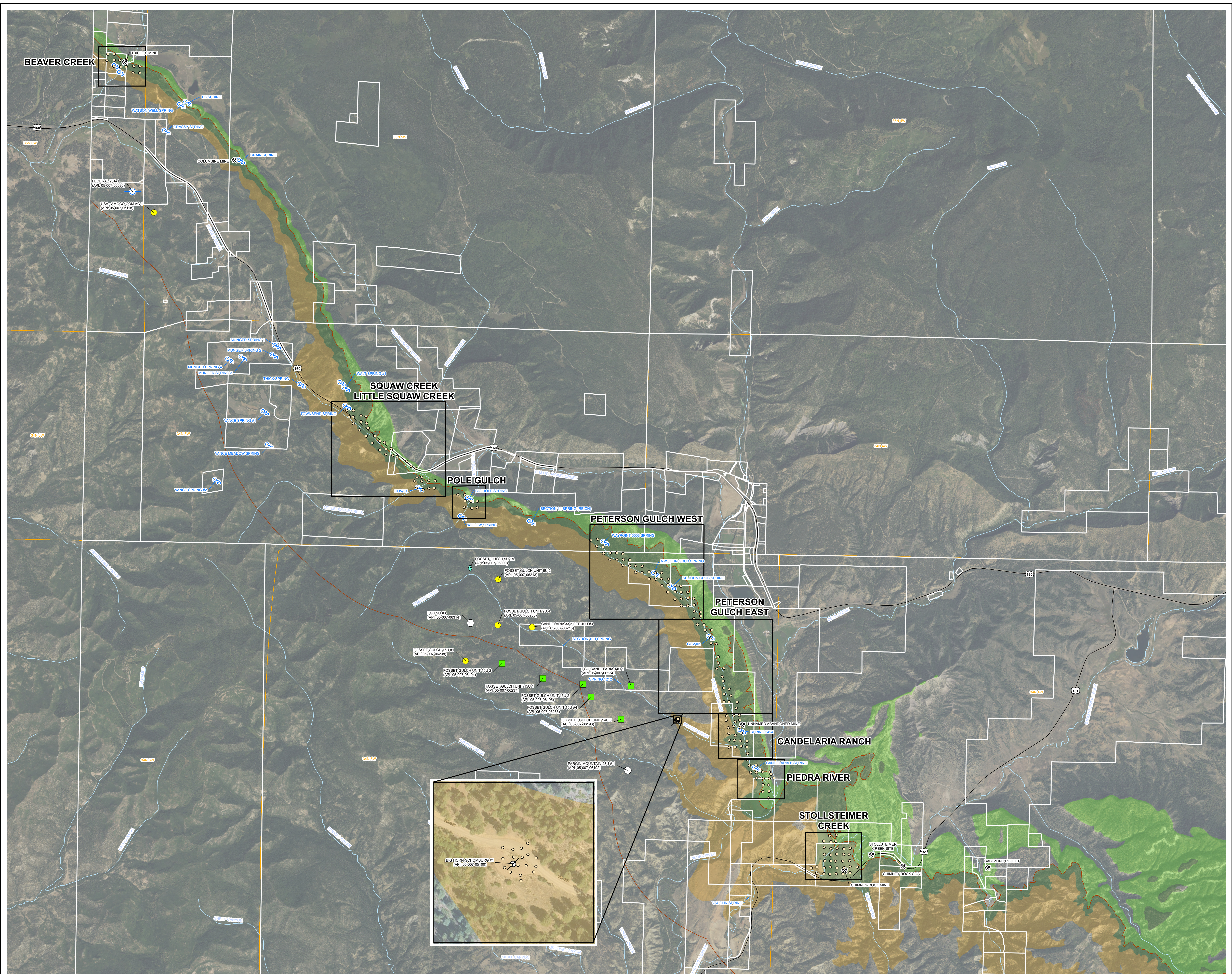
IMAGE COURTESY OF ESRI



**FIGURE 2**  
**PROPERTY ACCESS MAP**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**

**PETROX RESOURCES AND ELM RIDGE RESOURCES**





**LEGEND**

**METHANE FLUX MEASUREMENT (mol/m<sup>2</sup> • day)**

- 0.0000 - 0.1999
- 0.2000 - 0.5000
- 0.5001 - 1.0000
- 1.0001 - 10.0000
- 10.0001 - 50.0000
- 50.0001 - 100.0000
- 100.0001 - 200.0000

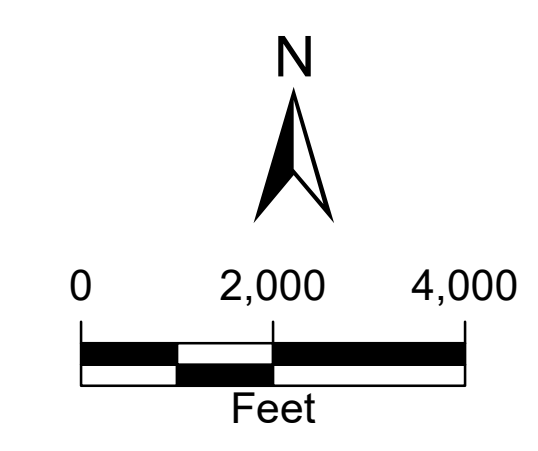
**COALBED METHANE WELLS (PETROX RESOURCES, INC.)**

- PRODUCING
- ◆ DRILLING
- SHUT IN
- WAITING ON INFORMATION
- PROPOSED WELL

- NATURAL SPRING
- ⊗ ABANDONED MINE
- ⊗ ABANDONED PRODUCTION WELL
- HIGHWAY
- SURFACE WATER
- PROPERTY BOUNDARY & OWNER (WHITE)

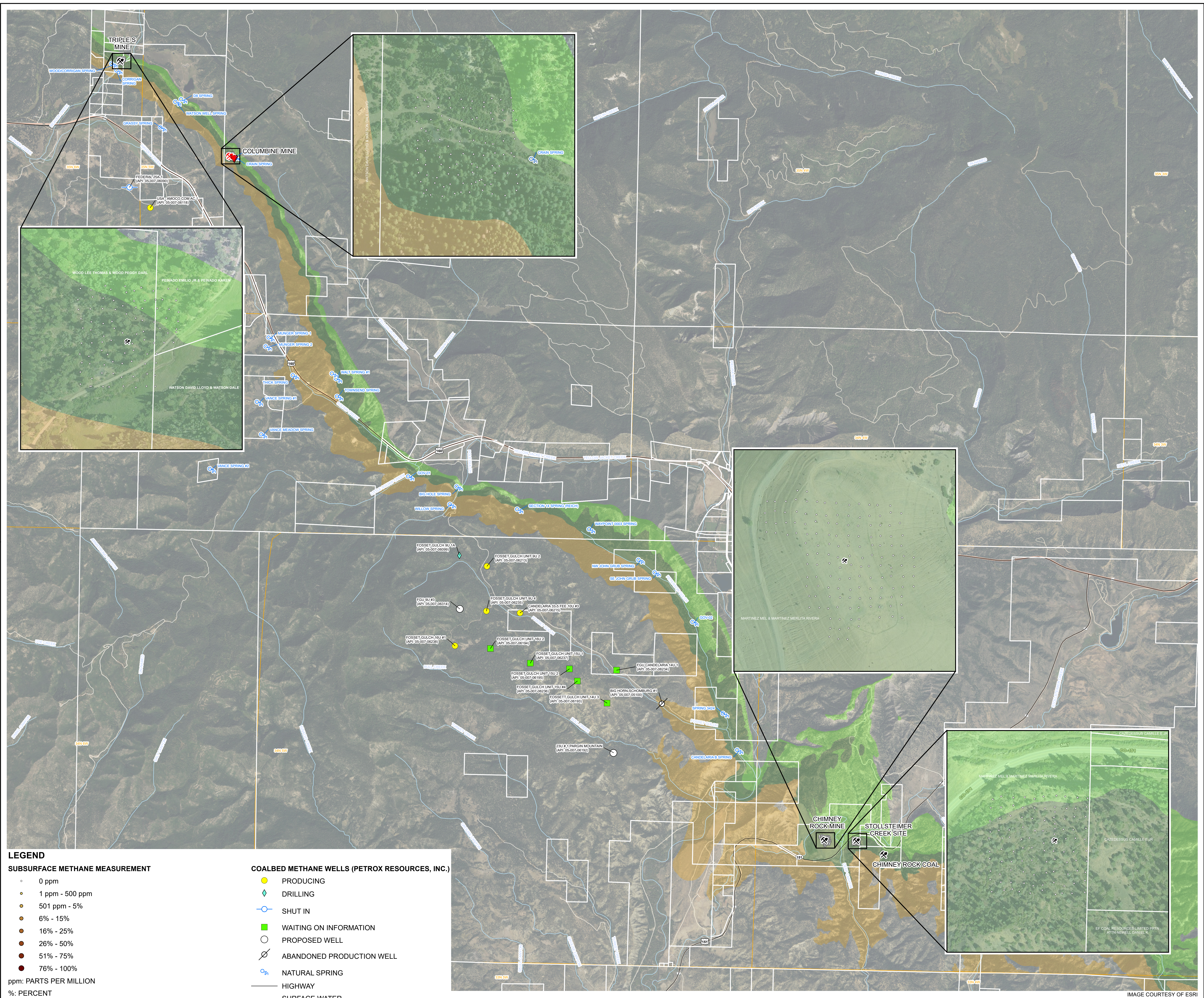
- BUREAU OF LAND MANAGEMENT OUTCROP ZONE (1.5 MILES INWARD FROM Kf-Kk CONTACT)
- DRAINAGE TRANSECT
- TOWNSHIP AND RANGE LINES
- GEOLOGY - COLORADO GEOLOGICAL SURVEY, 2011**
- KIRTLAND FORMATION (Kk)
- FRUITLAND FORMATION (Kf)
- PICTURED CLIFFS FORMATION (Kpc)

mol/m<sup>2</sup> • day: MOLES PER SQUARE METER PER DAY



**FIGURE 3**  
**DRAINAGE TRANSECTS SURVEY**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**





**LEGEND**

**SUBSURFACE METHANE MEASUREMENT**

- 0 ppm
- 1 ppm - 500 ppm
- 501 ppm - 5%
- 6% - 15%
- 16% - 25%
- 26% - 50%
- 51% - 75%
- 76% - 100%

ppm: PARTS PER MILLION  
%: PERCENT

ONLY MEASUREMENTS GREATER THAN 0 ppm ARE LABELED

- ✂ MINE ENTRANCE
- ✂ COLLAPSED MINE ENTRANCE
- ▼ COLLAPSED SHAFT

**COALBED METHANE WELLS (PETROX RESOURCES, INC.)**

- PRODUCING
- ◆ DRILLING
- SHUT IN
- WAITING ON INFORMATION
- PROPOSED WELL
- ⊘ ABANDONED PRODUCTION WELL
- NATURAL SPRING

- HIGHWAY
- SURFACE WATER
- PROPERTY BOUNDARY (WHITE)
- TOWNSHIP AND RANGE LINES

**GEOLOGY - COLORADO GEOLOGICAL SURVEY, 2011**

- KIRTLAND FORMATION (Kk)
- FRUITLAND FORMATION (Kf)
- PICTURED CLIFFS FORMATION (Kpc)

**FIGURE 4**  
**ABANDONED COAL MINES**  
**METHANE SOIL GAS MEASUREMENTS**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**  
**PETROX RESOURCES AND ELM RIDGE RESOURCES**

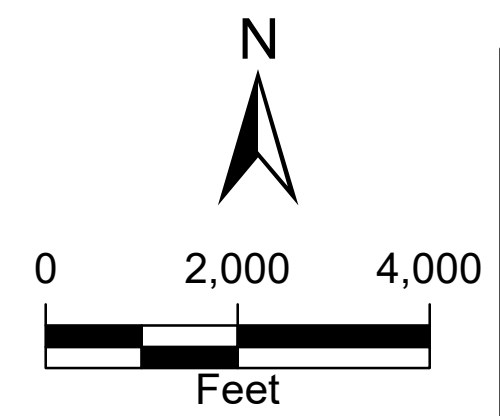
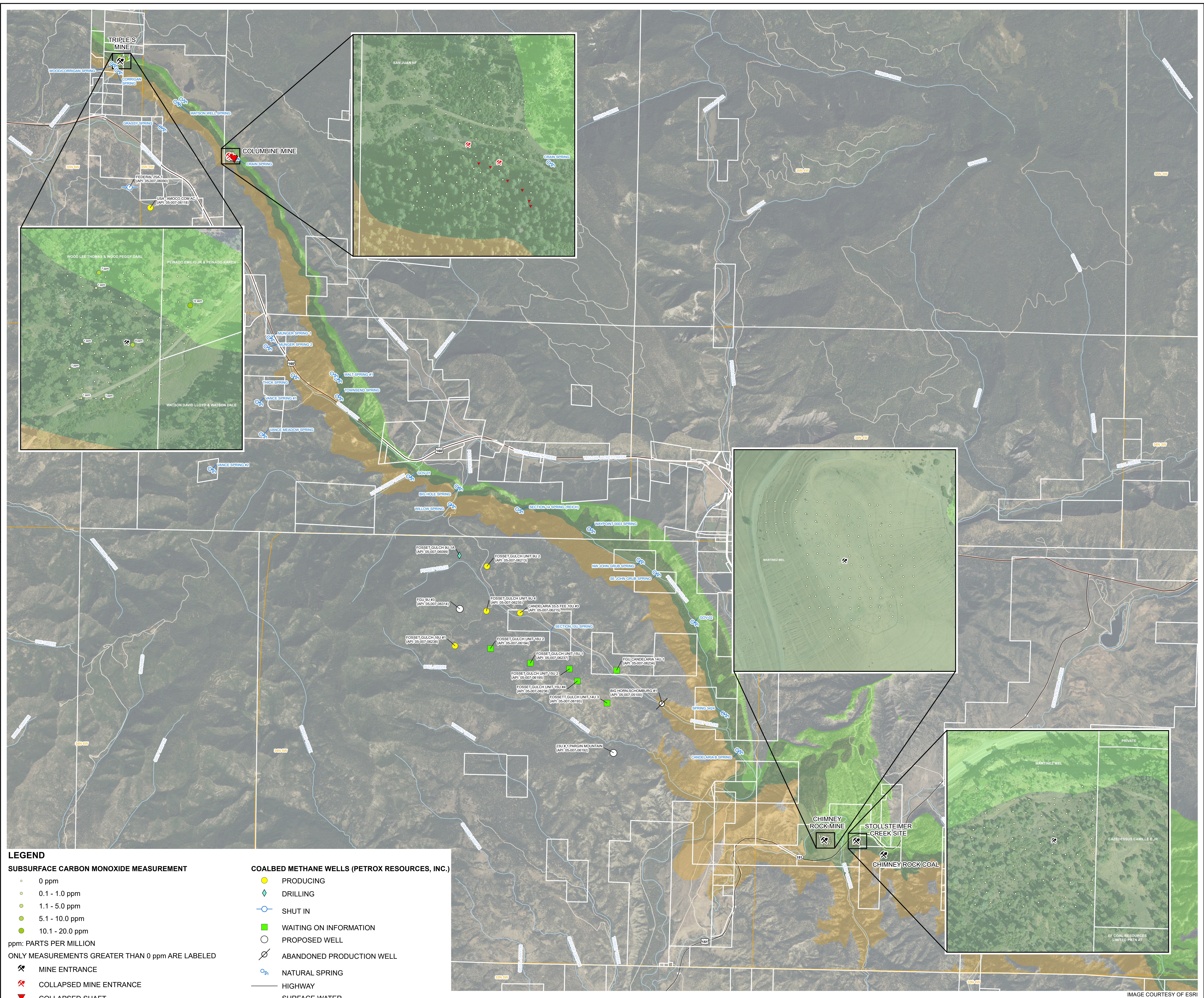


IMAGE COURTESY OF ESRI



**LEGEND**

**SUBSURFACE CARBON MONOXIDE MEASUREMENT**

- 0 ppm
- 0.1 - 1.0 ppm
- 1.1 - 5.0 ppm
- 5.1 - 10.0 ppm
- 10.1 - 20.0 ppm

ppm: PARTS PER MILLION  
 ONLY MEASUREMENTS GREATER THAN 0 ppm ARE LABELED

- ⚡ MINE ENTRANCE
- ⚡ COLLAPSED MINE ENTRANCE
- ⚡ COLLAPSED SHAFT

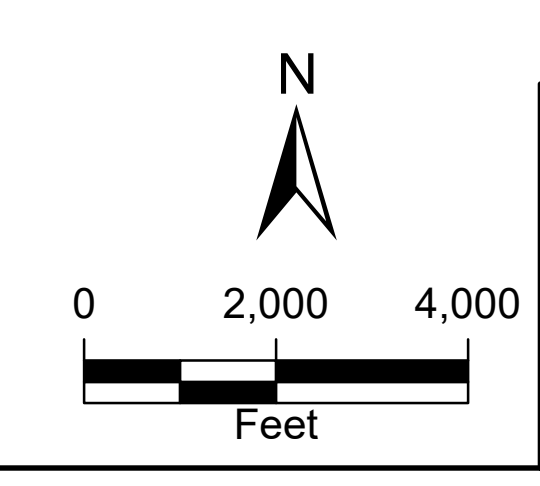
**COALBED METHANE WELLS (PETROX RESOURCES, INC.)**

- PRODUCING
- ◆ DRILLING
- SHUT IN
- WAITING ON INFORMATION
- PROPOSED WELL
- ABANDONED PRODUCTION WELL
- NATURAL SPRING

— HIGHWAY  
 — SURFACE WATER  
 — PROPERTY BOUNDARY (WHITE)  
 — TOWNSHIP AND RANGE LINES

**GEOLOGY - COLORADO GEOLOGICAL SURVEY, 2011**

- KIRTLAND FORMATION (Kk)
- FRUITLAND FORMATION (Kf)
- PICTURED CLIFFS FORMATION (Kpc)

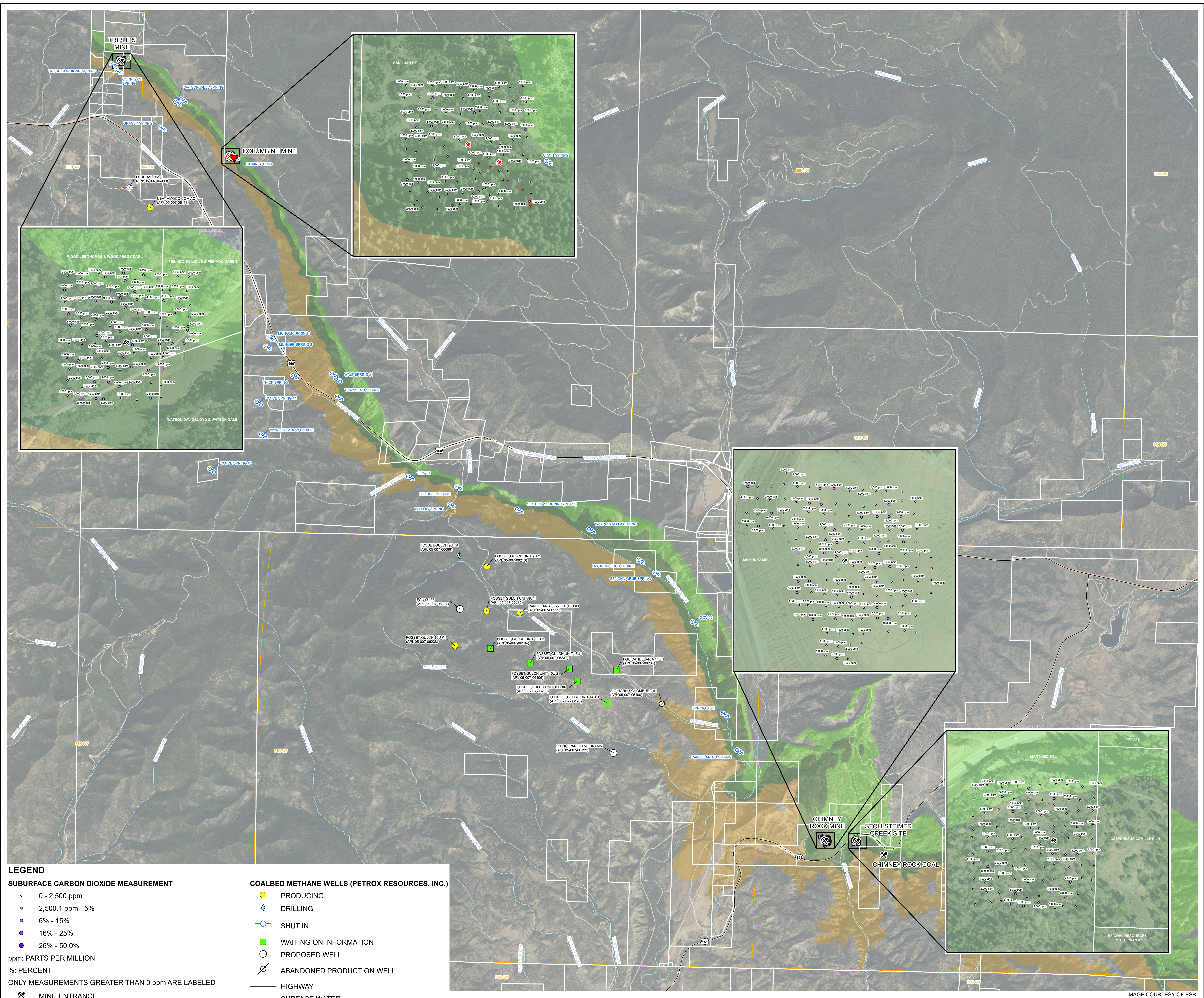


**FIGURE 5**  
 ABANDONED COAL MINES  
 CARBON MONOXIDE SOIL GAS MEASUREMENTS  
 2016 OUTCROP ZONE REPORT  
 ARCHULETA COUNTY, COLORADO  
 PETROX RESOURCES AND ELM RIDGE RESOURCES



P:\San Juan Basin GIS\Archuleta\Fruitland\_OMRM\XDs\Subgas\_Flux\2016\2016\_ARCH\_FIG 05 MINES CO.mxd

IMAGE COURTESY OF ESRI



**LEGEND**

**SUBSURFACE CARBON DIOXIDE MEASUREMENT**

- 0 - 2,500 ppm
- 2,500.1 ppm - 5%
- 6% - 15%
- 16% - 25%
- 26% - 50.0%

ppm: PARTS PER MILLION  
%: PERCENT

ONLY MEASUREMENTS GREATER THAN 0 ppm ARE LABELED

- ⊠ MINE ENTRANCE
- ⊠ COLLAPSED MINE ENTRANCE
- ⊠ COLLAPSED SHAFT

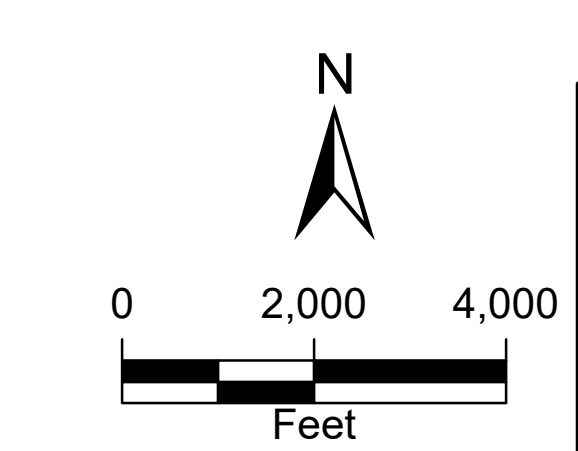
**COALBED METHANE WELLS (PETROX RESOURCES, INC.)**

- PRODUCING
- ◆ DRILLING
- SHUT IN
- WAITING ON INFORMATION
- PROPOSED WELL
- ⊘ ABANDONED PRODUCTION WELL

— HIGHWAY  
— SURFACE WATER  
— PROPERTY BOUNDARY (WHITE)  
— TOWNSHIP AND RANGE LINES

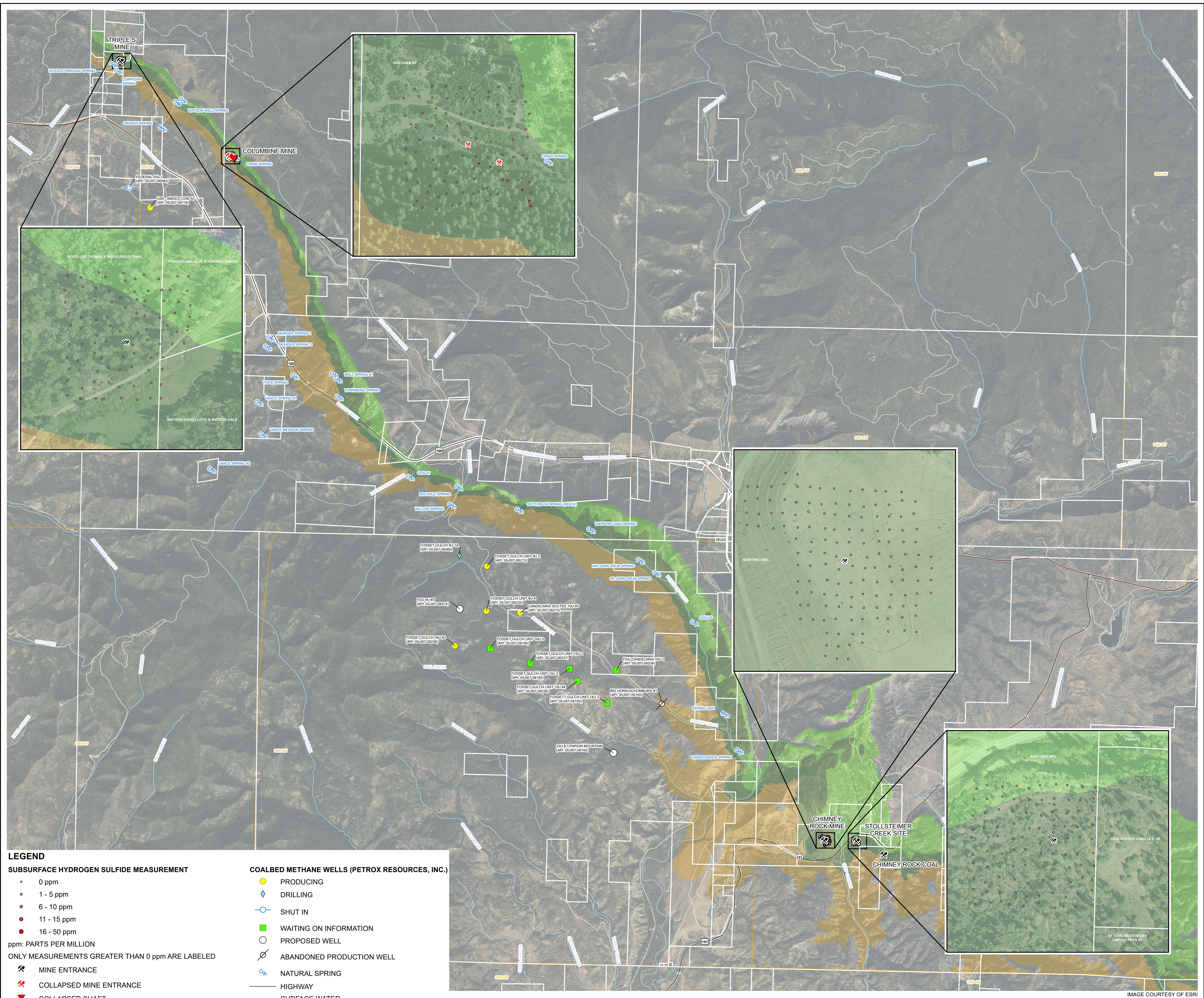
**GEOLOGY - COLORADO GEOLOGICAL SURVEY, 2011**

- KIRTLAND FORMATION (Kk)
- FRUITLAND FORMATION (Kf)
- PICTURED CLIFFS FORMATION (Kpc)



**FIGURE 6**  
**ABANDONED COAL MINES**  
**CARBON DIOXIDE SOIL GAS MEASUREMENTS**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**  
**PETROX RESOURCES AND ELM RIDGE RESOURCES**





**LEGEND**

**SUBSURFACE HYDROGEN SULFIDE MEASUREMENT**

- 0 ppm
- 1 - 5 ppm
- 6 - 10 ppm
- 11 - 15 ppm
- 16 - 50 ppm

ppm: PARTS PER MILLION  
 ONLY MEASUREMENTS GREATER THAN 0 ppm ARE LABELED

- ⚡ MINE ENTRANCE
- ⚡ COLLAPSED MINE ENTRANCE
- ▼ COLLAPSED SHAFT

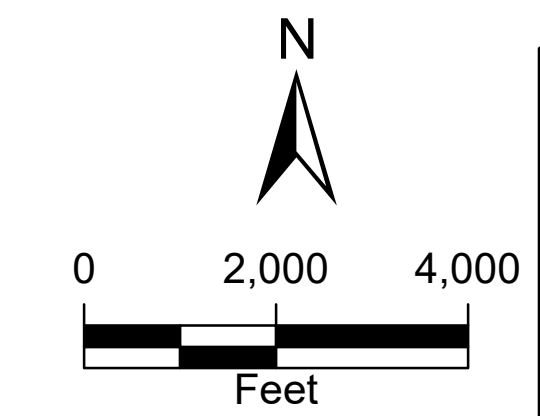
**COALBED METHANE WELLS (PETROX RESOURCES, INC.)**

- PRODUCING
- ◆ DRILLING
- SHUT IN
- WAITING ON INFORMATION
- PROPOSED WELL
- ⊘ ABANDONED PRODUCTION WELL
- ⊕ NATURAL SPRING

— HIGHWAY  
 — SURFACE WATER  
 — PROPERTY BOUNDARY (WHITE)  
 — TOWNSHIP AND RANGE LINES

**GEOLOGY - COLORADO GEOLOGICAL SURVEY, 2011**

- KIRTLAND FORMATION (Kk)
- FRUITLAND FORMATION (Kf)
- PICTURED CLIFFS FORMATION (Kpc)

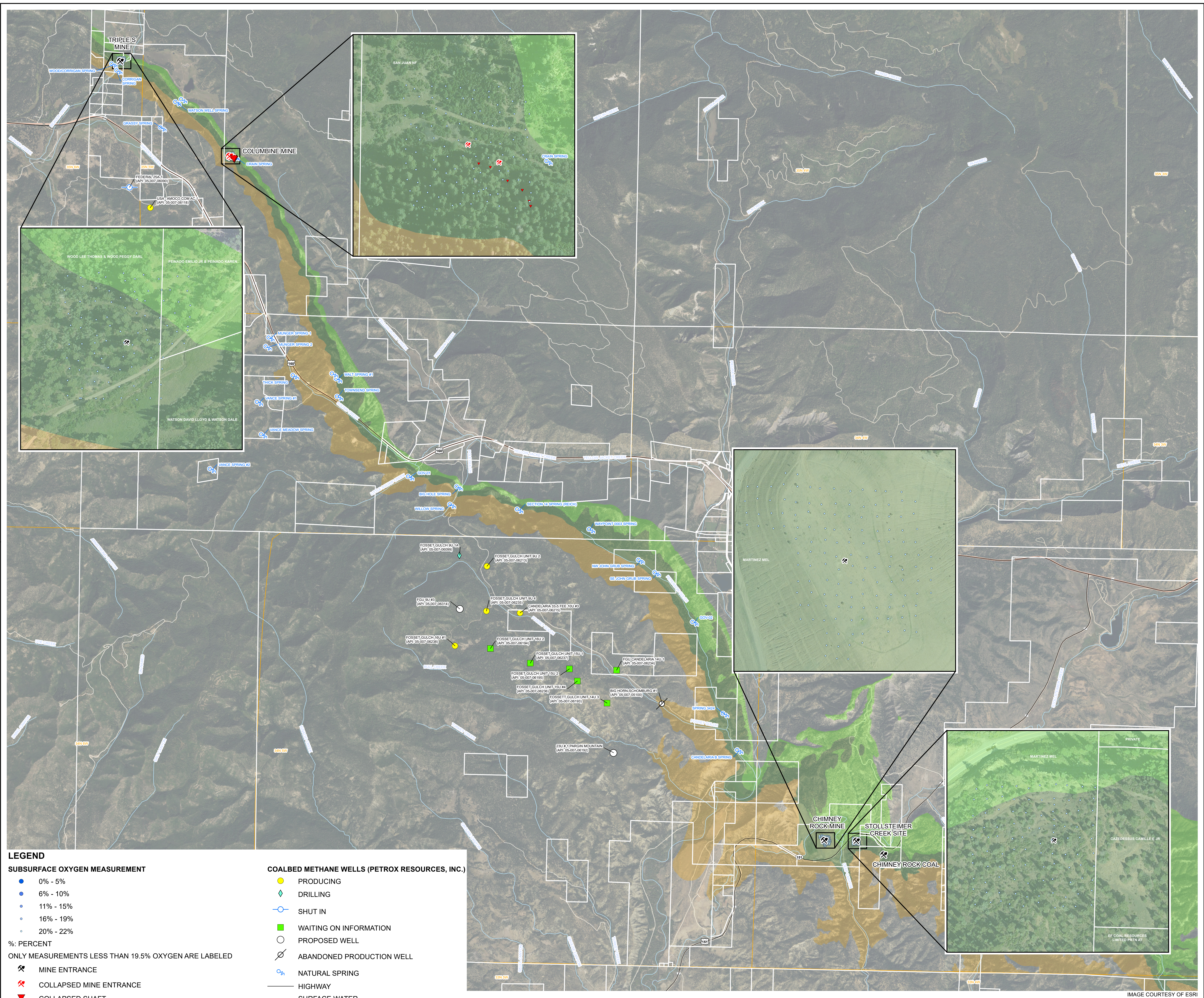


**FIGURE 7**  
 ABANDONED COAL MINES  
 HYDROGEN SULFIDE SOIL GAS MEASUREMENTS  
 2016 OUTCROP ZONE REPORT  
 ARCHULETA COUNTY, COLORADO  
 PETROX RESOURCES AND ELM RIDGE RESOURCES



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IMAGE COURTESY OF ESRI



**LEGEND**

**SUBSURFACE OXYGEN MEASUREMENT**

- 0% - 5%
- 6% - 10%
- 11% - 15%
- 16% - 19%
- 20% - 22%

**%: PERCENT**

ONLY MEASUREMENTS LESS THAN 19.5% OXYGEN ARE LABELED

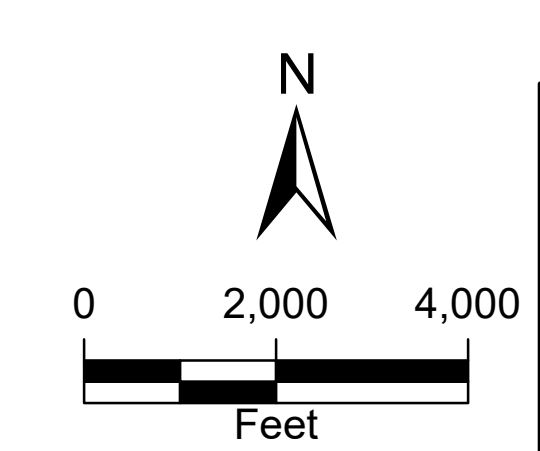
- ✂ MINE ENTRANCE
- ✂ COLLAPSED MINE ENTRANCE
- ▼ COLLAPSED SHAFT

**COALBED METHANE WELLS (PETROX RESOURCES, INC.)**

- PRODUCING
- ◆ DRILLING
- SHUT IN
- WAITING ON INFORMATION
- PROPOSED WELL
- ⊘ ABANDONED PRODUCTION WELL
- NATURAL SPRING

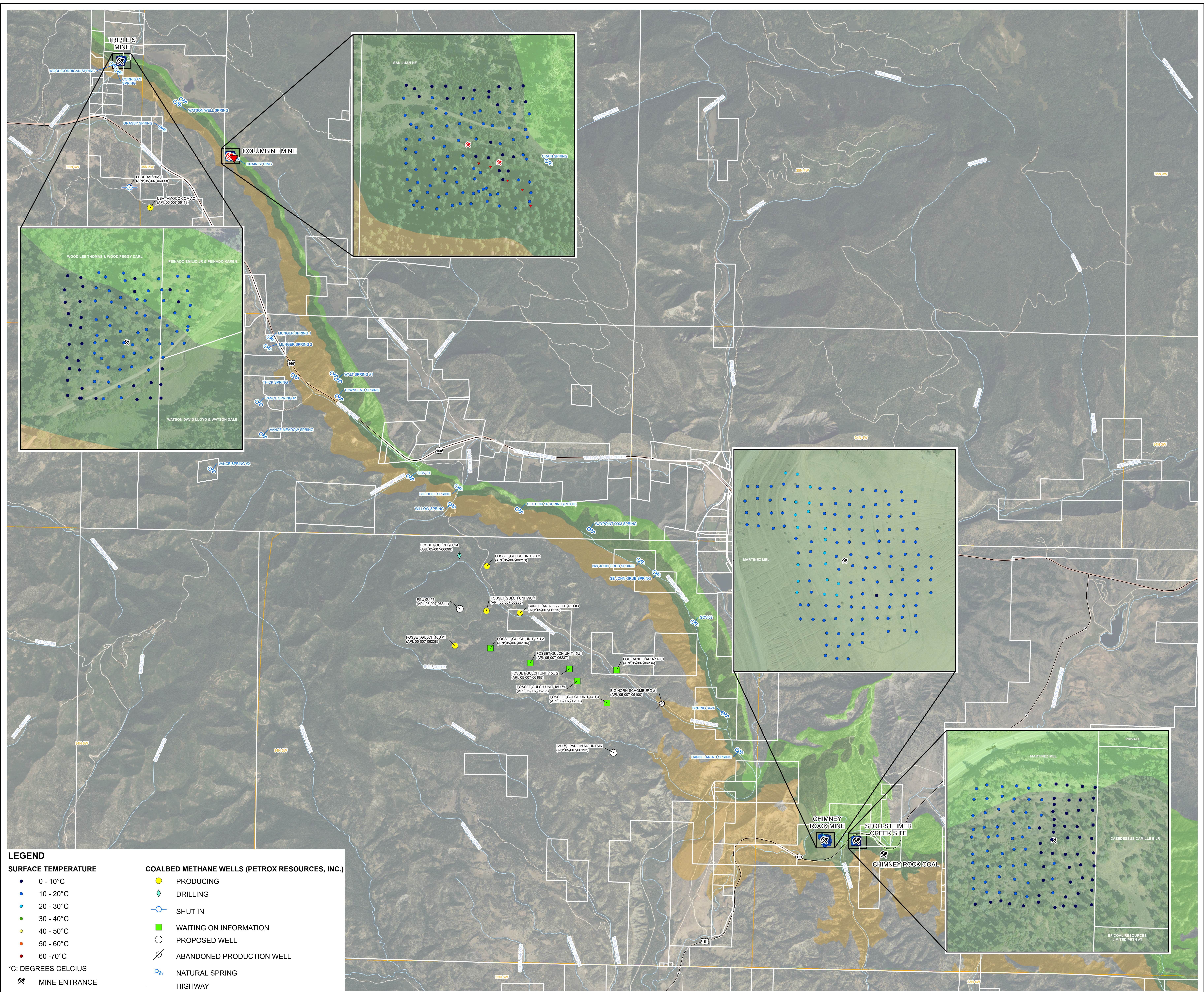
**GEOLOGY - COLORADO GEOLOGICAL SURVEY, 2011**

- KIRTLAND FORMATION (Kk)
- FRUITLAND FORMATION (Kf)
- PICTURED CLIFFS FORMATION (Kpc)



**FIGURE 8**  
**ABANDONED COAL MINES**  
**OXYGEN SOIL GAS MEASUREMENTS**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**  
**PETROX RESOURCES AND ELM RIDGE RESOURCES**





**LEGEND**

**SURFACE TEMPERATURE**

- 0 - 10°C
- 10 - 20°C
- 20 - 30°C
- 30 - 40°C
- 40 - 50°C
- 50 - 60°C
- 60 - 70°C

°C: DEGREES CELCIUS

**COALBED METHANE WELLS (PETROX RESOURCES, INC.)**

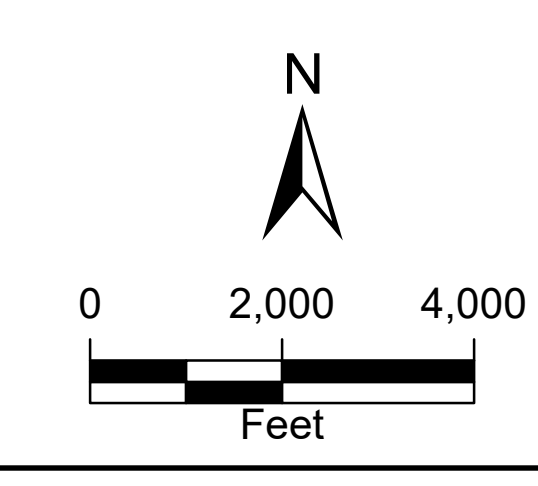
- PRODUCING
- ◆ DRILLING
- SHUT IN
- WAITING ON INFORMATION
- PROPOSED WELL
- ⊘ ABANDONED PRODUCTION WELL
- NATURAL SPRING

**MINE ENTRANCE**

- ⊗ MINE ENTRANCE
- ⊗ COLLAPSED MINE ENTRANCE
- ▼ COLLAPSED SHAFT

**GEOLOGY - COLORADO GEOLOGICAL SURVEY, 2011**

- HIGHWAY
- SURFACE WATER
- PROPERTY BOUNDARY (WHITE)
- TOWNSHIP AND RANGE LINES
- KIRTLAND FORMATION (Kk)
- FRUITLAND FORMATION (Kf)
- PICTURED CLIFFS FORMATION (Kpc)

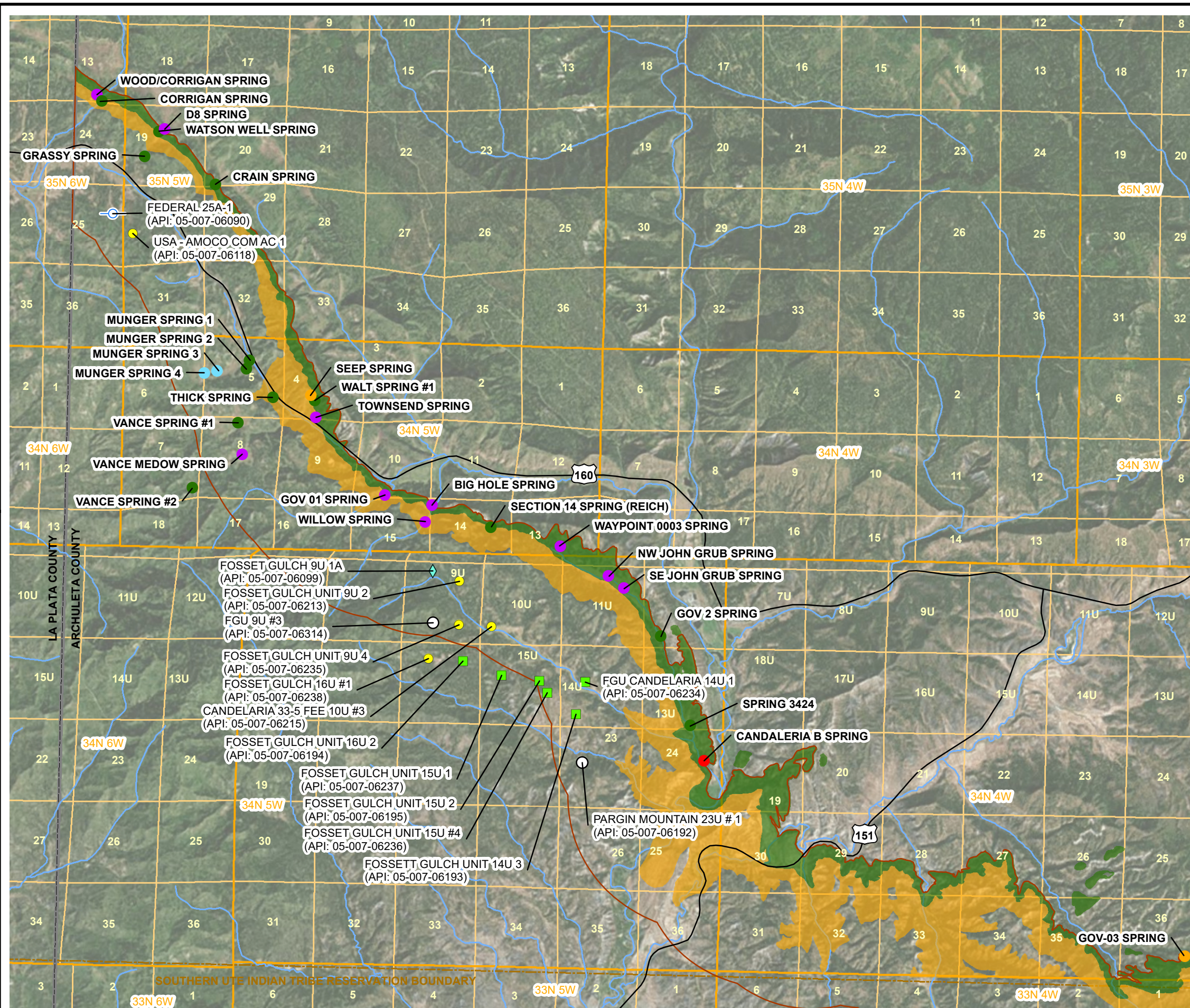


**FIGURE 9**  
**ABANDONED COAL MINES**  
**SURFACE TEMPERATURE SOIL GAS MEASUREMENTS**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**  
**PETROX RESOURCES AND ELM RIDGE RESOURCES**



P:\San Juan Basin GIS\Archuleta\Fruitland\_OMR\MXD\Subgas\_Flux\2016\2016\_ARCH\_FIG 09 MINES TEMP.mxd

IMAGE COURTESY OF ESRI



**LEGEND**

**COALBED METHANE WELLS (PETROX RESOURCES, INC.)**

- PRODUCING
- ◆ DRILLING
- SHUT IN
- WAITING ON INFORMATION
- PROPOSED WELL

**2016 NATURAL SPRING STATUS**

- SAMPLED
- STAGNANT
- DRY
- NOT LOCATED
- NO ACCESS/NO SAMPLE COLLECTED

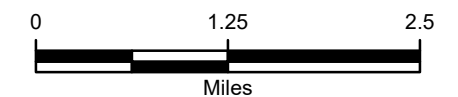
- HIGHWAY
- SURFACE WATER
- COUNTY BOUNDARY
- SOUTHERN UTE INDIAN TRIBE RESERVATION BOUNDARY
- TOWNSHIP AND RANGE LINES
- SECTION
- BUREAU OF LAND MANAGEMENT OUTCROP ZONE

**GEOLOGY - COLORADO GEOLOGICAL SURVEY, 2011**

- FRUITLAND FORMATION (Kf)
- KIRKLAND FORMATION (Kk)

SUBSURFACE METHANE MEASUREMENTS WERE COLLECTED FROM TEMPORARY SOIL PROBES ADVANCED WITH A SLIDE HAMMER AT EACH SAMPLED NATURAL SPRING LOCATION. THE CONCENTRATION OF SUBSURFACE METHANE WAS 0.0 PARTS PER MILLION METHANE FOR ALL MEASUREMENTS TAKEN.

IMAGE COURTESY OF ESRI



**FIGURE 10**  
**NATURAL SPRINGS STATUS**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**

**PETROX RESOURCES AND ELM RIDGE RESOURCES**



## **TABLES**



**TABLE 1  
PROPERTY OWNER AND ACCESS INFORMATION  
2016 OUTCROP ZONE REPORT  
ARCHULETA COUNTY, COLORADO**

**PETROX RESOURCES, INC. AND ELM RIDGE RESOURCES, INC.**

PERCEL NUMBER(S)	LANDOWNER NAME	CITY, STATE ZIPCODE
589711200001	JOHN W & PAMELA K GRUBB	FLORA VISTA NM, 87415
568508100020	WILLIAM VANCE JR	BAYFIELD CO 81122
589530100039	MEL MARTINEZ	PAGOSA SPRINGS CO, 81147
567913400016	EMILIO JR PEINADO & KAREN R PEINADO	BAYFIELD CO, 81122
568505200020	JEFFREY H MUNGER REVOCABLE TRUST	SAN DIEGO CA, 92110
568319300003, 568319200034	DAVID LLOYD WATSON & DALE LLOYD WATSON	BAYFIELD CO, 81122
589724400007	LUCY S CANDELARIA & BERNADETTE GONZALES	ARBOLES CO, 81121
567913400017	LEE THOMAS & PEGGY DARLENE WOOD	BAYFIELD CO, 81122
589713300006	GILBERT CANDELARIA	ARBOLES CO, 81121
568505200020	JEFFREY MUNGER	BAYFIELD, CO 81122
568510300009	ADAM RUSSELL DEE	CYRPRESS, TX 77429
589528400049	DIANE NEUMANN REVOCABLE TRUST	LINCOLNSHIRE, IL 60069
589528400043	JEAN PAUL AND SUSAN WRIGHT	PAGOSA SPRINGS, CO 81147
589533200046, 589528400053	THEODORE G WONZY AND EUGENIA LEON	PAGOSA SPRINGS, CO 81147
589713300006	SUSIE CANDELARIA TRUST	TUCSON, AZ 85743
589725400015	LARRY VAUGHN	PAGOSA SPRINGS, CO 81147

Notes:

Green indicates access granted by landowner
Red indicates access denied by landowner
White indicates no response from landowner, treated as no access



**TABLE 2  
METHANE FLUX DATA  
2016 OUTCROP ZONE REPORT  
ARCHULETA COUNTY, COLORADO**

**PETROX RESOURCES, INC. AND ELM RIDGE RESOURCES, INC.**

Mapping Area	Total Number of Methane Flux Points										Number of Sample Points with Methane greater than reporting limit <sup>1</sup>										Maximum Measurable Methane Flux <sup>2</sup> (moles/m <sup>2</sup> -day)								Volumetric Methane Flux (MCFD)									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2007	2008	2009	2010	2011	2013	2014	2015	2016	2008	2009	2010	2011	2012	2013	2014	2015	2016
Beaver Creek	14	53	46	48	48	54	13	51	13		1	0	0	0	1	0	0	0	0	0	0.2000	0.1579	0.0607	0.0740	<b>0.5347</b>	0	0	0	0	0	0	0	NA	0	0	0	0	0
Little Squaw Creek	21	77	78	77	76	29	*	*	*	*	2	2	0	0	0	0	*	*	*	*	<b>0.2300</b>	<b>0.2911</b>	0.0268	0.0852	0.0830	*	*	*	*	0.27	0	0	0	0	0	0	0	0
Yellow Jacket Pass/ Squaw Creek	10	208	170	204	205	127	35	125	36		0	0	0	0	0	0	0	0	0	0	0.0700	0.0373	0.0970	0.0140	0.1366	0	0	0	0	0	0	0	0	0	0	0	0	0
Pole Gulch	10	86	87	85	88	29	8	28	8		1	0	1	0	0	0	0	0	0	0	<b>0.3000</b>	0.1775	<b>0.2156</b>	0.1089	0.0117	0	0	0	0	0	0.02	0	0	0	0	0	0	0
Peterson Gulch	18	357	331	382	412	263	66	245	68		1	0	0	0	0	0	0	0	0	0	<b>0.2300</b>	0.1925	0.1733	0.0069	0.1991	0	0	0	0	0	0	0	0	0	0	0	0	0
Piedra River	--	--	--	--	--	--	18	61	38		--	--	--	--	--	--	0	0	0	0	--	--	--	--	--	0	0	0	0	--	--	--	--	--	--	--	--	--
Stollsteimer Creek	11	201	203	176	195	122	34	131	34		0	3	2	0	1	0	0	0	0	0	0.1500	<b>0.3440</b>	0.3382	0.1493	<b>0.2997</b>	0	0	0	0	0.38	0.50	0	NA	0	0	0	0	0
<b>TOTAL</b>	<b>84</b>	<b>982</b>	<b>915</b>	<b>972</b>	<b>1024</b>	<b>624</b>	<b>192</b>	<b>641</b>	<b>197</b>		<b>5</b>	<b>5</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>
<b>Abandoned Production Well</b>																																						
Big Horn-Schomburg #1	5	9	5	9	26	18	18	19		18	1	0	1	0	1	0	0	0	0	0	<b>0.2364</b>	0.0661	0.0055	0.0852	<b>0.2122</b>	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:  
moles/m<sup>2</sup>-day - moles per meter squared per day  
MCFD - thousand cubic feet per day  
-- - No data available  
> - greater than

<sup>1</sup>Only methane flux values that were greater than the portable flux meter reporting limit of 0.2 moles/m<sup>2</sup>-day were used in calculations  
**Bold** indicates methane flux values above the reporting limit  
NA - Not applicable due to insufficient data points to calculate volumetric methane flux  
\*Little Squaw Creek and Yellow Jacket Pass/Squaw Creek have been combined into one



**TABLE 3**  
**NATURAL SPRINGS SAMPLING STATUS**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**

**PETROX RESOURCES, INC. AND ELM RIDGE RESOURCES, INC.**

NATURAL SPRING	MONTH AND YEAR													
	September 2005	May/June 2006	October 2007	October 2008	May 2009	October 2009	July 2010	May 2011	May 2012	May 2013	May 2014	May/June 2015	May/August 2016	
Beaver Creek	Not Sampled	Not Sampled	Not Sampled	Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Discontinued*	Discontinued*	Discontinued*	Discontinued*	
Big Hole Spring	Not Sampled	Sampled	Not Sampled	Dry	Not Located	Not Located	Dry	Dry	Not Sampled	Dry	Dry	Not Located	Not Located	
Candelaria A Spring	Not Sampled	Not Sampled	Not Sampled	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	
Candelaria B Spring	Not Sampled	Sampled	Not Sampled	No Access	No Access	No Access	No Access	No Access	No Access	Dry	Dry	No Access	No Access	
Corrigan Spring	Not Sampled	Not Sampled	Not Sampled	Not Located	Sampled	Dry	Dry	Sampled	Sampled	Dry	Dry	Dry	Sampled	
Crain Spring	Not Sampled	Sampled	Not Sampled	Sampled	Sampled	Dry	Sampled	No Access	Sampled	Sampled	Dry	Sampled	Sampled	
D8 Spring	--	--	--	--	--	--	--	--	--	--	--	Dry	Dry	
Gov-1 Spring	--	--	--	--	--	--	--	--	--	Dry	Dry	Dry	Dry	
Gov-2 Spring	--	--	--	--	--	--	--	--	--	Sampled	Sampled	Dry	Sampled	
Gov-3 Spring	--	--	--	--	--	--	--	--	--	Not Located	Dry	Not Located	Not Located	
Grassy Spring	Not Sampled	Sampled	Sampled	No Access	No Access	No Access	No Access	No Access	Sampled	Sampled	Sampled	Sampled	Sampled	
High Watson Spring	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	No Access	Not Sampled	Discontinued**	Discontinued**	Discontinued**	Discontinued**	
Miser Spring & Pipeline	Not Sampled	Not Sampled	Not Sampled	No Access	No Access	No Access	No Access	No Access	No Access	Discontinued**	Discontinued**	Discontinued**	Discontinued**	
Munger Spring 1	--	--	--	--	--	--	--	--	--	Dry	Sampled	Sampled	Sampled	
Munger Spring 2	--	--	--	--	--	--	--	--	--	Sampled	Dry	Sampled	Sampled	
Munger Spring 3	--	--	--	--	--	--	--	--	--	Dry	Dry	Dry	Stagnant	
Munger Spring 4	--	--	--	--	--	--	--	--	--	Dry	Dry	Sampled	Stagnant	
NW John Grubb Spring	Sampled	Sampled	Sampled	Sampled	Sampled	Dry	Sampled	Sampled	Sampled	Dry	Dry	Dry	Dry	
Ramona Leonard Spring (Mona)	Not Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	No Access	No Access	No Access	No Access	No Access	No Access	No Access	
Ramona Spring	Not Sampled	Not Sampled	Not Sampled	Dry	Not Located	Not Located	No Access	No Access	No Access	No Access	No Access	No Access	No Access	
SE John Grubb Spring	Sampled	Sampled	Sampled	Sampled	Sampled	Dry	Not Sampled	Sampled	Sampled	Dry	Dry	Dry	Dry	
Section 10U Spring	Sampled	Sampled	Not Sampled	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	
Section 14 (Reich) Spring	Sampled	Sampled	Sampled	Sampled	Sampled	Dry	Sampled	No Access	Not Sampled	Sampled	Sampled	Sampled	Sampled	
Seep Spring	Not Sampled	Not Sampled	Not Sampled	Dry	Not Located	Not Located	Not Located	Not Located	Dry	Not Located	Not Located	Not Located	Not Located	
Spring 1212	Sampled	Sampled	Not Sampled	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	
Spring 3424	Sampled	Sampled	Not Sampled	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	Sampled	Sampled	
Thick Spring	Not Sampled	Sampled	Sampled	Not Located	Sampled	Dry	Not Sampled	Sampled	Sampled	Sampled	Dry	Sampled	Sampled	
Townsend Spring	Not Sampled	Not Sampled	Not Sampled	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
Vance Meadow Spring	Not Sampled	Sampled	Sampled	Sampled	Sampled	Dry	Dry	Sampled	Sampled	Dry	Dry	Dry	Dry	
Vance Spring #1	Not Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	
Vance Spring #2	--	--	--	--	--	--	--	--	--	--	--	--	Sampled	
Vaughn Spring	Not Sampled	Not Sampled	Not Sampled	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	No Access	
Walt Spring #1	Not Sampled	Sampled	Not Sampled	Dry	Dry	Dry	Dry	Sampled	Dry	Sampled	Dry	Sampled	Sampled	
Watson Well Spring	Not Sampled	Sampled	Not Sampled	Sampled	Sampled	Sampled	Sampled	No Access	Sampled	Sampled	Sampled	Sampled	Sampled	
Waypoint 0003 Spring	Not Sampled	NS	Not Sampled	Not Located	Not Located	Not Located	Not Sampled	Not Located	Dry	Not Located	Not Located	Not Located	Dry	
Willow Spring	Not Sampled	Sampled	Sampled	Sampled	Sampled	Dry	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Dry	
Wood/Corrigan Spring	Not Sampled	Not Sampled	Not Sampled	Dry	Sampled	Dry	Not Sampled	Sampled	Dry	Dry	Dry	Dry	Dry	

**Notes:**

- denotes not part of the sampling program for that year
- \* natural spring discontinued from sampling program due to its location in vicinity of Corrigan Spring
- \*\*natural spring discontinued from sampling program due to location of spring outside of Kf outcrop and/or BLM outcrop zone



**TABLE 4**  
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Natural Spring	2016 Field Observations/ Notes	Date	Water Quality Field Measurements				
			Conductivity (µS/cm)	pH (Units)	ORP (mV)	Temperature (°C)	TDS (ppm)
Beaver Creek	Discontinued*	September 2005	--	--	--	--	--
		May 2006	--	--	--	--	--
		October 2007	286.6	8.00	21.0	10.0	146.60
		October 2008	303.0	7.40	166.0	5.8	197.00
		May 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	Discontinued*				
		May 2014	Discontinued*				
		May 2015	Discontinued*				
		May 2016	Discontinued*				
Big Hole Spring	Not Located	September 2005	--	--	--	--	--
		May 2006	365.5	7.27	141.0	11.7	249.10
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		June 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
		May 2016	--	--	--	--	--
Candelaria A Spring	Not Sampled due to access	September 2005	--	--	--	--	--
		May 2006	--	--	--	--	--
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		June 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
		May 2016	--	--	--	--	--
Candelaria B Spring	Not Sampled due to access	September 2005	--	--	--	--	--
		May 2006	--	--	--	--	--
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		June 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--



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Natural Spring	2016 Field Observations/ Notes	Date	Water Quality Field Measurements				
			Conductivity (µS/cm)	pH (Units)	ORP (mV)	Temperature (°C)	TDS (ppm)
		May 2016	--	--	--	--	--
Corrigan Spring	Sampled	September 2005	--	--	--	--	--
		June 2006	170.3	6.08	122.0	17.7	109.70
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		May 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	253.0	6.83	97.4	22.5	126.00
		May 2012	162.3	6.53	-45.2	11.5	81.20
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		June 2015	--	--	--	--	--
		May 2016	--	7.20	131.5	12.7	84.76
Crain Spring	Sampled	September 2005	--	--	--	--	--
		June 2006	570.3	7.50	-115.0	29.1	375.30
		October 2007	--	--	--	--	--
		October 2008	526.0	7.47	273.0	8.8	342.00
		May 2009	811.0	6.87	--	7.5	--
		October 2009	--	--	--	--	--
		July 2010	482.0	6.80	--	11.8	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	668.0	7.70	--	20.5	334.00
		May 2014	--	--	--	--	--
		June 2015	445.5	7.44	89.8	14.6	295.78
		May 2016	640.0	7.69	119.0	7.63	392.93
D8 Spring	Dry	June 2015	--	--	--	--	--
		May 2016	--	--	--	--	--
Gov-1 Spring	Dry	May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
		May 2016	--	--	--	--	--
Gov-2 Spring	Sampled	May 2013	659.0	7.00	17.4	10.2	328.00
		May 2014	510.0	6.90	--	13.1	--
		May 2015	--	--	--	--	--
		May 2016	577.3	7.57	116.3	11.0	376.34
Gov-3 Spring	Not Located	May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
		May 2016	--	--	--	--	--
Grassy Spring	Sampled	September 2005	--	--	--	--	--
		June 2006	570.3	7.50	-115.0	29.1	375.30
		October 2007	88.4	8.18	16.0	8.6	44.32
		October 2008	--	--	--	--	--
		May 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	954.0	7.00	--	14.3	480.00



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Natural Spring	2016 Field Observations/ Notes	Date	Water Quality Field Measurements				
			Conductivity (µS/cm)	pH (Units)	ORP (mV)	Temperature (°C)	TDS (ppm)
Natural Spring		May 2014	654.0	6.50	148.0	11.9	--
		June 2015	629.9	6.91	112.4	11.6	410.00
		May 2016	738.4	6.41	89.7	10.84	5034.52
High Watson Spring	Discontinued**	September 2005	--	--	--	--	--
		June 2006	--	--	--	--	--
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		May 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	789.0	7.49	18.1	16.7	392.00
		May 2013	Discontinued**				
		May 2014	Discontinued**				
		May 2015	Discontinued**				
May 2016	Discontinued**						
Miser Spring and Pipeline	Discontinued**	September 2005	--	--	--	--	--
		June 2006	--	--	--	--	--
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		June 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	Discontinued**				
		May 2014	Discontinued**				
		May 2015	Discontinued**				
		May 2016	Discontinued**				
Munger Spring 1	Sampled	May 2013	--	--	--	--	--
		May 2014	107.0	7.00	185.0	13.9	--
		June 2015	550.0	6.92	96.6	13.6	352.36
		May 2016	585.5	7.52	86.2	12.78	387.45
Munger Spring 2	Sampled	May 2013	358.0	7.40	--	18.9	176.00
		May 2014	--	--	--	--	--
		June 2015	320.4	6.88	57.2	13.1	207.60
May 2016	404.2	7.62	70.3	14.20	261.47		
Munger Spring 3	Stagnant	May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		June 2015	--	--	--	--	--
		May 2016	--	--	--	--	--
Munger Spring 4	Stagnant	May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		June 2015	424.7	7.33	84.3	18.7	260.78
		May 2016	--	--	--	--	--
NW John Grub Spring	Dry	September 2005	415.8	6.97	--	15.8	282.30
		May 2006	421.7	7.83	108.0	27.0	275.90
		October 2007	292.2	7.28	-162.0	17.1	254.80
		October 2008	425.0	7.07	-15.0	15.7	276.00



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Natural Spring	2016 Field Observations/ Notes	Date	Water Quality Field Measurements				
			Conductivity (µS/cm)	pH (Units)	ORP (mV)	Temperature (°C)	TDS (ppm)
NW John Grub Spring	Dry	June 2009	339.0	8.70	--	14.5	--
		October 2009	--	--	--	--	--
		July 2010	441.0	5.91	--	16.4	--
		May 2011	561.0	7.08	21.7	21.0	278.00
		May 2012	540.0	6.77	20.3	22.0	271.00
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
		May 2016	--	--	--	--	--
Ramona Leonard Spring (Mona)	Not Sampled due to access	September 2005	--	--	--	--	--
		May 2006	768.4	6.35	107.0	13.5	522.40
		October 2007	793.5	7.68	42.0	11.8	413.40
		October 2008	879.0	6.99	185.6	9.7	571.00
		May 2009	793.0	6.97	--	9.1	--
		October 2009	825.0	7.24	--	10.0	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
May 2016	--	--	--	--	--		
Ramona Spring	Not sampled due to access	September 2005	--	--	--	--	--
		June 2006	--	--	--	--	--
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		May 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
May 2016	--	--	--	--	--		
SE John Grub Spring	Dry	September 2005	524.5	7.04	--	15.6	358.50
		May 2006	509.5	7.86	-49.0	24.4	336.90
		October 2007	980.1	7.29	-68.0	18.4	513.00
		October 2008	528.0	7.18	63.5	12.4	342.00
		June 2009	542.0	6.58	12.0	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	428.0	7.08	16.0	23.6	213.00
		May 2012	341.0	7.13	-18.1	25.6	170.00
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
		May 2016	--	--	--	--	--
Section 10U Spring	Not sampled due to access	September 2005	458.1	7.27	131.0	10.9	314.70
		May 2006	489.9	7.18	521.0	20.0	328.20
		October 2007	--	--	--	--	--



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Natural Spring	2016 Field Observations/ Notes	Date	Water Quality Field Measurements				
			Conductivity (µS/cm)	pH (Units)	ORP (mV)	Temperature (°C)	TDS (ppm)
Section 10U Spring	Not sampled due to access	October 2008	--	--	--	--	--
		June 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
		May 2016	--	--	--	--	--
Section 14 (Reich) Spring	Sampled	September 2005	412.2	7.93	--	20.2	277.50
		May 2006	372.9	7.48	79.0	13.3	251.50
		October 2007	394.7	7.92	0.0	10.7	198.70
		October 2008	445.0	7.09	45.0	8.6	290.00
		June 2009	607.0	6.89	--	9.0	--
		October 2009	--	--	--	NM	--
		July 2010	404.0	6.77	--	10.7	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	661.0	7.30	37.4	8.0	329.00
		May 2014	464.0	6.60	--	8.5	--
May 2015	544.4	6.40	40.2	8.3	302.00		
May 2016	570.7	7.63	121.1	14.93	372.99		
Seep Spring	Not located	September 2005	--	--	--	--	--
		May 2006	--	--	--	--	--
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		May 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
		May 2016	--	--	--	--	--
Spring 1212	Not sampled due to access	October 2005	420.0	6.59	--	9.1	--
		June 2006	356.6	7.29	75.0	15.3	243.90
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		May 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
May 2015	--	--	--	--	--		
May 2016	--	--	--	--	--		
Spring 3424	Not Sampled due to access	September 2005	725.2	6.86	71.0	16.5	504.00
		May 2006	641.5	7.97	-98.0	17.3	436.70



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Natural Spring	2016 Field Observations/ Notes	Date	Water Quality Field Measurements				
			Conductivity (µS/cm)	pH (Units)	ORP (mV)	Temperature (°C)	TDS (ppm)
Spring 3424	Not Sampled due to access	October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		June 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		July 2015	1,004.2	6.64	130.2	12.9	652.73
August 2016	851.2	7.07	--	20.29	555.56		
Thick Spring	Sampled	September 2005	--	--	--	--	--
		May 2006	325.6	7.80	120.0	11.7	214.60
		October 2007	376.5	7.74	32.0	12.9	192.20
		October 2008	--	--	--	--	--
		May 2009	54.6	7.52	--	12.3	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	408.0	7.01	40.0	11.4	203.00
		May 2012	457.0	6.51	22.6	7.1	229.00
		May 2013	836.0	7.10	69.7	12.4	448.00
May 2014	--	--	--	--	--		
May 2015	551.3	6.85	94.1	7.9	358.31		
May 2016	640.0	7.21	142.0	10.62	420.55		
Townsend Spring	Dry	September 2005	--	--	--	--	--
		May 2006	--	--	--	--	--
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		May 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
May 2016	--	--	--	--	--		
Vance Meadow Spring	Dry	September 2005	--	--	--	--	--
		June 2006	459.9	7.20	-60.0	16.5	310.90
		October 2007	389.8	7.20	-67.0	12.2	195.10
		October 2008	476.0	7.90	249.6	8.0	308.00
		June 2009	455.0	7.23	--	13.7	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	365.0	7.24	22.9	16.9	182.00
		May 2012	360.0	8.30	33.1	18.1	179.00
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
June 2015	--	--	--	--	--		
May 2016	--	--	--	--	--		
Vance Spring #1	Sampled	September 2005	--	--	--	--	--



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Natural Spring	2016 Field Observations/ Notes	Date	Water Quality Field Measurements				
			Conductivity (µS/cm)	pH (Units)	ORP (mV)	Temperature (°C)	TDS (ppm)
Vance Spring #1	Sampled	May 2006	404.0	7.75	-12.0	11.6	269.60
		October 2007	417.1	7.34	519.0	9.6	213.20
		October 2008	464.0	7.20	120.3	7.2	302.00
		May 2009	399.0	7.88	--	12.8	--
		October 2009	481.0	7.41	--	6.8	--
		July 2010	421.0	7.13	--	15.8	--
		May 2011	298.0	6.72	6.0	10.7	151.00
		May 2012	332.0	6.86	51.2	8.7	166.00
		May 2013	505.0	6.90	30.9	15.4	253.00
		May 2014	324.0	7.80	67.8	15.9	--
		June 2015	299.4	7.54	95.0	16.8	194.91
		May 2016	434.2	7.63	106.4	20.46	281.51
Vance Spring #2	Sampled	May 2016	422.8	8.20	95.2	13.05	271.50
Vaughn Spring	Not Sampled due to access	September 2005	--	--	--	--	--
		June 2006	730.7	7.55	521.0	20.1	509.50
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		June 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
		May 2016	--	--	--	--	--
Walt Spring #1	Sampled	September 2005	--	--	--	--	--
		May 2006	524.0	7.90	86.0	12.1	345.40
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		May 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	207.0	7.41	93.2	11.4	155.00
		May 2012	--	--	--	--	--
		May 2013	512.0	6.90	92.7	13.0	242.00
		May 2014	--	--	--	--	--
		May 2015	321.0	7.43	136.8	14.4	214.85
May 2016	378.9	7.35	84.0	9.34	246.52		
Watson Well Spring	Sampled	September 2005	--	--	--	--	--
		June 2006	745.5	7.29	34.0	13.0	507.70
		October 2007	--	--	--	--	--
		October 2008	869.0	6.90	273.2	13.9	565.00
		May 2009	705.0	6.90	--	9.9	--
		October 2009	852.0	6.90	--	13.4	--
		July 2010	570.0	6.75	--	17.8	--
		May 2011	--	--	--	--	--
		May 2012	836.0	6.46	9.5	20.3	418.00
		May 2013	903.0	7.20	--	10.3	453.00
		May 2014	654.0	6.40	148.0	11.9	--
June 2015	708.1	6.99	93.9	14.0	460.35		



**TABLE 4**  
**NATURAL SPRINGS FIELD OBSERVATIONS AND MEASUREMENTS**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**

**PETROX RESOURCES, INC. AND ELM RIDGE RESOURCES, INC.**

Natural Spring	2016 Field Observations/ Notes	Date	Water Quality Field Measurements				
			Conductivity (µS/cm)	pH (Units)	ORP (mV)	Temperature (°C)	TDS (ppm)
Watson Well Spring	Sampled	May 2016	814.8	7.22	96.9	9.77	527.31
Waypoint 0003 Spring	Not Located	September 2005	--	--	--	--	--
		May 2006	--	--	--	--	--
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		June 2009	--	--	--	--	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	--	--	--	--	--
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		May 2014	--	--	--	--	--
		May 2015	--	--	--	--	--
Willow Spring	Dry	September 2005	--	--	--	--	--
		May 2006	252.9	7.39	122.0	14.0	178.70
		October 2007	318.3	7.42	508.0	13.9	161.40
		October 2008	325.0	7.09	243.4	6.6	211.00
		June 2009	285.0	7.54	--	10.4	--
		October 2009	--	--	--	--	--
		July 2010	284.0	6.70	--	12.4	--
		May 2011	277.0	6.30	116.5	10.4	139.00
		May 2012	335.0	6.79	29.5	10.6	167.00
		May 2013	341.0	7.20	35.9	14.2	172.00
		May 2014	263.0	7.20	298.2	7.4	--
		May 2015	328.2	7.12	84.4	9.4	214.79
May 2016	--	--	--	--	--		
Wood/Corrigan Spring	Dry	September 2005	--	--	--	--	--
		June 2006	--	--	--	--	--
		October 2007	--	--	--	--	--
		October 2008	--	--	--	--	--
		May 2009	480.0	6.96	--	7.5	--
		October 2009	--	--	--	--	--
		July 2010	--	--	--	--	--
		May 2011	476.0	7.13	279.2	12.1	241.00
		May 2012	--	--	--	--	--
		May 2013	--	--	--	--	--
		July 2014	--	--	--	--	--
		June 2015	--	--	--	--	--
May 2016	--	--	--	--	--		

**Notes:**

µS/cm - microSiemens per centimeter      °C - degrees celsius      -- denotes not measured  
 ORP - oxidation reduction potential      TDS - total dissolved solids  
 mV - millivolts      ppm - parts per million

\* natural spring discontinued from sampling program due to its location in vicinity of Corrigan Spring

\*\*natural spring discontinued from sampling program due to location of spring outside of Kf outcrop and/or BLM outcrop zone



**TABLE 5**  
**NATURAL SPRINGS WATER FLOW RATE MEASUREMENTS**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**

**ELM RIDGE RESOURCES, INC. AND PETROX RESOURCES, INC.**

NATURAL SPRING	FLOW RATES (Gallons/Minute)												
	September 2005	May/June 2006	October 2007	October 2008	May/June 2009	October 2009	July 2010	May 2011	May 2012	May 2013	May 2014	May/June 2015	May/August 2016
Beaver Creek	--	--	7.00	--	--	--	--	--	--	Discontinued*	--	--	--
Big Hole Spring	--	<1	--	--	--	--	--	--	--	--	--	--	--
Candelaria A Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Candelaria B Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Corrigan Spring	--	--	--	--	--	--	--	--	--	--	--	--	1.3
Crain Spring	--	--	--	0.20	2.66	--	2.00	--	--	0.04	--	0.25	0.38
D8 Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Gov-1 Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Gov-2 Spring	--	--	--	--	--	--	--	--	--	0.35	--	--	0.5
Gov-3 Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Grassy Spring	--	--	<0.25	--	--	--	--	--	--	0.11	--	0.38	0.38
High Watson Spring	--	--	--	--	--	--	--	--	--	Discontinued**	--	--	--
Miser Spring & Pipeline	--	--	--	--	--	--	--	--	--	Discontinued**	--	--	--
Munger Spring 1	--	--	--	--	--	--	--	--	--	--	--	0.18	0.75
Munger Spring 2	--	--	--	--	--	--	--	--	--	0.16	--	0.19	1.0
Munger Spring 3	--	--	--	--	--	--	--	--	--	--	--	--	--
Munger Spring 4	--	--	--	--	--	--	--	--	--	--	--	--	--
NW John Grub Spring	0.10	<1	<0.5	0.90	--	--	--	--	--	--	--	--	--
Ramona Leonard Spring (Mona)	--	0.60	0.40	0.75	1.30	0.24	--	--	--	--	--	--	--
Ramona Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
SE John Grub Spring	0.25	<1	<0.25	0	--	--	--	--	--	--	--	--	--
Section 10U Spring	0.90	1.00	--	--	--	--	--	--	--	--	--	--	--
Section 14 (Reich) Spring	--	<1	<0.5	0	1.50	--	1.30	--	--	2.18	--	--	0.33
Seep Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Spring 1212	--	5.28	--	--	--	--	--	--	--	--	--	--	--
Spring 3424	1.00	1.00	--	--	--	--	--	--	--	--	--	--	--
Thick Spring	--	2.00	<1	--	--	--	--	0.20	0.15	0.12	--	0.61	0.44
Townsend Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Vance Meadow Spring	--	<0.5	<0.5	0	--	--	0.27	0.20	--	--	--	--	--
Vance Spring #1	--	1.00	<0.5	0	1.90	0.20	--	0.40	0.53	0.14	--	0.04	0.88
Vance Spring #2	--	--	--	--	--	--	--	--	--	--	--	--	1.66
Vaughn Spring	--	<1	--	--	--	--	--	--	--	--	--	--	--
Walt Spring #1	--	--	<1	--	--	--	--	0.40	--	0.14	--	0.52	0.32
Watson Well Spring	--	--	--	--	--	--	--	--	0.88	--	--	--	--
Waypoint 0003 Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Willow Spring	--	1.00	<0.25	0.03	0.60	--	0.50	0.30	1.06	0.24	--	--	--
Wood/Corrigan Spring	--	--	--	--	--	--	--	0.30	--	--	--	--	--

**Notes:**

-- denotes no measurement taken

< - less than designated flow rate

\* natural spring discontinued from sampling program due to its location in vicinity of Corrigan Spring

\*\*natural spring discontinued from sampling program due to location of spring outside of Kf outcrop and/or BLM outcrop zone



**TABLE 6  
NATURAL SPRINGS ANALYTICAL RESULTS - DISSOLVED METHANE  
2016 OUTCROP ZONE REPORT  
ARCHULETA COUNTY, COLORADO**

**PETROX RESOURCES, INC. AND ELM RIDGE RESOURCES, INC.**

NATURAL SPRING	METHANE CONCENTRATIONS (mg/L)												
	September 2005	May/June 2006	October 2007	October 2008	May/June 2009	October 2009	July 2010	May 2011	May 2012	May 2013	May 2014	May/June/July 2015	May/August 2016
Beaver Creek	--	NS	<0.02	<0.02	--	--	--	--	--	Discontinued*	Discontinued*	Discontinued*	Discontinued*
Big Hole Spring	--	0.0010	--	--	--	--	--	--	--	--	--	--	--
Candelaria A Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Candelaria B Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Corrigan Spring	--	<0.001	--	--	<0.02	--	--	<0.02	<0.02	--	--	--	<0.2
Crain Spring	--	0.0067	--	<0.02	<0.02	--	<0.02	--	--	<0.02	--	<0.2	<0.2
D8 Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Gov-1 Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Gov-2 Spring	--	--	--	--	--	--	--	--	--	<0.02	<0.02	--	<0.2
Gov-3 Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Grassy Spring	--	--	<0.02	--	--	--	--	--	--	<0.02	<0.02	<0.2	<0.2
High Watson Spring	--	--	--	--	--	--	--	--	--	Discontinued**	Discontinued**	Discontinued**	Discontinued**
Miser Spring & Pipeline	--	--	--	--	--	--	--	--	--	Discontinued**	Discontinued**	Discontinued**	Discontinued**
Munger Spring 1	--	--	--	--	--	--	--	--	--	--	--	<0.2	<0.2
Munger Spring 2	--	--	--	--	--	--	--	--	--	<0.02	<0.02	<0.2	<0.2
Munger Spring 3	--	--	--	--	--	--	--	--	--	--	--	--	--
Munger Spring 4	--	--	--	--	--	--	--	--	--	--	--	<0.2	--
NW John Grub Spring	0.015	0.0016	0.30	0.0300	0.07	--	0.07	0.03	0.27	--	--	--	--
Ramona Leonard Spring (Mona)	<0.0005	<0.001	<0.02	<0.02	<0.02	<0.02	--	--	--	--	--	--	--
Ramona Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
SE John Grub Spring	<0.0005	0.0025	0.6500	<0.02	0.02	--	--	0.023	0.29	--	--	--	--
Section 10U Spring	<0.0005	0.0062	--	--	--	--	--	--	--	--	--	--	--
Section 14 (Reich) Spring	0.0006	<0.001	0.0200	0.0200	<0.02	--	--	--	--	<0.02	<0.02	<0.2	<0.2
Seep Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Spring 1212	0.0005	<0.001	--	--	--	--	--	--	--	--	--	--	--
Spring 3424	0.0017	0.0230	--	--	--	--	--	--	--	--	--	<0.2	<0.2
Thick Spring	--	<0.001	<0.02	--	<0.02	--	--	<0.02	<0.02	<0.02	<0.02	<0.2	<0.2
Townsend Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Vance Meadow Spring	--	0.0110	0.06	<0.02	<0.02	--	--	<0.02	<0.02	--	--	--	--
Vance Spring #1	--	0.0220	<0.02	0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	--	<0.2	<0.2
Vance Spring #2	--	--	--	--	--	--	--	--	--	--	--	--	<0.2
Vaughn Spring	--	0.0037	--	--	--	--	--	--	--	--	--	--	--
Walt Spring #1	--	<0.001	--	--	--	--	--	<0.02	--	<0.02	--	<0.2	<0.2
Watson Well Spring	--	0.0160	--	<0.02	<0.02	<0.02	--	--	<0.02	--	<0.02	<0.2	<0.2
Waypoint 0003 Spring	--	--	--	--	--	--	--	--	--	--	--	--	--
Willow Spring	--	<0.001	<0.02	<0.02	<0.02	--	<0.02	--	<0.02	<0.02	<0.02	<0.2	--
Wood/Corrigan Spring	--	--	--	--	--	--	--	--	--	--	--	--	--

**Notes:**

mg/L - milligrams per liter

-- denotes a sample was not collected/analyzed

< - indicates not detected above the detection limit

\* natural spring discontinued from sampling program due to its location in vicinity of Corrigan Spring

\*\*natural spring discontinued from sampling program due to location of spring outside of Kf outcrop and/or BLM outcrop zone



**TABLE 7**  
**NATURAL SPRINGS ANALYTICAL RESULTS - MAJOR IONS**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**

**PETROX RESOURCES, INC. AND ELM RIDGE RESOURCES, INC.**

Natural Spring	Date	Cations				Anions				
		Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Carbonate (mg/L)	Bicarbonate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	
Beaver Creek	October 2008	35.0	10.70	8.60	1.90	<10	128.0	33.0	<10	
	May 2009	--	--	--	--	--	--	--	--	
	July 2010	--	--	--	--	--	--	--	--	
	May/June 2011	--	--	--	--	--	--	--	--	
	May 2012	--	--	--	--	--	--	--	--	
	May 2013	Discontinued*								
	May 2014	Discontinued*								
	May 2015	Discontinued*								
May 2016	Discontinued*									
Corrigan Spring	May/June 2011	31.9	7.60	7.20	0.50	<10	64.0	19.0	<10	
	May 2012	21.9	5.02	4.23	1.10	<10	290.0	62.0	<10	
	May 2013	--	--	--	--	--	--	--	--	
	May 2014	--	--	--	--	--	--	--	--	
	June 2015	--	--	--	--	--	--	--	--	
	May 2016	14.9	3.36	<5.00	<5.00	<10.0	45.0	8.76	<1.00	
Crain Spring	October 2008	65.6	18.80	15.20	1.60	<10	214.0	98.0	<10	
	May 2009	74.7	21.10	19.60	1.40	<10	230.0	134.0	<10	
	July 2010	68.3	18.30	14.40	1.90	<10	190.0	76.0	<10	
	May 2011	--	--	--	--	--	--	--	--	
	May 2012	--	--	--	--	--	--	--	--	
	May 2013	79.5	21.90	22.50	2.55	<10	179.0	126.0	<10	
	May 2014	--	--	--	--	--	--	--	--	
	June 2015	71.5	21.70	22.00	2.03	<10	250.0	96.0	<20	
May 2016	75	20.5	20.4	<5.00	40.0	260	85.2	1.45		
Gov-1 Spring	May 2013	--	--	--	--	--	--	--	--	
	May 2014	--	--	--	--	--	--	--	--	
	May 2015	--	--	--	--	--	--	--	--	
	May 2016	--	--	--	--	--	--	--	--	
Gov-2 Spring	May 2013	80.9	24.60	16.00	1.50	<10	244.0	74.0	<10	
	May 2014	87.7	25.20	15.90	1.23	<10	272.0	72.0	<10	
	May 2015	--	--	--	--	--	--	--	--	
	May 2016	72.8	20.0	14.1	1.23	20.0	195	84.0	1.39	
Gov-3 Spring	May 2013	--	--	--	--	--	--	--	--	
	May 2014	--	--	--	--	--	--	--	--	
	May 2015	--	--	--	--	--	--	--	--	
	May 2016	--	--	--	--	--	--	--	--	
Grassy Spring	May 2012	95.1	27.90	23.80	2.89	12	246.0	158.0	<10	
	May 2013	108.0	34.70	32.10	4.25	<10	216.0	250.0	<10	
	May 2014	98.9	31.00	32.10	4.62	<10	248.0	176.0	50	
	June 2015	99.1	29.80	26.40	2.77	<10	290.0	166.0	120	
	May 2016	96.3	27.5	23.3	<5.00	<10	300	129	2.17	
Munger Spring 1	May 2014	73.7	15.90	20.90	2.76	<10	162.0	33.0	77	
	June 2015	78.1	17.00	22.00	2.56	<10	155.0	28.7	106	
	May 2016	70.2	13.9	21.3	2.24	<10	190	26.0	64.2	
Munger Spring 2	May 2013	47.5	8.55	19.60	1.70	<10	117.0	19.0	36	
	May 2014	--	--	--	--	--	--	--	--	
	June 2015	42.8	8.07	18.70	2.94	<10	150.0	13.2	34	
	May 2016	48.6	8.77	18.80	1.87	<10.0	190	15.4	16.9	
Munger Spring 4	June 2015	78.2	11.10	12.50	1.67	<10	260.0	<10.0	<10	
	May 2016	--	--	--	--	--	--	--	--	



**TABLE 7**  
**NATURAL SPRINGS ANALYTICAL RESULTS - MAJOR IONS**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**

**PETROX RESOURCES, INC. AND ELM RIDGE RESOURCES, INC.**

Natural Spring	Date	Cations				Anions			
		Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Carbonate (mg/L)	Bicarbonate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)
NW John Grub Spring	October 2008	59.1	12.80	<0.5	0.60	<10	187.0	54.0	<10
	May 2009	30.9	16.00	11.30	0.60	<10	117.0	67.0	<10
	July 2010	66.1	14.00	12.00	0.80	<10	175.0	71.0	<10
	May 2011	72.9	18.70	14.50	1.60	<10	230.0	106.0	<10
	May 2012	84.7	21.90	16.70	2.27	<10	290.0	62.0	<10
	May 2013	--	--	--	--	--	--	--	--
	May 2014	--	--	--	--	--	--	--	--
	May 2015	--	--	--	--	--	--	--	--
Ramona Leonard Spring	October 2008	138.0	27.70	9.60	1.60	<10	200.0	340.0	<10
	May 2009	120.0	23.10	8.50	1.30	<10	181.0	250.0	<10
	July 2010	--	--	--	--	--	--	--	--
	May 2011	--	--	--	--	--	--	--	--
	May 2012	--	--	--	--	--	--	--	--
	May 2013	--	--	--	--	--	--	--	--
	May 2014	--	--	--	--	--	--	--	--
	May 2015	--	--	--	--	--	--	--	--
SE John Grub Spring	October 2008	65.3	16.90	14.00	0.70	<10	214.0	78.0	<10
	May 2009	72.2	16.60	14.30	0.60	10	238.0	57.0	<10
	July 2010	--	--	--	--	--	--	--	--
	May 2011	56.1	12.60	11.20	1.30	<10	171.0	60.0	<10
	May 2012	101.0	27.80	22.00	3.79	<10	300.0	108.0	<10
	May 2013	--	--	--	--	--	--	--	--
	May 2014	--	--	--	--	--	--	--	--
	May 2015	--	--	--	--	--	--	--	--
Section 14 (Reich) Spring	October 2008	48.8	6.00	27.00	0.60	<10	189.0	43.0	<10
	May 2009	62.8	6.70	24.50	1.00	10	188.0	61.0	<10
	July 2010	57.5	6.10	24.70	0.80	<10	169.0	55.0	<10
	May 2011	--	--	--	--	--	--	--	--
	May 2012	--	--	--	--	--	--	--	--
	May 2013	93.8	10.20	26.10	1.25	<10	240.0	75.0	<10
	May 2014	84.5	9.24	26.80	1.19	<10	222.0	66.0	<10
	May 2015	86.6	9.19	25.20	1.51	<10	252.0	65.0	<10
Spring 3424	July 2015	124.0	53.00	24.40	2.19	<10	250.0	270.0	<10
	May 2016	109	42.8	24.8	2.57	<10	300	224	2.87
Thick Spring	October 2008	--	--	--	--	--	--	--	--
	May 2009	44.6	8.20	14.40	0.80	<10	124.0	28.0	22
	July 2010	--	--	--	--	--	--	--	--
	May 2011	48.7	9.70	15.60	<0.5	<10	136.0	31.0	32
	May 2012	51.6	10.50	16.20	1.39	<10	126.0	23.0	36
	May 2013	49.9	10.40	17.10	2.22	<10	131.0	25.0	40
	May 2014	--	--	--	--	--	--	--	--
	May 2015	65.3	14.20	18.30	1.50	<10	132.0	25.7	71.0
Vance Meadow Spring	May 2016	72.9	13.70	19.00	1.10	<10	130.0	28.0	77.6
	October 2008	68.3	9.00	14.40	2.60	<10	244.0	11.0	<10
	May 2009	66.7	8.20	14.00	2.70	<10	236.0	11.0	<10
	July 2010	--	--	--	--	--	--	--	--
	May 2011	50.1	6.70	12.00	2.20	<10	178.0	<10	<10
	May 2012	47.8	8.49	16.50	2.36	<10	144.0	27.0	<10
	May 2013	--	--	--	--	--	--	--	--
	May 2014	--	--	--	--	--	--	--	--
May 2015	--	--	--	--	--	--	--	--	
May 2016	--	--	--	--	--	--	--	--	



**TABLE 7**  
**NATURAL SPRINGS ANALYTICAL RESULTS - MAJOR IONS**  
**2016 OUTCROP ZONE REPORT**  
**ARCHULETA COUNTY, COLORADO**

**PETROX RESOURCES, INC. AND ELM RIDGE RESOURCES, INC.**

Natural Spring	Date	Cations				Anions			
		Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Carbonate (mg/L)	Bicarbonate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)
Vance Spring #1	October 2008	52.5	6.60	13.10	5.90	<10	182.0	19.0	<10
	May 2009	57.8	7.70	14.30	4.20	<10	208.0	<10	<10
	July 2010	63.4	8.40	14.90	5.80	<10	226.0	<10	<10
	May/June 2011	36.6	4.80	10.60	7.50	<10	133.0	16.0	<10
	May 2012	40.6	5.16	12.20	7.89	<10	125.0	25.0	<10
	May 2013	47.6	5.90	13.30	12.30	<10	98.0	73.0	<10
	May 2014	45.2	5.44	12.40	8.75	<10	152.0	26.0	<10
	June 2015	44.7	5.59	13.40	8.48	<10	170.0	16.9	<10
May 2016	58.8	7.33	13.9	10.7	60.0	230	12.5	1.79	
Vance Spring #2	May 2016	66.1	11.8	10.5	<5.00	<10.0	270	53.3	1.17
Walt Spring #1	May 2011	43.8	13.60	11.70	0.60	<10	141.0	65.0	<10
	May 2012	--	--	--	--	--	--	--	--
	May 2013	52.0	16.70	13.20	1.61	<10	149.0	84.0	<10
	May 2014	--	--	--	--	--	--	--	--
	May 2015	41.4	13.20	11.10	1.41	<10	140.0	47.9	<10
	May 2016	44.2	13.50	12.2	1.23	<10	136	50.5	1.18
Watson Well Spring	October 2008	109.0	38.70	25.50	2.40	<10	394.0	134.0	<10
	May 2009	86.8	30.70	20.50	1.90	<10	288.0	94.0	<10
	July 2010	78.1	26.90	18.10	2.50	12	218.0	84.0	<10
	May 2011	--	--	--	--	--	--	--	--
	May 2012	102.0	39.40	21.40	2.04	<10	348.0	118.0	<10
	May 2013	104.0	41.20	20.00	2.35	<10	326.0	108.0	<10
	May 2014	103.0	40.10	20.40	2.36	<10	324.0	78.0	<10
	June 2015	98.4	39.20	19.20	2.36	<10	340.0	85.6	<10
May 2016	104	39.2	17.8	<5.00	40.0	380	76.0	2.16	
Willow Spring	October 2008	39.3	5.80	16.50	1.40	<10	157.0	19.0	<10
	May 2009	34.5	5.10	16.10	1.40	<10	122.0	18.0	<10
	July 2010	39.2	5.70	16.30	1.80	<10	131.0	16.0	<10
	May 2011	32.7	5.20	14.90	1.00	<10	129.0	16.0	<10
	May 2012	38.0	5.81	16.90	1.17	<10	132.0	20.0	<10
	May 2013	35.7	5.72	17.00	1.23	<10	124.0	27.0	<10
	May 2014	--	--	--	--	--	--	--	--
	May 2015	--	--	--	--	--	--	--	--
	May 2016	--	--	--	--	--	--	--	--
Wood Spring	October 2008	--	--	--	--	--	--	--	--
	May 2009	65.7	11.60	10.70	1.60	<10	142.0	122.0	<10
	July 2010	--	--	--	--	--	--	--	--
	May 2011	66.9	12.80	10.40	0.80	<10	135.0	126.0	<10
	May 2012	21.9	5.02	4.23	1.10	<10	64.0	19.0	<10
	May 2013	--	--	--	--	--	--	--	--
	May 2014	--	--	--	--	--	--	--	--
	June 2015	--	--	--	--	--	--	--	--
May 2016	--	--	--	--	--	--	--	--	

**Notes:**

mg/L - milligrams per liter

-- denotes not sampled/analyzed

< - less than the laboratory reporting limit

\* natural spring discontinued from sampling program due to its location in vicinity of Corrigan Spring

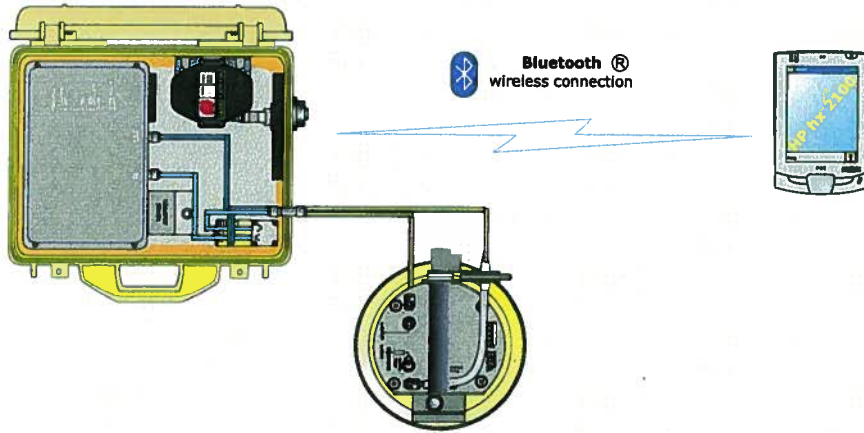


**APPENDIX A**  
**EQUIPMENT SPECIFICATIONS**



# WEST Systems portable soil flux meter for Carbon dioxide, Methane and Hydrogen sulfide fluxes

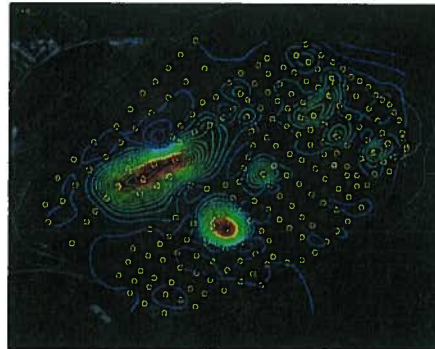
The WEST Systems Fluxmeter is a portable instrument for the measurement of soil gas diffuse degassing phenomena that uses the accumulation chamber method.



This method studied for soil respiration in agronomy (Parkinson) and for soil degassing in volcanic areas (R. Cioni et al.), has been designed by WEST Systems to obtain a portable instrument that allows the performance of measurements with very good accuracy in a short time. The instrument allows a wide range evaluation of the amount of soil gas flux and can be utilized for the evaluation of biogas degassing (landfills), for the survey of non visible degassing phenomena in volcanic and geothermal areas as well as soil respiration rate in agronomy. In the picture below, the results of the degassing survey of a landfill.



Portable fluxmeter



Methane flux contour lines



a group of researchers during a flux mapping fieldwork, using the WS-LI820 flux meter  
Courtesy of United States Geological Survey

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Systems

# Portable soil flux meter

## Common physical characteristics:

Total Weight = 8.3 Kg/16 lbs. to be carried on the back using the backpack-like support vest. The field operator will also have to carry one of the accumulation chambers and the palmtop:

## Warm Up

Only at instrument cold start-up a warm-up time of 20 minutes is required. The typical measurement time ranges from 2 to 4 minutes and the autonomy of the instrument is about 4 hours with a single NiMH 14.4 Volts, 2.6 A/h battery. The instrument comes with two interchangeable batteries.

## Accumulation Chamber specifications:

- Accumulation chamber A diameter : 200 mm / Height: 100 mm / weight: 1.5 Kg/3.3 lbs
- Accumulation chamber B diameter : 200 mm / Height: 200mm / weight : 2.2 Kg/4.84 lbs

**Palm top computer:** PocketPC Color Display based on Windows Mobile operating system.

- PalmTop with cables, 0.3 Kg/0.7 lbs.
- Size 125mm (4.8") x 82mm (3.2") \* 25 mm (1").

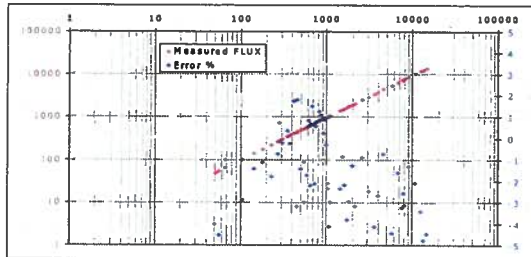
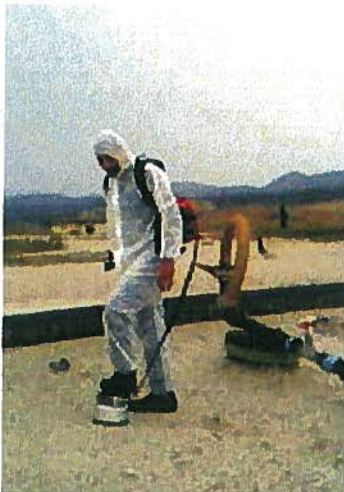
**Software** The instrument is supplied with a custom software, FluxManager, which allows recording and visualization of the increase in concentration of the target gas in the accumulation chamber, and then the flux calculations. The obtained measurements can be saved on the palmtop computer and then transferred to a desktop PC with a USB connection or using a SD card.

## The instrument is supplied complete with:

- backpack-like support vest
- Carrying case for transport and storage
- 2 batteries NiMH 14.4 Volts 2.6 A/h and 1 NiMH battery charger
- Accumulation chamber A and B
- Palmtop Pocket PC
- User Manual, in English
- FLUX Manager Software for Windows Mobile, in English

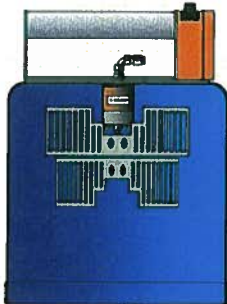
The standard flux meter configuration is supplied with a single gas detector, normally the carbon dioxide detector. The fluxmeter can host two sensors by the way special releases, based on specific customer request, it can be supplied with a maximum of 3 sensors.

Finally we improved the connection between the instrument and the palmtop that now is based on BlueTooth wireless embedded device.



The measured carbon dioxide flux vs imposed flux (grams  $m^{-2} day^{-1}$ );  
The error % vs imposed flux (in blue).

The instrument is extremely versatile and allows measurement of flux in 2/4 minutes. In the picture: Soil bio-gas flux monitoring in a landfill.



Accumulation Chamber Type B

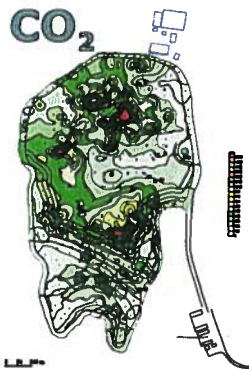
## The accumulation chambers

In the normal use of instrument only the chamber B is used. To extend the instrument sensitivity to very low fluxes the accumulation chamber A is supplied.

	Type A	Type B
net area $m^2$	0.0314	
net volume $m^3$	0.003	0.006

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## CO<sub>2</sub> - LI820

### LI820 based Carbon dioxide fluxmeter

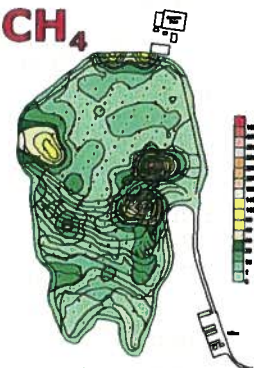
The CO<sub>2</sub> Fluxmeter is equipped with the LICOR LI-820 the most accurate and reliable portable carbon dioxide detector. The LI-820 is a double beam infrared sensor compensated for temperature variation in the range from -10 to 45°C and for atmospheric pressure variation in the range 660-1060 hPa. Accuracy 2% repeatability ±5ppm. The full scale range can be set to 1000, 2000, 5000 or 20000 ppmV of carbon dioxide. The characteristics of precision refer to the sensor set to a full scale range of 20000 ppmV. If a very high sensitivity is required, the detector can be set to 1000 or 2000 ppm full scale value to measure with very high precision fluxes in the range from 0 to 10 moles m<sup>-2</sup> day<sup>-1</sup>

#### CO<sub>2</sub> FLUX Measurement range:

from 0 up 600 moles m<sup>-2</sup> day<sup>-1</sup>

The accuracy depends on the measured flux:

0 to 0.5 moles m <sup>-2</sup> day <sup>-1</sup>	25% (Acc.ch.A)
0.5 to 1 moles m <sup>-2</sup> day <sup>-1</sup>	15% (Acc.ch.A or B)
1 to 150 moles m <sup>-2</sup> day <sup>-1</sup>	10% (Acc.ch.B)
150 to 300 moles m <sup>-2</sup> day <sup>-1</sup>	10% (Acc.ch.B)
300 to 600 moles m <sup>-2</sup> day <sup>-1</sup>	20% (Acc.ch.B)



## WS-HC CH<sub>4</sub>

### Methane fluxmeter

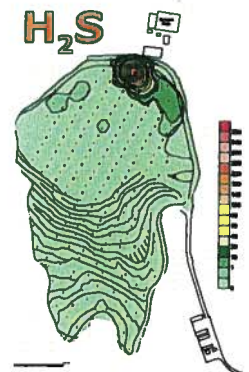
The methane sensor is an IR spectrometer. The full-scale range is 5000ppm, accuracy of 5% of reading, and repeatability is 2% of span. Detection limit 60 ppm, resolution 22 ppm. The detector was designed to measure the not controlled emissions of landfill, but it can be used to detect methane emission from coal or wherever the 0.2 moles/m<sup>2</sup>/day detection limit is acceptable.

#### Methane Flux measurement range

from 0.2 up 300 moles m<sup>-2</sup> day<sup>-1</sup>

The fluxmeter is provided with 2 accumulation chambers and the accuracy depends on the measured flux:

0.2 to 10 moles m <sup>-2</sup> day <sup>-1</sup>	25% (Acc.Ch.A)
10 to 150 moles m <sup>-2</sup> day <sup>-1</sup>	15% (Acc.Ch.A)
150 to 300 moles m <sup>-2</sup> day <sup>-1</sup>	20% (Acc.Ch.B)



## H<sub>2</sub>S - WEST

### Hydrogen sulfide

The hydrogen sulphide detector is an electrochemical cell with the following specifications:

The full-scale range is 20ppm, with a precision of 3% of reading, and the repeatability is 1.5% of span with a zero offset of 0.3%.

H<sub>2</sub>S Flux measurement range: from 0.0025 to 0.5 moles/m<sup>2</sup> per day.

The precision depends on the measured flux:

0.0025 - 0.05 moles/m <sup>2</sup> per day	±25% (Acc. Chamber A)
0.05 - 0.5 moles/m <sup>2</sup> per day	±10% (Acc. Chamber B)

NOTE: The hydrogen sulphide flux evaluation can be affected by the presence of large quantities of water in both liquid and vapour phases.

We thanks to N.Lima et al. for the maps.

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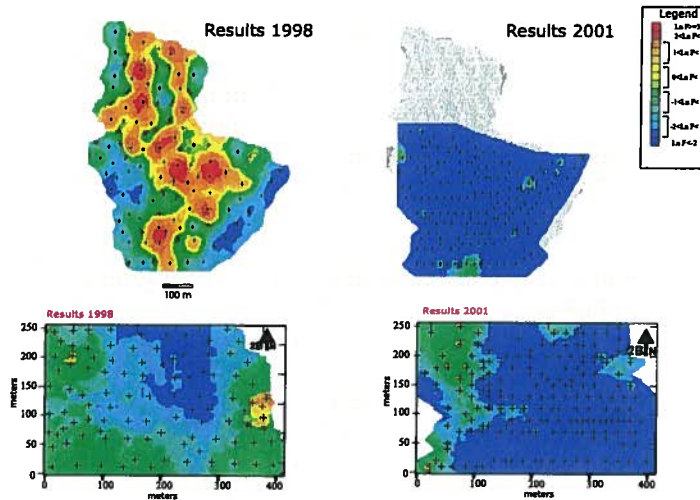
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## Application on a landfill: mapping the biogas non controlled emissions.

The figure shows the compare between the results of the measurement regime of a land/fill undertaken in 1998 and 2001: the mapping performed in 1998 gave clear indications of the areas which required intervention to improve the cover and the capture system.

The interventions were performed only where necessary with a significant economic savings.

The measurement regime of 2001 indicates without any doubt that the interventions were efficient and state-of-the-art.



The obtained results:

- Minor atmospheric emissions;
- Higher quantity and better quality of biogas for cogeneration;
- Optimisation of management costs.

## Continuous soil flux monitoring

WEST Systems produces a soil gas station for the continuous monitoring of carbon dioxide and hydrogen sulfide flux, soil temperature, soil water content, soil pressure gradient, soil heat flux and meteorological parameters.

For more information contact your local representative, visit our web site or e-mail to: [g.virgili@westsystems.com](mailto:g.virgili@westsystems.com)

### Local sales representative

H.Q.

#### West Systems Srl

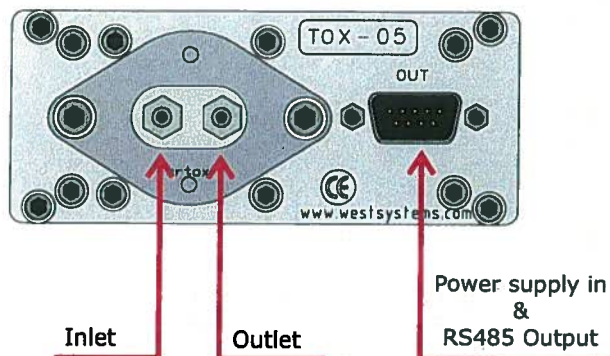
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# Hydrogen Sulfide Detector



Pin	Signal
1	Gnd
2	+VDC
3	Gnd
4	RS485-B
5	RS485-A
6	Gnd
7	+12V
8	Gnd
9	RS485-B

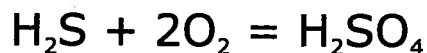
### Legenda

**Gnd:** Ground reference for power supply and RS485  
**+VDC:** 10-28 Volts Power supply input  
**RS485-A:** Digital signal output A  
**RS485-B:** Digital signal output B

### Sensor specifications

Ambient conditions:  
 Air temperature -40°C to 65 °C  
 Air pressure 700 hPa to 1300 hPa  
 Air RH 5% - 95% non condensating.  
 Expected sensor life > 24 months.  
 Chemical cell order code: WEST H2S-BH  
 Detector order code: WEST TOX-05-H2S-BH  
 Factory calibration : 20 ppm  
 RMS Noise <= 0.02 ppm  
 Zero Offset <= 0.2 ppm  
 Max Overrange >= 200 ppm

The chemical cell reaction is:



the gas sample specific consumption is very low:

$2.5 \times 10^{-10}$  moles/Sec per ppm

Due to this consumption the H2S flux is methodically underestimated by a -10% with the Accumulation Chamber A and by a -5% when using the accumulation chamber B. Then we advise to use the accumulation chamber B except when the flux is very very low.

# Appendix M

## WS-HC detector

### WS-HC Hydrocarbon Flux measurement:

The HydroCarbon detector is based on a double beam infrared spectrometer able to detect methane, hexane, propane and other molecules with HC linkages. The instrument comes calibrated for the methane. *The instrument requires a frequent **zero base-line** calibration that will be done using atmospheric air. The calibration requires 20 second.*

### Detector specifications:

Accuracy 5%

Repeatability 2%

Resolution 22 ppm (Methane equivalent)

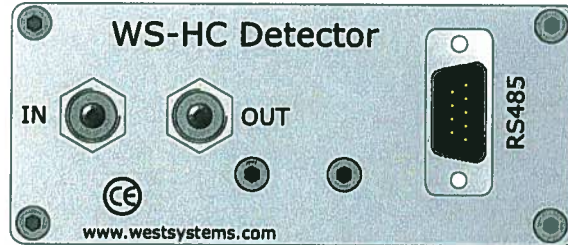
Full scale range is 50000 ppm of methane.

Detection limit 60 ppm.

Methane flux measurement range from 0.1 to 150 moles/m<sup>2</sup> per day.  
The precision depends on the measured flux:

range	0.1	5	moles/ m <sup>2</sup> per day	±25%
	5	150	moles/ m <sup>2</sup> per day	±10%

The measurement of very low fluxes (< 0.1 moles/m<sup>2</sup>/day ) is possible but the error will increase due to the low detector sensitivity.



**RS485 Connector DB9 Male panel**

<b>Pin 1</b>	<b>Gnd</b>
<b>Pin 2</b>	<b>+Power supply</b>
<b>Pin 3</b>	<b>Gnd</b>
<b>Pin 4</b>	<b>RS485 B</b>
<b>Pin 5</b>	<b>RS485 A</b>
<b>Pin 6</b>	<b>Gnd</b>
<b>Pin 7</b>	<b>+Power supply</b>
<b>Pin 8</b>	<b>Gnd</b>
<b>Pin 9</b>	<b>RS485 B</b>

The gas fittings can be used with rilsan 6x4 mm tubes or silicon 5x3.2 tubes. Please respect inlet and outlet ports.

# LI-820 Specifications

## CO<sub>2</sub> Specifications

**Measurement Range:** 0-1000 ppm, 0-2000 ppm with 14 cm bench; 0-5000 ppm, 0-20000 ppm with 5 cm bench

**Accuracy:** < 2.5% of reading with 14 cm bench; 4% of reading with 5 cm bench

### Calibration Drift

<sup>1</sup>**Zero Drift:** < 0.15 ppm / °C

<sup>2</sup>**Span Drift at 370 ppm:** < 0.03% / °C

<sup>3</sup>**Total Drift at 370 ppm:** < 0.4 ppm / °C

**RMS Noise at 370 ppm with 1 sec Signal Filtering:** < 1 ppm

<sup>1</sup> Zero drift is the change with temperature at 0 concentration

<sup>2</sup> Span drift is the change after re-zeroing following a temperature change

<sup>3</sup> Total drift is the change with temperature without re-zeroing or re-spanning

**Measurement Principle:** Non-Dispersive Infrared

**Traceability:** Traceable gases to WMO standards from 0-3000 ppm. Traceable gases to EPA protocol gases from 3000 to 20000 ppm

**Pressure Compensation Range:** 15 kPa-115 kPa

**Maximum Gas Flow Rate:** 1 liter/minute

**Output Signals:** Two Analog Voltage (0-2.5 V or 0-5 V) and Two Current (4-20 mA)  
Digital: TTL (0-5 V) or Open Collector

**DAC Resolution:** 14-bits across user-specified range

**Source Life:** 18000 hours

**Power Requirements:** Input Voltage 12-30 VDC  
1.2A @ 12V (14 W) maximum during warm-up with heaters on  
0.3 A @ 12 V (3.6 W) average after warm-up with heaters on

**Supply Operating Range:** 12-30 VDC

**Operating Temperature Range:** -20 to 45 °C

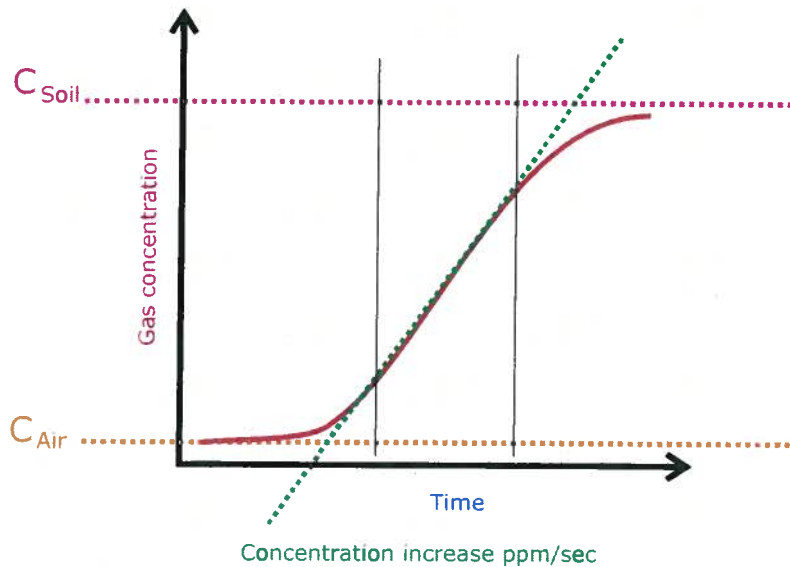
**Relative Humidity Range:** 0 to 95% RH, Non-Condensing

**Dimensions:** 8.75" x 6" x 3" (22.23 x 15.25 x 7.62 cm)

**Weight:** 2.2 lbs (1 kg)

## Quantifying the flux

How explained in the chapter 3 the flux is proportional to the concentration increase ratio ppm/sec. The proportionality factor depends on the chamber volume/surface ratio as well as the barometric pressure and the air temperature inside the accumulation chamber.



There are two methods to carry out the field work, in both cases for each measurement you have to record the type of accumulation chamber used, the barometric pressure, and the air temperature.

The variation of few mBar of the pressure and or few degrees of temperature do not affect the evaluation of flux very much, then you can use a mean value for both parameters. Of course that depends on the accuracy you want to reach for the evaluation of flux.

The instrument measures the barometric pressure, using the embedded pressure sensor of the LICOR, with a good accuracy. A platinum Pt100 or a thermo-couple thermometer can be used to measure the air temperature as well as the soil temperature.

### Choosing the flux measurement unit

The first measurements made, 10 years ago, with the accumulation chamber was expressed in cm/sec which is a speed, the speed of carbon dioxide flowing out from the soil. During the last ten years several units have been used by volcanologist and by geochemistry researchers. The most common unit is grams/squaremeter per day, but using the same instrument for two gas species to express the flux using this unit means to have two different conversion factors. Actually we use the unit **moles/squaremeter per day** that has two advantages: A single conversion factor for every gas specie and an easy conversion of the flux in grams/sm per day simply multiplying the result expressed in moles/sm per day for the molecular weight of the target gas.

From the [tools][settings] menu you can set the accumulation chamber factor in the "A.c.K." field.

If this factor is set to 1 the instrument will give you results expressed in ppm/sec, that's simply the slope of the curve in the selected interval.

If you set the A.c.K to a value different from 1 the instrument will give you the results expressed in moles per square meter per day.

Please see next page.

## Quantifying the flux

### Method 1: Measuring the slope

Set the Accumulation Chamber factor to 1 in order to have the flux measurement expressed in the slope unit "ppm/sec" and translate it in the desired unit with a post processing.

Using this method you can focus only on the accumulation chamber interfacing with the soil, the flux curve shape and the other aspects of the measurement, putting off choosing the correct accumulation chamber factor.

### Method 2: Measuring the flux directly in moles/sm/day.

To get the results directly in moles/sm/day you have to set the Accumulation Chamber factor to the correct value, taking it from the tables.

For each measurement, if there are variations in the air temperature, or of the barometric pressure, or if you changed the accumulation chamber you have to select the [tools][settings] menu and put the correct accumulation chamber factor in the "A.c.K." field. This operation can be "critical". In any case on the saved files you'll find the results of flux evaluation expressed in both units, the raw ppm/sec and the moles/sm/day computed with the A.c.K. you set.

### The accumulation chamber factors

Here following the formula used to compute the A.c.K.:

$$K = \frac{86400 \cdot P}{10^6 \cdot R \cdot T_k} \cdot \frac{V}{A}$$

Where

- **P** is the barometric pressure expressed in mBar (HPa)
- **R** is the gas constant 0.08314510 bar L K<sup>-1</sup> mol<sup>-1</sup>
- **T<sub>k</sub>** is the air temperature expressed in Kelvin degree
- **V** is the chamber net volume in cubic meters
- **A** is the chamber inlet net area in square meters.

The dimensions of the A.c.K. are

$$K = \frac{\text{moles} \cdot \text{meter}^{-2} \cdot \text{day}^{-1}}{\text{ppm} \cdot \text{sec}^{-1}}$$

In the table the conversion factors vs temperature and barometric pressure for the Accumulation Chamber Type A and B are reported.

### An example:

You're using the accumulation chamber B, the slope of the flux curve is 2.5 ppm/sec, the barometric pressure is 1008 mBar (HPa) and the air temperature is 22 °C.

From the table B get the value that correspond to the barometric pressure and temperature. In this case I get the value computed for 25°C and 1013 mBar : 0.696.

Then the flux is: 2.5 x 0.696= 1.74 moles per square meter per day.

The Gasport Gas Tester is designed for gas utility workers to detect methane and certain toxic gases. It is a reliable, simple, versatile tool to help your service technicians get the job done quickly! With multiple ranges and sensing capabilities built into one rugged housing, the Gasport Tester simplifies your work by reducing the number of meters you have to carry on the job.



## Applications

The Gasport Tester's poison-tolerant methane sensor provides three measurement ranges for your daily service needs:

- Open air, safety sampling
- Small, in-home leak detection
- Street/outdoor service line leak detection



## Features and Benefits

- **Proven in field use—rugged and reliable**  
Less costly to maintain, less time in repair
- **Multiple functions in one instrument**  
No need to buy, carry & maintain multiple instruments
- **New, poison-tolerant combustible gas sensor**  
Reduces meter ownership costs
- **User-selectable, “silent” operation mode**  
Reduces customer disturbances and worries
- **Fast warm up time**  
Fastest warm up time in industry saves time
- **Can monitor up to four gases at a time**  
Fewer instruments to carry
- **Show all gas concentrations simultaneously**  
Eliminates guesswork on what reading is displayed
- **Autoranging methane sensor**  
Automatically switches between 0-5% and 5-100% methane ranges
- **Gas readings recorded for later retrieval**  
Can double check readings after job is done
- **Simple manual or automated calibration options**  
Reduces training time and helps ensure accuracy
- **Intrinsically safe**  
Meets safety standards for work in hazardous areas
- **Lifetime warranty on case and electronics**  
Reduced maintenance and lifetime costs

## Specifications

Gas	Range	Resolution
Methane	0-5000 ppm	50 ppm
Methane	0-100% LEL or 0-5% CH <sub>4</sub>	1 % LEL or 0.1% CH <sub>4</sub>
Methane	5-100% CH <sub>4</sub>	1% CH <sub>4</sub>
Oxygen	0-25%	0.1%
Carbon Monoxide	0-1000 ppm	1 ppm
Hydrogen Sulfide	0-100 ppm	1 ppm

<b>Battery types:</b>	NiCd and Alkaline
<b>Case material:</b>	Impact resistant, stainless-steel-fiber-filled polycarbonate
<b>Operating temperature:</b>	normal -10 to 40°C; extended -20 to 50°C
<b>Operating humidity:</b>	Continuous: 15-95% RH, non-condensing Intermittent duty: 5-95% RH, non condensing
<b>Warm up time:</b>	Less than 20 seconds to initial readings
<b>Datalog capacity:</b>	12 hours
<b>Input:</b>	3 clearly marked, metal domed keys
<b>Warranty:</b>	Case and Electronics: Lifetime Sensors and consumable parts: 1 year

**The answer for gas utilities' gas detection needs**

# Ordering Information

## Battery Chargers

Part No.	Description
494716	Omega 120 VAC 50/60Hz
495965	Omega 220 VAC 50/60Hz
801759	Omega 110/220 VAC, Five Unit, 50/60Hz
800525	Omega 8 - 24VDC for vehicle use

## Battery Packs

Part No.	Description
496990	Standard NiCd Rechargeable
800526	Alkaline, Type C
711041	Alkaline, with Thumbscrews
800527	Heavy Duty NiCd Rechargeable

## Sensors

Part No.	Description
813693	Combustible Gas
480566	O <sub>2</sub>
812389	CO
812390	H <sub>2</sub> S

## Protective Boots

Part No.	Description
804955	Black, for NiCd Battery Packs
802806	Orange, for NiCd Battery Packs
806751	Black, for Alkaline Battery Packs
806750	Orange, for Alkaline Battery Packs
806749	Black, for HD NiCd Battery Packs
806748	Orange, for HD NiCd Battery Packs
812833	Yellow Soft Carrying Case with Harness
711022	Black padded Vinyl Carrying Case with Harness

## Sampling Equipment

Part No.	Description
800332	Probe - 1 ft., plastic
800333	Probe - 3 ft., plastic
803561	Probe - 3 ft., plastic (holes 2" from end) (bar hole probe)
803962	Probe - 3 ft., plastic (holes 2" from handle) (solid probe)
803848	Probe - Hot Gas Sampler
710465	Sampling Line - 5 ft., coiled
497333	Sampling Line - 10 ft.
497334	Sampling Line - 15 ft.
497335	Sampling Line - 25 ft.

## Sampling Accessories

Part No.	Description
801582	Replacement Filter, Probe, pkg. of 10
801291	External Filter Holder
014318	Charcoal Filter
711039	Line Scrubber Filter Holder
711059	Line Scrubber Replacement Cartridges, Box of 12
808935	Dust Filter, Pump Module
802897	Water Trap (Teflon) Filter, Pump Module

## Calibration Check Equipment

Part No.	Description
477149	Calibration Kit Model RP with 0.25 lpm Regulator
491041	Calibration Gas - methane, 2.5%
473180	Calibration Gas - 300 ppm CO
813718	Calibration Gas - methane, 2.5% oxygen, 15% 60 ppm CO
813720	Calibration Gas - methane, 2.5% oxygen, 15% 300 ppm CO 10 ppm H <sub>2</sub> S
710288	Gasmiser™ Demand Regulator 0 - 3.0 lpm

## Accessories

Part No.	Description
804679	Data Docking Module Kit. Includes the Data Docking Module, MSA Link Software and Instruction Manual

## Approvals

The Gasport Gas Tester has been designed to meet intrinsic safety testing requirements in certain hazardous atmospheres.

The Gasport Gas Tester is approved by MET (an OSHA Nationally Recognized Testing Laboratory [NRTL]) for use in Class I, Division I, Groups A, B, C, D; Class II, Division I, Groups E, F, G; and Class III Hazardous locations. Gasport Gas Testers sold in Canada are approved by CSA for use in Class I, Division I, Groups A, B, C, and D locations.

Contact MSA at 1-800-MSA-2222 for more information or with questions regarding the status of approvals.

## Gasport Gas Tester Kits

	LEL Display	O <sub>2</sub>	CO	H <sub>2</sub> S	Alarms Always	Alarms Optional	Leak Detect Page Peak	Alkaline Battery	NiCd Battery	5ft Coiled Line	1ft Probe	Part No.
4-Gas, Selectable, NiCd	•	•	•	•	•	•	•	•	•	•	•	711489
4-Gas, Selectable, Alkaline	•	•	•	•	•	•	•	•	•	•	•	711490
3-Gas, Selectable, NiCd	•	•	•	•	•	•	•	•	•	•	•	711493
3-Gas, Selectable, Alkaline	•	•	•	•	•	•	•	•	•	•	•	711494
2-Gas, Selectable, NiCd	•	•	•	•	•	•	•	•	•	•	•	711495
2-Gas, Selectable, Alkaline	•	•	•	•	•	•	•	•	•	•	•	711496
4-Gas, Alarms On, NiCd	•	•	•	•	•	•	•	•	•	•	•	711491
4-Gas, Alarms On, Alkaline	•	•	•	•	•	•	•	•	•	•	•	711492

## Assemble-to-Order (ATO) System: You Make the Choices

The ATO System makes it easy to "custom order" the Gasport Gas Tester, configured exactly the way you want it. You can choose from an extensive line of base instrument components and accessories. To obtain a copy of the "ATO System and Price Information for the Gasport Gas Tester," call toll-free 1-800-MSA-2222, and request Bulletin 0804-28. To obtain a copy of the ATO via FAX, call MSA QuickLit Information Service at 1-800-672-9010. At the prompt, request QuickLit Document #2345 (ATO for Gasport Gas Tester).

Note: This Data Sheet contains only a general description of the products shown. While uses and performance capabilities are described, under no circumstances shall the products be used by untrained or unqualified individuals and not until the product instructions including any warnings or cautions provided have been thoroughly read and understood. Only they contain the complete and detailed information concerning proper use and care of these products.

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# QRAE II User's Guide



**Covers QRAE II Diffusion & Pump Models  
with Firmware Version 3.60 or higher**



P/N 020-4100-000 Rev. F  
May 2013

# QRAE II User Guide

## 1.2 Specifications

### QRAE II Specifications

<b>Configuration</b>	Pumped or diffusion 4-gas with datalogging		
<b>Dimensions:</b>	Diffusion: 5" L x 2.8" W x 1.5" H (125mm x 72mm x 38mm) Pump: 5" L x 2.8" W x 1.5" H (125mm x 72mm x 38mm)		
<b>Weight:</b>	Diffusion: 9 oz (250g) Pump: 12 oz (350 g) with battery		
<b>Detectors:</b>	2 Electrochemical toxic gases sensors 1 Solid Polymer Electrolyte oxygen sensor 1 Catalytic sensor for combustible level organics		
<b>Battery:</b>	Rechargeable 3.7V Li-ion battery pack (6-hour charge time) or a 3 AA alkaline battery adapter.		
<b>Operating Time:</b>	Up to 10 hours continuous w/ Li-ion battery pack		
<b>Display:</b>	4-line graphical LCD with automatic LED backlight for dim lighting conditions		
<b>Keypad:</b>	2 programming/operation keys		
<b>Direct Readout:</b>	Up to 4 simultaneous values with sensor name, battery charge, high and low values for all sensors, elapsed time, and datalogging on/off state		
<b>Sampling Method:</b>	Diffusion or pumped (depending on model)		
<b>Range, Resolution &amp; Response Time:</b>	LEL	0-100%	1 % 15 sec
	O <sub>2</sub>	0-30%	0.1 % 20 sec
	CO	0-1000 ppm	1 ppm 25 sec
	H <sub>2</sub> S	0-100 ppm	0.1 ppm 30 sec
<b>Alarm Settings:</b>	Separate limits for TWA, STEL, High, Low		
<b>Alarms:</b>	≥95 dB @ 30 cm buzzer, flashing red LEDs, vibration alarm, LCD to indicate exceeded preset limits, low battery, or sensor failure		
<b>Calibration:</b>	Two-point field calibration for fresh air and standard reference gas		
<b>Protection:</b>	Password protected calibration settings, alarm limits, and data		
<b>Intrinsic Safety:</b>	CSA Class I, Division 1, Group A, B, C, D, T4 (US & Canada), SIRA ATEX II 2G Ex ia d II C T4 Gb (Europe), IECEx Ex d ia II C T4 Gb		
<b>EM Immunity:</b>	No effect when exposed to 0.43mW/cm <sup>2</sup> RF interference (5-watt transmitter at 12"/10cm).		
<b>Data Storage:</b>	64,000 readings (64 hours, 4 channels at 1 minute interval) in non-volatile memory.		
<b>Datalog Interval:</b>	Programmable 1- to 3,600-second intervals		
<b>Alarm Settings:</b>	Separate alarm limit settings for TWA, STEL, Low and High alarm.		
<b>Communication:</b>	Download data to PC and upload monitor setup from PC through an RS-232 link to PC serial port		
<b>Temperature:</b>	-20° C to 50° C (-4° F to 122° F)		
<b>Humidity:</b>	0% to 95% relative humidity (non-condensing)		

#### Caution:

Refer to RAE Systems Technical Note TN-114 for sensor cross-sensitivities.  
Refer to RAE Systems Technical Note TN-144 for LEL sensor poisoning.

## KEY FEATURES

### Trimble Floodlight satellite shadow reduction technology

More positions and increased accuracy in tough environments

### Sunlight readable display

For unmatched clarity in bright sunlight

### 3.5G cellular capability

High-speed Internet connectivity in the field

### 5 megapixel autofocus camera

Capture high quality photographs and link directly to features

### Field-swappable battery

All day operation and the convenience of swap-and-go battery replacement



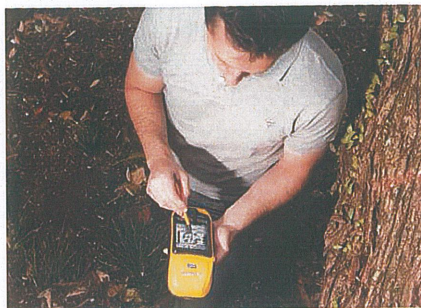
## THE ACCURACY YOU NEED ANYWHERE YOU NEED IT

Bringing together the essential functionality for productive GIS data collection in one device, the Trimble® GeoExplorer® 6000 series also delivers positioning accuracy in challenging GNSS situations such as under trees and near buildings with Trimble Floodlight™ technology. Wherever you work, it just works.

### Accurate, productive, reliable data collection

Integrating both a GPS/GLONASS receiver and a dual frequency GNSS antenna, the Trimble GeoExplorer 6000 series delivers accuracy you can depend on to record new assets, or reliably navigate back to previously recorded locations.

Used with Trimble's range of powerful field and office software, GeoExplorer 6000 series handhelds allow you to work faster and in more places than ever before. The Trimble GeoExplorer series can deliver down to centimeter accuracy—either postprocessed or in real time for the confidence the job is done right while still on site.



Trees and buildings create "satellite shadows", limiting the areas where you can reliably collect high-accuracy GNSS data. Using Trimble Floodlight technology, the GeoExplorer 6000 series continues to deliver productive, usable data under tree canopy or in urban canyons. You can work with fewer disruptions, meaning better data, faster, at less cost.

### Designed for work, wherever you work

The Trimble GeoExplorer series works for the way you work. The built-in 5 megapixel autofocus camera, with geotagging capability, gives you one of the best ways to capture information about an asset, event, or site. A sunlight-optimized display maintains exceptional clarity in all outdoor conditions for crisp on screen text and images. And you can stay connected with an optional integrated 3.5G cellular modem for continuous network and Internet access to real-time map data, web-based services, Trimble VRS™ corrections, and live update of field information.



With the Trimble GeoExplorer 6000 series you get it all.

# TRIMBLE GEOEXPLORER 6000 SERIES

## PRODUCT MODELS

	GeoXH	GeoXT
Accuracy	Decimeter/Centimeter	Submeter
Floodlight	Yes	Optional
Cellular modem	Optional	Optional
Camera	5 MP	5 MP

## GNSS

Receiver ..... Trimble Maxwell™ 6 GNSS chipset  
 Channels ..... 220 channels  
 Systems ..... GPS, GLONASS<sup>1</sup>  
 WAAS/EGNOS/MSAS/GAGAN  
 Update rate ..... 1 Hz  
 Time to first fix ..... 45 s (typical)  
 NMEA-0183 support ..... Optional  
 Trimble Floodlight technology ..... Optional  
 RTCM support ..... RTCM2.x/RTCM3.x  
 CMR support ..... CMR/CMR+/CMRx

## GeoXT handhelds

GPS ..... L1C/A  
 GLONASS ..... L1C/A, L1P

## GeoXH handhelds

GPS ..... L1C/A, L2C, L2E  
 GLONASS ..... L1C/A, L1P, L2C/A, L2P

## GNSS ACCURACY<sup>2</sup>

### GeoXH Centimeter Edition

#### Real-time Centimeter output

Horizontal (external antenna)<sup>3</sup> ..... 1 cm + 1 ppm  
 Vertical (external antenna) ..... 1.5 cm + 2 ppm  
 Horizontal (internal antenna) ..... 2.5 cm + 1.2 ppm  
 Vertical (internal antenna) ..... 4 cm + 2 ppm

#### Postprocessed Centimeter output

Horizontal (external antenna)<sup>3</sup> ..... 1 cm + 1 ppm  
 Vertical (external antenna) ..... 1.5 cm + 1 ppm  
 Horizontal (internal antenna) ..... 2.5 cm + 1.2 ppm  
 Vertical (internal antenna) ..... 4 cm + 1.5 ppm

## All GeoXH configurations

### Real-time and postprocessed H-Star (Horizontal RMS)

H-Star ..... 10 cm + 1 ppm

## All GeoXH and GeoXT configurations

### Real-time DGNSS (Horizontal RMS)

Code ..... 75 cm + 1 ppm  
 SBAS<sup>4</sup> (WAAS/EGNOS/MSAS) ..... typically < 1 m

### Postprocessed DGNSS (Horizontal RMS)

Code ..... 50 cm + 1 ppm  
 Carrier (after 45 minutes) ..... 1 cm + 2 ppm

## ENVIRONMENTAL (MIL-STD-810G)

Drop shock ..... 1.2 m (4 ft) to plywood over concrete  
 Functional shock ..... Method 516.6 Procedure I  
 Vibration ..... Method 514.6 Procedure I  
 Relative humidity ..... 95% non-condensing  
 Maximum operating altitude ..... 9,000 m (29,000 ft)  
 Maximum storage altitude ..... 12,000 m (40,000 ft)

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## TEMPERATURE

Operation ..... -20 °C to +60 °C (-4 °F to +140 °F)  
 Storage ..... -30 °C to +70 °C (-22 °F to +158 °F)

## INGRESS PROTECTION

Water/Dust ..... IP65

## SIZE AND WEIGHT

Height ..... 234 mm (9.2 in)  
 Width ..... 99 mm (3.9 in)  
 Depth ..... 56 mm (2.2 in)  
 Weight (inc. battery) ..... 925 g (2.0 lb)

## BATTERY

Type ..... Rechargeable, removable Li-Ion  
 Capacity ..... 11.1 V 2.5 AH  
 Charge time ..... 4 hours (typical)

## BATTERY RUN TIME<sup>5</sup>

	GeoXH	GeoXT
GNSS	9 hours	11 hours
GNSS & Wi-Fi	8 hours	9.5 hours
GNSS & cellular	6.5 hours	7 hours
Standby time (typical)	50 days	50 days

## CONNECTORS & INPUTS

- Internal microphone and speaker
- Mini USB connector
- DE-9 serial via optional USB to serial converter
- External power connector
- SIM socket
- SDHC card socket

## CAMERA

Still mode ..... Autofocus 5 MP  
 Still image format ..... JPG  
 Video mode ..... Up to VGA resolution  
 Video file format ..... WMV with audio

## CELLULAR<sup>6</sup> & WIRELESS<sup>7</sup>

UMTS/HSDPA ..... 850/900/2100 MHz  
 GPRS/EDGE ..... 850/900/1800/1900 MHz  
 Wi-Fi ..... 802.11 b/g  
 Bluetooth ..... Version 2.1 + EDR

## DISPLAY

Type ..... Transflective LED-backlit LCD  
 Size ..... 4.2" (diagonal)  
 Resolution ..... 480x640  
 Luminance ..... 280 cd/m2

## HARDWARE

Processor ..... TI OMAP 3503  
 RAM ..... 256 MB  
 Flash ..... 2 GB  
 External storage ..... SD/SDHC up to 32 GB

## LANGUAGES

- English, Spanish, French, German, Italian, Portuguese (Brazilian), Chinese (Simplified), Korean, Japanese, Russian

## IN THE BOX

GeoExplorer 6000 series handheld, rechargeable battery pack, pouch and strap, USB data cable, AC power adaptor, screen protector kit, spare stylus & tether, documentation

## OPTIONAL ACCESSORIES

- Trimble Zephyr™ Model 2 external GNSS antenna
- Trimble Tornado™ external GNSS antenna
- Trimble Tempest™ external GNSS antenna
- Vehicle power supply
- 1.5 m & 5 m external antenna cable
- Range pole kit for external antenna
- Carbon fiber monopole kit
- Backpack kit for external antenna
- Vehicle mount
- Hard carry case
- Null modem cable
- USB to serial converter cable

## SOFTWARE COMPATIBILITY

- Trimble TerraSync software
- Trimble GPS Pathfinder® Office software
- Trimble Positions™ software suite
- Trimble GPSCorrect™ extension for Esri ArcPad software
- Trimble GPS Analyst™ extension for Esri ArcGIS for Desktop software
- Trimble GPS Controller software
- Trimble GNSS Connector software
- Trimble TrimPix™ Pro system
- Custom applications built with a Mobile GIS Developer Community software development kit (SDK)
- Third party NMEA-based applications

<sup>1</sup> GLONASS is enabled on GeoXT and GeoXH handhelds with Floodlight technology enabled.

<sup>2</sup> Accuracy and reliability may be subject to anomalies due to multipath, obstructions, satellite geometry, and atmospheric conditions. Always follow recommended GNSS data collection practices. Specified Centimeter accuracy can normally be achieved for baselines of 30 km or less. Specified H-Star accuracy can normally be achieved for baseline lengths of 100 km or less. Centimeter and H-Star accuracy is typically achieved within 2 minutes. Carrier postprocessed accuracy is limited to data collected within 10 km of the base station used for corrections.

<sup>3</sup> Stated accuracy is for the Zephyr Model 2 antenna.

<sup>4</sup> SBAS (Satellite Based Augmentation System). Includes WAAS; available in North America only; EGNOS; available in Europe only and MSAS; available in Japan only.

<sup>5</sup> Actual run time will vary with conditions and environment of use.

<sup>6</sup> Not available on all configurations. The GeoXH and GeoXT 3.5G edition handhelds are PTCRB certified and can operate on supported networks that do not require carrier certification. Consult with your local reseller for more information.

<sup>7</sup> Bluetooth and Wi-Fi type approvals are country specific. GeoExplorer 6000 series handhelds have Bluetooth and Wi-Fi approval in the U.S. and in most European countries. For further information please consult your local reseller.

Specifications subject to change without notice.



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www.trimble.com  
 store.trimble.com

# Operator's Manual

## SMARTROLL™ MP Handheld Instrument

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## General Specifications

Operating temperature	-5 to 50° C (23 to 122° F)
Storage temperature	-40 to 65° C (-40 to 149° F)
Dimensions	4.7 cm (1.85 in.) OD x 26.9 cm (10.6 in.) with restrictor installed (does not include connector)
Weight	694 g (1.53 lbs)
Wetted materials	PVC, 316 stainless steel, titanium, Acetal, Viton®, PC/PMMA
Environmental rating	IP68 with all sensors and cable attached. IP67 with sensors removed and cable detached.
Reading rate	1 reading every 10 seconds; data logged to smartphone.
Power	6 VDC from battery pack
Interface	iPhone® 4S, iPod touch® 5, or iPad® 3, 4, mini or later; iOS 6.0 or later. Bluetooth® Low Energy (BLE) radio. Purchase the iSitu™ App at the Apple® App Store.
Cable	Black polyurethane. Standard lengths available: 1.5 m, 4.6 m, 9.1 m, 30.5 m (5 ft, 15 ft, 30 ft, 100 ft)
Warranty	2-years
Notes	Specifications are subject to change without notice. Apple, iPhone, iPod touch, and iPad are trademarks of Apple Inc. registered in U.S. and other countries. Bluetooth is a registered trademark of Bluetooth SIG, Inc. Viton is a registered trademark of DuPont Performance Elastomers L.L.C.

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## Sensor Specifications

### Level, Depth, Pressure Sensor Specifications

Accuracy	Typical $\pm 0.1\%$ FS @ 15° C; $\pm 0.3\%$ FS max. from 0 to 50° C
Range	76 m (250 ft); absolute (non-vented)
Resolution	$\pm 0.01\%$ FS or better
Sensor Type	Fixed
Response Time	Instantaneous in thermal equilibrium
Units of Measure	Pressure: psi, kPa, bar, mbar, mmHg, inHg Level: mm, cm, m, in, ft
Methodology	Piezoresistive; ceramic

### Barometric Pressure Sensor Specifications (Battery Pack)

Accuracy	$\pm 3$ mbar max.
Range	300 to 1100 mbar
Resolution	0.01 mbar
Sensor Type	Fixed
Response Time	Instantaneous in thermal equilibrium
Units of Measure	psi, kPa, bar, mbar, mmHg, inHg, Torr, atm
Methodology	Piezoresistive pressure sensor

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## Conductivity Sensor Specifications

Accuracy	Typical $\pm 0.5\%$ + 1 $\mu\text{S}/\text{cm}$ ; $\pm 1\%$ max.
Range	5 to 100,000 $\mu\text{S}/\text{cm}$
Resolution	0.1 $\mu\text{S}/\text{cm}$
Sensor Type	Fixed
Response Time	Instantaneous in thermal equilibrium
Units of Measure	Actual conductivity ( $\mu\text{S}/\text{cm}$ , $\text{mS}/\text{cm}$ ) Specific conductivity ( $\mu\text{S}/\text{cm}$ , $\text{mS}/\text{cm}$ ) Salinity (PSU) Total dissolved solids (ppt, ppm) Resistivity (Ohms-cm) Density ( $\text{g}/\text{cm}^3$ )
Methodology	Std. Methods 2510 EPA 120.1

## Dissolved Oxygen RDO Fast Cap (Optical Sensor) Specifications

Accuracy	$\pm 0.1$ mg/L; $\pm 0.2$ mg/L; $\pm 10\%$ of reading
Range	0 to 8 mg/L; 8 to 20 mg/L; 20 to 50 mg/L; Full operating range: 0 to 50 mg/L
Resolution	0.01 mg/L
Sensor Type	Fixed with replaceable RDO Fast Cap (life: 1 year typical)
Response Time	T90: <30 sec. T95: <45 sec.
Units of Measure	mg/L, % saturation, ppm
Methodology	EPA-approved In-Situ Methods 1002-8-2009 1003-8-2009 1004-8-2009

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## ORP Sensor Specifications

Accuracy	±5.0 mV
Range	±1400 mV
Resolution	0.1 mV
Sensor Type	Replaceable pH/ORP combo sensor
Response Time	<15 sec.
Units of Measure	mV
Methodology	Std. Methods 2580

## pH Sensor Specifications

Accuracy	±0.1 pH unit from 0 to 12 pH units
Range	0 to 14 pH units
Resolution	0.01 pH unit
Sensor Type	Replaceable pH/ORP combo sensor
Response Time	<15 sec., pH 7 to pH 4
Units of Measure	pH units
Methodology	Std. Methods 4500-H+ EPA 150.2

## Air Temperature Sensor Specifications (Battery Pack)

Accuracy	±2° C
Range	-20 to 70° C (-4 to 158° F)
Resolution	0.1° C
Sensor Type	Fixed
Response Time	<30 sec.
Units of Measure	Celsius, Fahrenheit
Methodology	EPA 170.1

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## Sample Temperature Sensor Specifications (Probe)

Accuracy	±0.1° C
Range	-5 to 50° C (23 to 122° F)
Resolution	0.01° C or better
Sensor Type	Fixed
Response Time	<30 sec.
Units of Measure	Celsius, Fahrenheit
Methodology	EPA 170.1

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## Battery Pack Specifications

<b>Battery Type</b>	<b>Four 1.5V AA lithium or alkaline batteries</b>
Operating temperature	-5 to 50° C (23 to 122° F); 95% relative humidity, non-condensing
Storage temperature	-40 to 65° C (-40 to 149° F); 95% relative humidity, non-condensing
Dimensions & weight	9.5 x 7.6 x 5.7 cm (3.75 x 3 x 2.25 in.) (H x D x W). Weight: 165 g (5.8 oz)
Materials	PC/ABS
Environmental rating	IP67 with battery cover closed
Output options	BLE radio
Battery type	4 AA Lithium or Alkaline
Warranty on battery pack	1-year
Warranty on cable	1-year



**GEM™2000**

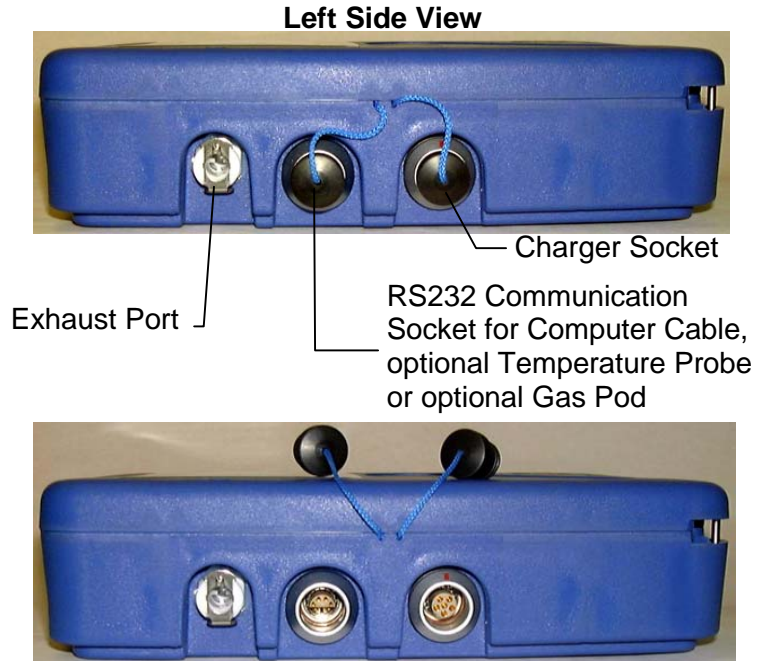
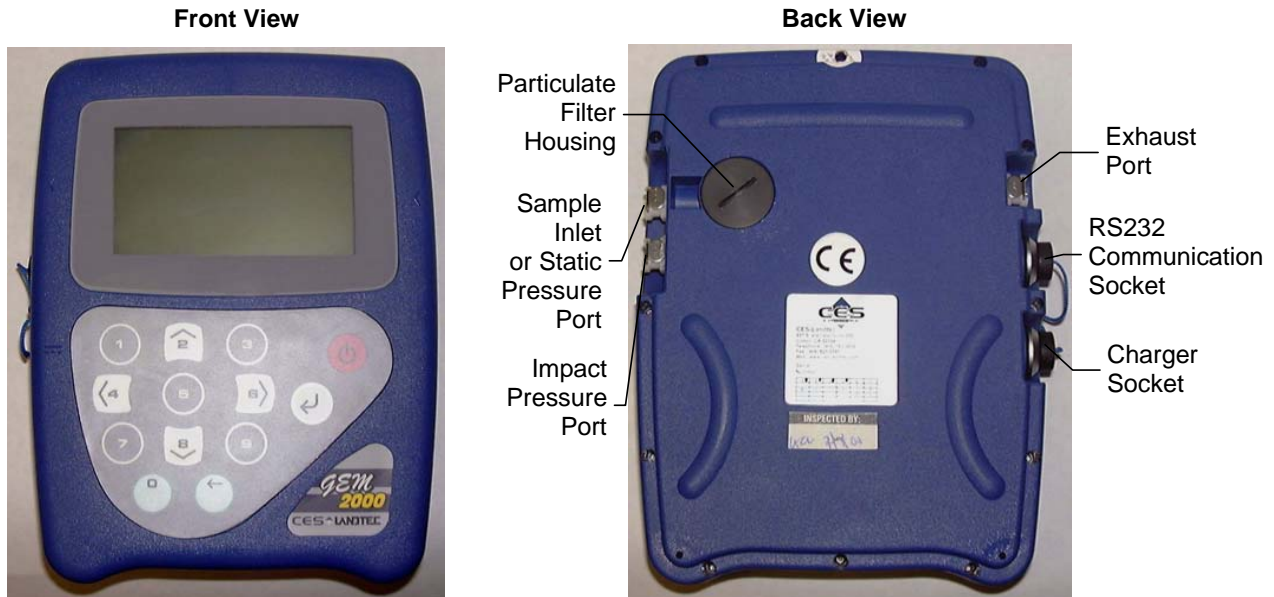
**GEM™2000 Plus**

GAS ANALYZER & EXTRACTION MONITOR

OPERATION MANUAL

## 2 General Operational Features

### 2.1 Physical Characteristics of the GEM™2000 / GEM™2000 Plus



**Right Side View**



Impact Pressure Port

Sample Inlet or  
Static Pressure Port

**Keypad**



Number entry,  
Navigation  
and Cursor  
Keys

Number entry  
Keys

Backlight operation and  
'0' (zero) Key

Pump operation and  
Back Space Key

On/Off Key

Enter/Store  
Key

Whenever a key is pressed the unit will emit a short 'beep' as an acknowledgement. This function cannot be turned off.

**2.2 Turning the Instrument On/Off**

When switching the instrument on, a long beep will sound, followed by the LANDTEC logo being displayed and the self-test will commence.

When switching the instrument off, the On/Off button must be held down for approximately 15 seconds, at which point a clean air purge will be carried out. If for any reason the instrument 'locks-up' and will not switch off, press and hold the On/Off button for 15 seconds. This will force the instrument to switch off.

**2.3 Warm-up Self Test**

When switched on, the instrument will perform a predetermined self-test sequence taking approximately 20 seconds, during this time many of the instrument's functions are tested, including:

- General operation
- Pump function
- Gas flow measurement
- Calibration
- Backlight function
- Solenoid function

## 9 Technical Specifications

### 9.1 Physical

Weight	4.4 lbs.
Size	L 2.48" x W 7.48" x D 9.92".
Case material	Anti-static ABS.
Keys	Membrane panel.
Display	Liquid Crystal Display 40 x 16 characters. Fiber optic woven backlight for low light conditions.
Filters	User replaceable integral fiber filter at inlet port and external PTFE water trap filter.

### 9.2 General

Certifications	UL Certified to Class 1, Zone 1, AEx Ib d IIa T4
Temperature measurement	With optional probe 14°F to 167°F.
Temperature accuracy	±0.4°F (± probe accuracy).
Visual and audible alarm	User selectable CO <sub>2</sub> , CH <sub>4</sub> and O <sub>2</sub> Min/Max levels via DataField CS software.
Communications	RS232 protocol via download lead with variable baud rate.
Relative pressure	±250 mbar from calibration pressure

### 9.3 Power supply

Battery type	Rechargeable Nickel Metal Hydride battery pack containing six 4AH cells. <b>Not user replaceable.</b> Lithium Manganese battery for data retention.
Battery life	Typical use 10 hours from fully charged condition.
Battery charger	Separate intelligent 2A battery charger powered from AC voltage supply (110-230V).
Charge time	Approximately 2 hours from complete discharge.
Alternative power	Can be powered externally for fixed-in-place applications only. Contact LANDTEC for further information.
Battery lifetime	Up to 1,000 charge/discharge cycles.

### 9.4 Gas Ranges

Detection principle	CO <sub>2</sub> and CH <sub>4</sub> by dual wavelength infrared cell with reference channel. O <sub>2</sub> by internal electrochemical cell.			
Oxygen cell lifetime	Approximately 18 months in air.			
Typical Accuracy 0 - Full Scale	<b>Gas</b>	<b>0-5% volume</b>	<b>5-15% volume</b>	<b>15%-FS</b>
	CH <sub>4</sub>	±0.3%	±1%	±3% (100%)
	CO <sub>2</sub>	±0.3%	±1%	±3% (60%)
	O <sub>2</sub>	±1%	±1%	±1% (21%)
Response time, T90	CH <sub>4</sub>	≤20 seconds		
	CO <sub>2</sub>	≤20 seconds		
	O <sub>2</sub>	≤20 seconds		
Range	CH <sub>4</sub>	0-70% to specification, 0-100% reading.		
	CO <sub>2</sub>	0-40% to specification, 0-100% reading.		
	O <sub>2</sub>	0-25%		

**9.5 Pump**

Typical flow	300 cc/min.
Flow fail point	50 cc/min approximately.
Flow with 200 mbar vacuum	250 cc/min approximately.
Vacuum	70 inches H <sub>2</sub> O.

**9.6 Operating Conditions**

Operating temp range	32°F to 104°F.
Relative humidity	0-95% non-condensing.
Atmospheric pressure range	700-1200 mbar. Displayed in Inches of Mercury (5.9 – 35.4"Hg). Not corrected for sea level.
Atmospheric pressure accuracy	±5 mbar approximately.
Case seal	IP65.

**9.7 Optional Gas Pods**

Typical Accuracy (Subject to User calibration).	<b>Gas</b>	<b>0-Full Scale</b>
	CO	±10% FS
	H <sub>2</sub> S	±10% FS
	SO <sub>2</sub>	±10% FS
	NO <sub>2</sub>	±10% FS
	CL <sub>2</sub>	±10% FS
	H <sub>2</sub>	±10% FS
	HCN	±10% FS
Response time, T90	CO	≤60 seconds
	H <sub>2</sub> S	≤60 seconds
	SO <sub>2</sub>	≤60 seconds
	NO <sub>2</sub>	≤60 seconds
	CL <sub>2</sub>	≤60 seconds
	H <sub>2</sub>	≤60 seconds
	HCN	≤60 seconds
	Range	CO
H <sub>2</sub> S		0-50 or 0-200ppm
SO <sub>2</sub>		0-20 or 0-100ppm
NO <sub>2</sub>		0-20ppm
CL <sub>2</sub>		0-20ppm
H <sub>2</sub>		0-1000ppm
HCN		0-100ppm

**APPENDIX B FLUX  
METER DATA**



SitePt	Area Abbrev	Northing	Easting	DATE TIME:	CH4 flux	H2S flux	CO2 flux	PRESSUR E (HPa):	TEMP DegC	CH4 slope	H2S slope	CO2 slope	AcK
BeaverCreek080916_01	BC	1234977	2424754	09-08-2016 12:43:53	0	0.003302	0.066986	776.6	34.8	0	0.014	0.284	0.235868
BeaverCreek080916_02	BC	1235360	2424779	09-08-2016 12:47:59	0	0.008234	0.42158	776.6	35.6	0	0.035	1.792	0.235256
BeaverCreek080916_03	BC	1235336	2424333	09-08-2016 12:52:44	0	0.011258	0.46674	776.5	36.5	-2.913	0.048	1.99	0.234542
BeaverCreek080916_04	BC	1235729	2424388	09-08-2016 12:57:04	0	0.005611	0.630098	775.8	37.2	0	0.024	2.695	0.233802
BeaverCreek080916_05	BC	1235727	2424776	09-08-2016 13:00:57	0	0.006992	0.174089	774.8	37.8	0	0.03	0.747	0.233051
BeaverCreek080916_06	BC	1235337	2425121	09-08-2016 13:05:54	0	0.00721	0.402349	774.7	38.4	-1.44	0.031	1.73	0.232572
BeaverCreek080916_07	BC	1234934	2425180	09-08-2016 13:09:57	0	0.010702	0.671657	776.2	38.9	-0.226	0.046	2.887	0.232649
BeaverCreek080916_08	BC	1235409	2425552	09-08-2016 13:18:15	0	0.004646	0.151678	777.7	40.0	-0.303	0.02	0.653	0.232279
BeaverCreek080916_09	BC	1234946	2425515	09-08-2016 13:25:24	0	0.008788	0.406805	776.3	40.8	0	0.038	1.759	0.23127
BeaverCreek080916_10	BC	1234970	2425985	09-08-2016 13:31:35	0	0.004163	0.482499	777.4	41.2	-0.577	0.018	2.086	0.231303
BeaverCreek080916_11	BC	1234984	2426351	09-08-2016 13:40:23	0	0.003454	0.327189	775.1	41.7	-2.001	0.015	1.421	0.230253
BeaverCreek080916_12	BC	1234568	2426351	09-08-2016 13:53:06	0	0.005969	0.278704	773.8	42.1	-0.329	0.026	1.214	0.229575
BeaverCreek080916_13	BC	1234586	2425945	09-08-2016 14:01:02	0	0.003428	0.347406	771.1	42.4	-0.776	0.015	1.52	0.228557
BigHornSchomburg072216_01	BHS	1194628	2459517	22-07-2016 14:05:22	0	0.006113	0.094509	789.9	41.1	0	0.026	0.402	0.235097
BigHornSchomburg072216_02	BHS	1194607	2459514	22-07-2016 14:08:21	0	0.004702	0.086516	789.9	41.1	0	0.02	0.368	0.235097
BigHornSchomburg072216_03	BHS	1194580	2459548	22-07-2016 14:11:02	0	0	0.188197	803.2	41.0	0	0	0.787	0.239132
BigHornSchomburg072216_04	BHS	1194597	2459546	22-07-2016 14:13:32	0	0.011	0.065044	803.2	41.0	0	0.046	0.272	0.239132
BigHornSchomburg072216_05	BHS	1194628	2459538	22-07-2016 14:16:02	0	0.006215	0.079845	803.2	41.1	0	0.026	0.334	0.239056
BigHornSchomburg072216_06	BHS	1194626	2459563	22-07-2016 14:18:14	0	0.008126	0.154631	803.0	41.1	0	0.034	0.647	0.238996
BigHornSchomburg072216_07	BHS	1194607	2459587	22-07-2016 14:20:41	0	0.011703	0.303094	803.0	41.3	0	0.049	1.269	0.238844
BigHornSchomburg072216_08	BHS	1194624	2459594	22-07-2016 14:22:55	0	0.005015	0.060658	803.4	41.5	0	0.021	0.254	0.238811
BigHornSchomburg072216_09	BHS	1194650	2459594	22-07-2016 14:25:27	0	0.001193	0	802.9	41.7	0	0.005	-0.026	0.238511
BigHornSchomburg072216_10	BHS	1194661	2459569	22-07-2016 14:28:09	0	0	0	802.9	42.0	0	-0.003	-0.093	0.238284
BigHornSchomburg072216_11	BHS	1194652	2459551	22-07-2016 14:30:36	0	0.005716	0.049058	803.2	42.3	0	0.024	0.206	0.238147
BigHornSchomburg072216_12	BHS	1194653	2459525	22-07-2016 14:32:50	0	0.004994	0.161943	802.8	42.6	0	0.021	0.681	0.237802
BigHornSchomburg072216_13	BHS	1194620	2459497	22-07-2016 14:35:20	0	0.005464	0.138982	802.8	42.9	0	0.023	0.585	0.237576
BigHornSchomburg072216_14	BHS	1194647	2459492	22-07-2016 14:37:31	0	0.00451	0.10301	802.8	43.2	-0.999	0.019	0.434	0.237351
BigHornSchomburg072216_15	BHS	1194682	2459491	22-07-2016 14:40:13	0	0	0.011148	802.8	43.4	0	-0.032	0.047	0.237201
BigHornSchomburg072216_16	BHS	1194676	2459522	22-07-2016 14:43:40	0	0.005924	0.186026	802.8	43.7	0	0.025	0.785	0.236976
BigHornSchomburg072216_17	BHS	1194680	2459549	22-07-2016 14:46:13	0	0.001421	0	802.8	43.9	0	0.006	-0.23	0.236827
BigHornSchomburg072216_18	BHS	1194695	2459568	22-07-2016 14:48:40	0	0.005917	0.48871	802.5	44.0	0	0.025	2.065	0.236664
CandalariaRanch080916_01	CR	1192557	2463867	09-08-2016 09:54:31	0	0.001463	0.015605	809.6	37.4	0	0.006	0.064	0.243832
CandalariaRanch080916_02	CR	1192971	2463825	09-08-2016 09:59:37	0	0.001215	0.05032	807.4	37.5	0	0.005	0.207	0.243091
CandalariaRanch080916_03	CR	1193013	2463479	09-08-2016 10:14:19	0	0.001695	0.114784	806.9	38.5	0	0.007	0.474	0.242161
CandalariaRanch080916_04	CR	1192965	2463101	09-08-2016 10:18:13	0	0.004838	0.219175	806.6	38.7	0	0.02	0.906	0.241915
CandalariaRanch080916_05	CR	1192935	2462737	09-08-2016 10:22:45	0	0.003868	0.138294	806.9	39.0	0	0.016	0.572	0.241773
CandalariaRanch080916_06	CR	1193382	2462743	09-08-2016 10:29:12	0	0.0065	0.322352	805.0	39.6	0	0.027	1.339	0.240741
CandalariaRanch080916_07	CR	1193372	2463059	09-08-2016 10:33:44	0	0.00553	0.13344	805.0	40.0	0	0.023	0.555	0.240433
CandalariaRanch080916_08	CR	1193342	2463425	09-08-2016 10:37:58	0	0.005039	0.018717	804.2	40.3	0	0.021	0.078	0.239964
CandalariaRanch080916_09	CR	1193681	2463120	09-08-2016 10:43:21	0	0.003828	0.304772	803.0	40.8	-1.247	0.016	1.274	0.239225

SitePt	Area Abbrev	Northing	Easting	DATE TIME:	CH4 flux	H2S flux	CO2 flux	PRESSUR E (HPa):	TEMP DegC	CH4 slope	H2S slope	CO2 slope	AcK
CandalariaRanch080916_10	CR	1193804	2462714	09-08-2016 10:48:07	0	0.004058	0.125308	802.2	41.2	0	0.017	0.525	0.238682
CandalariaRanch080916_11	CR	1194151	2462687	09-08-2016 10:52:46	0	0.004765	0.182031	801.8	41.6	0	0.02	0.764	0.23826
CandalariaRanch080916_12	CR	1194609	2462545	09-08-2016 10:58:52	0	0.003805	0.110833	801.4	42.0	0	0.016	0.466	0.237839
CandalariaRanch080916_13	CR	1194884	2462576	09-08-2016 11:06:06	0	0.004038	0.445802	801.3	42.4	0	0.017	1.877	0.237508
CandalariaRanch080916_14	CR	1194901	2463013	09-08-2016 11:07:52	0	0.003559	0.180097	801.3	42.7	0	0.015	0.759	0.237282
CandalariaRanch080916_15	CR	1194912	2463363	09-08-2016 11:12:36	0	0.003328	0.122643	802.9	42.8	0	0.014	0.516	0.237681
CandalariaRanch080916_16	CR	1194624	2463383	09-08-2016 11:17:00	0	0.004276	0.178387	802.4	42.8	-0.01	0.018	0.751	0.237533
CandalariaRanch080916_17	CR	1194531	2463116	09-08-2016 11:20:42	0	0	0.268022	802.4	42.7	0	-0.02	1.128	0.237608
CandalariaRanch080916_18	CR	1194238	2463001	09-08-2016 11:24:21	0	0.004282	0.125138	803.4	42.7	-0.007	0.018	0.526	0.237904
CandalariaRanch080916_19	CR	1194169	2463425	09-08-2016 11:28:25	0	0.004992	0.165931	803.3	42.9	0	0.021	0.698	0.237724
CandalariaRanch080916_20	CR	1193825	2463475	09-08-2016 11:32:16	0	0.004042	0.464148	804.0	43.1	0	0.017	1.952	0.237781
CandalariaRanch080916_21	CR	1193323	2463835	09-08-2016 11:43:50	0	0.008556	0.11764	804.6	43.5	0	0.036	0.495	0.237658
FossetGulch072216_01	FG	1209395	2444596	22-07-2016 11:30:30	0	0.005947	0.291654	796.0	27.3	0	0.024	1.177	0.247795
FossetGulch072216_02	FG	1209414	2444197	22-07-2016 11:37:18	0	0.002462	0.34068	796.0	29.3	0	0.01	1.384	0.246156
FossetGulch072216_03	FG	1209354	2443760	22-07-2016 11:44:09	0	0.002692	0.139752	795.9	31.0	0	0.011	0.571	0.244749
FossetGulch072216_04	FG	1209614	2443751	22-07-2016 11:49:30	0	0.003402	0.415293	793.6	32.3	0	0.014	1.709	0.243004
FossetGulch072216_05	FG	1209597	2443466	22-07-2016 11:58:04	0	0.001941	0.028143	795.7	33.6	0	0.008	0.116	0.242614
FossetGulch072216_06	FG	1209382	2443315	22-07-2016 12:02:58	0	0.001696	0.040693	795.7	34.1	0	0.007	0.168	0.242219
FossetGulch072216_07	FG	1208918	2443422	22-07-2016 12:09:29	0	0.002883	0.333677	790.7	34.7	0	0.012	1.389	0.240228
FossetGulch072216_08	FG	1208848	2443847	22-07-2016 12:17:06	0	0.004336	0.244965	794.1	35.2	0	0.018	1.017	0.24087
FossetGulch072216_09	FG	1208916	2444194	22-07-2016 12:22:35	0	0.000963	0.235566	794.6	35.4	0	0.004	0.978	0.240865
FossetGulch072216_10	FG	1208945	2444529	22-07-2016 12:28:02	0	0.006499	0.136001	794.6	35.6	0	0.027	0.565	0.240709
FossetGulch072216_11	FG	1208137	2446794	22-07-2016 12:48:04	0	0.00454	0.614868	790.9	36.4	0	0.019	2.573	0.238969
FossetGulch072216_12	FG	1208137	2447189	22-07-2016 12:53:02	0	0.005037	0.233622	794.1	36.5	0	0.021	0.974	0.239859
FossetGulch072216_13	FG	1207745	2447191	22-07-2016 12:59:22	0	0.005496	0.113023	791.6	36.7	0	0.023	0.473	0.238949
FossetGulch072216_14	FG	1207701	2446849	22-07-2016 13:06:03	0	0.002627	0.31903	791.6	36.9	0	0.011	1.336	0.238795
FossetGulch072216_15	FG	1207755	2446385	22-07-2016 13:13:15	0	0.000955	0.274688	792.4	37.4	0	0.004	1.151	0.238651
FossetGulch072216_16	FG	1208157	2446436	22-07-2016 13:19:26	0	0.007854	0.094252	791.8	38.0	0	0.033	0.396	0.238011
FossetGulch072216_17	FG	1208542	2445987	22-07-2016 13:27:47	0	0.005939	0.138503	791.6	38.5	-0.012	0.025	0.583	0.237569
FossetGulch072216_18	FG	1208536	2446411	22-07-2016 13:35:06	0	0.012504	0.156422	787.4	39.0	0	0.053	0.663	0.23593
Martinez072916_01	STC	1185146	2468581	29-07-2016 10:56:57	0	0	0.131652	809.3	31.0	0	0	0.529	0.24887
Martinez072916_02	STC	1185172	2468132	29-07-2016 11:04:46	0	0.00074	0.13494	809.6	33.8	-1.065	0.003	0.547	0.246691
Martinez072916_03	STC	1185500	2467791	29-07-2016 11:10:20	0	0	0.146423	809.9	35.7	-1.539	0	0.597	0.245265
Martinez072916_04	STC	1185559	2468152	29-07-2016 11:16:36	0	0	0.318979	809.1	37.4	0	0	1.309	0.243681
Martinez072916_05	STC	1185508	2468598	29-07-2016 11:22:42	0	0.000485	0.057943	808.6	38.8	0	0.002	0.239	0.242438
Martinez072916_06	STC	1185939	2468627	29-07-2016 11:26:57	0	0.000484	0.107707	809.6	39.7	0	0.002	0.445	0.242039
Martinez072916_07	STC	1186331	2468610	29-07-2016 11:33:18	0	0.000241	0.032765	809.2	41.0	0	0.001	0.136	0.240918
Martinez072916_08	STC	1186763	2468596	29-07-2016 11:38:04	0	0.000479	0.14733	807.2	42.0	-3.638	0.002	0.615	0.23956
Martinez072916_09	STC	1187157	2468572	29-07-2016 11:43:00	0	0.000476	0.068579	804.9	43.0	0	0.002	0.288	0.238122
Martinez072916_10	STC	1187493	2468935	29-07-2016 11:48:08	0	0.000474	0.013274	804.0	44.1	-0.604	0.002	0.056	0.237031

SitePt	Area Abbrev	Northing	Easting	DATE TIME:	CH4 flux	H2S flux	CO2 flux	PRESSUR E (HPa):	TEMP DegC	CH4 slope	H2S slope	CO2 slope	AcK
Martinez072916_11	STC	1187523	2469359	29-07-2016 11:55:28	0	0.000237	0	806.9	45.4	-1.81	0.001	-0.001	0.236915
Martinez072916_12	STC	1187146	2469314	29-07-2016 12:00:26	0	0.000473	0.068623	807.2	45.9	-1.743	0.002	0.29	0.236632
Martinez072916_13	STC	1187110	2469015	29-07-2016 12:04:20	0	0.000473	0.036898	807.6	46.2	-2.207	0.002	0.156	0.236527
Martinez072916_14	STC	1186693	2469008	29-07-2016 12:08:58	0	0.000472	0.071485	806.3	46.5	-5.165	0.002	0.303	0.235925
Martinez072916_15	STC	1186700	2469390	29-07-2016 12:16:42	0	0.000708	0.137585	807.8	47.0	-0.997	0.003	0.583	0.235994
Martinez072916_16	STC	1186679	2469809	29-07-2016 12:22:28	0	0.000707	0.041458	806.8	47.2	-2.434	0.003	0.176	0.235555
Martinez072916_17	STC	1186710	2470207	29-07-2016 12:26:26	0	0.000704	0.065463	803.4	47.1	-4.954	0.003	0.279	0.234636
Martinez072916_18	STC	1186330	2470136	29-07-2016 12:30:36	0	0.000469	0.006101	803.4	47.1	-1.199	0.002	0.026	0.234636
Martinez072916_19	STC	1186329	2469796	29-07-2016 12:35:13	0	0.000704	0.053996	804.1	47.2	-2.799	0.003	0.23	0.234767
Martinez072916_20	STC	1185919	2469735	29-07-2016 12:39:24	0	0.000468	2.181335	802.4	47.4	-2.363	0.002	9.317	0.234124
Martinez072916_21	STC	1185947	2470163	29-07-2016 12:44:05	0	0.000702	0.08262	802.4	47.5	-2.137	0.003	0.353	0.234051
Martinez072916_22	STC	1185588	2470202	29-07-2016 12:48:08	0	0.000468	0.020379	803.3	47.6	-1.784	0.002	0.087	0.234241
Martinez072916_23	STC	1185548	2470643	29-07-2016 12:52:22	0	0.000703	0.009839	803.6	47.7	-1.186	0.003	0.042	0.234255
Martinez072916_24	STC	1185203	2470192	29-07-2016 12:57:06	0	0.000703	0.028135	804.8	47.9	-6.037	0.003	0.12	0.234459
Martinez072916_25	STC	1185518	2469809	29-07-2016 13:02:10	0	0.000937	0.064901	805.0	48.2	0	0.004	0.277	0.234298
Martinez072916_26	STC	1186356	2469376	29-07-2016 13:08:04	0	0.001869	1.0811	803.6	48.6	-3.051	0.008	4.628	0.2336
Martinez072916_27	STC	1185920	2469295	29-07-2016 13:12:25	0	0.000934	0.125801	803.9	49.0	-4.709	0.004	0.539	0.233397
Martinez072916_28	STC	1185498	2469383	29-07-2016 13:15:57	0	0.000468	0	806.3	49.3	-0.6	0.002	-0.14	0.233876
Martinez072916_29	STC	1185137	2469753	29-07-2016 13:19:49	0	0.000468	0.006782	806.8	49.5	-3.589	0.002	0.029	0.233876
Martinez072916_30	STC	1185142	2469345	29-07-2016 13:22:40	0	0.000234	0.110775	806.2	49.5	-3.33	0.001	0.474	0.233702
Martinez072916_31	STC	1185116	2468942	29-07-2016 13:25:02	0	0.000937	0.663445	807.9	49.4	-3.04	0.004	2.832	0.234267
Martinez072916_32	STC	1185565	2468981	29-07-2016 13:28:04	0	0.001172	0.272119	807.8	49.2	-2.075	0.005	1.161	0.234384
Martinez072916_33	STC	1185928	2468999	29-07-2016 13:31:04	0	0.000938	0.131538	807.6	49.0	-0.247	0.004	0.561	0.234471
Martinez072916_34	STC	1186298	2468994	29-07-2016 13:33:46	0	0.001408	0.141788	807.8	48.7	-6.821	0.006	0.604	0.234748
PetersonGulch072716_01	PetG	1205732	2454180	27-07-2016 10:37:41	0	0.002651	0.195925	789.6	33.3	0	0.011	0.813	0.24099
PetersonGulch072716_02	PetG	1205787	2454611	27-07-2016 10:43:04	0	0.004093	0.177214	790.2	33.8	-5.095	0.017	0.736	0.24078
PetersonGulch072716_03	PetG	1205344	2454558	27-07-2016 10:47:18	0	0.002405	0.191401	789.9	34.1	0	0.01	0.796	0.240454
PetersonGulch072716_04	PetG	1205306	2454947	27-07-2016 10:51:51	0	0.008652	0.251138	790.5	34.5	0	0.036	1.045	0.240323
PetersonGulch072716_05	PetG	1204907	2454980	27-07-2016 10:56:04	0	0.002641	0.243241	790.6	34.8	-0.401	0.011	1.013	0.24012
PetersonGulch072716_06	PetG	1204936	2455400	27-07-2016 11:00:37	0	0.003598	0.211549	791.0	35.3	-0.291	0.015	0.882	0.239852
PetersonGulch072716_07	PetG	1204533	2455369	27-07-2016 11:05:22	0	0.002873	0.188913	790.9	35.8	-1.375	0.012	0.789	0.239433
PetersonGulch072716_08	PetG	1204534	2455804	27-07-2016 11:09:55	0	0.00311	0.216053	791.1	36.1	-3.122	0.013	0.903	0.239261
PetersonGulch072716_09	PetG	1204941	2455791	27-07-2016 11:13:57	0	0.008132	0.223873	791.6	36.4	0	0.034	0.936	0.239181
PetersonGulch072716_10	PetG	1204895	2456164	27-07-2016 11:17:56	0	0.005728	0.13054	790.6	36.7	-1.702	0.024	0.547	0.238647
PetersonGulch072716_11	PetG	1204532	2456201	27-07-2016 11:22:01	0	0.002862	0.208944	791.2	37.1	0	0.012	0.876	0.23852
PetersonGulch072716_12	PetG	1204180	2456156	27-07-2016 11:26:01	0	0.004768	0.103701	791.8	37.5	0	0.02	0.435	0.238394
PetersonGulch072716_13	PetG	1204514	2456593	27-07-2016 11:31:00	0	0.001666	0.050471	792.0	38.0	0	0.007	0.212	0.238071
PetersonGulch072716_14	PetG	1204160	2456595	27-07-2016 11:34:34	0	0.004517	0.111981	791.7	38.3	0	0.019	0.471	0.237752
PetersonGulch072716_15	PetG	1204146	2456953	27-07-2016 11:38:10	0	0.006414	0.10548	792.1	38.7	-0.001	0.027	0.444	0.237567
PetersonGulch072716_16	PetG	1203737	2456957	27-07-2016 11:41:57	0	0.005931	0.082088	791.8	39.0	0	0.025	0.346	0.237248

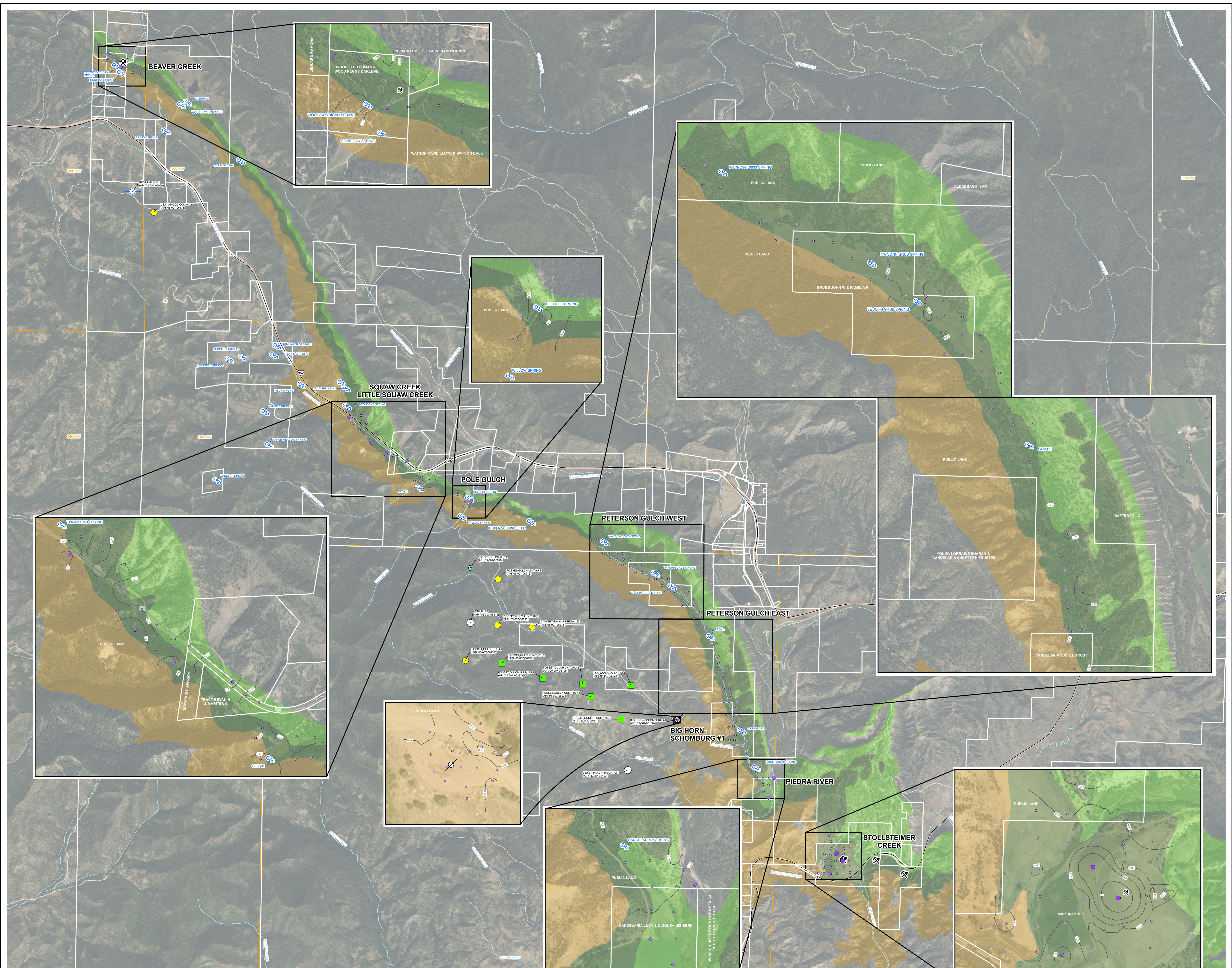
SitePt	Area Abbrev	Northing	Easting	DATE TIME:	CH4 flux	H2S flux	CO2 flux	PRESSUR E (HPa):	TEMP DegC	CH4 slope	H2S slope	CO2 slope	AcK
PetersonGulch072716_17	PetG	1203726	2457356	27-07-2016 11:45:51	0	0.004978	0.141984	792.1	39.4	-1.004	0.021	0.599	0.237035
PetersonGulch072716_18	PetG	1204115	2457376	27-07-2016 11:49:37	0	0.004263	0.061337	792.4	39.8	-1.102	0.018	0.259	0.236821
PetersonGulch072716_19	PetG	1203770	2457786	27-07-2016 11:53:54	0	0.003074	0.064786	792.4	40.3	-0.038	0.013	0.274	0.236443
PetersonGulch072716_20	PetG	1203344	2457797	27-07-2016 11:57:41	0	0.004727	0.094535	792.8	40.6	0	0.02	0.4	0.236337
PetersonGulch072716_21	PetG	1203318	2458188	27-07-2016 12:01:37	0	0.004011	0.097446	792.5	41.0	-0.226	0.017	0.413	0.235946
PetersonGulch072716_22	PetG	1203721	2458175	27-07-2016 12:05:05	0	0.002831	0.118444	793.0	41.2	0	0.012	0.502	0.235945
PetersonGulch072716_23	PetG	1203722	2458562	27-07-2016 12:09:06	0	0.003534	0.053249	792.9	41.6	-1.194	0.015	0.226	0.235615
PetersonGulch072716_24	PetG	1203346	2458555	27-07-2016 12:12:58	0	0.002824	0.041416	792.9	42.0	-1.636	0.012	0.176	0.235316
PetersonGulch072716_25	PetG	1203327	2458989	27-07-2016 12:16:39	0	0.001176	0.024929	793.2	42.3	-1.432	0.005	0.106	0.235182
PetersonGulch072716_26	PetG	1202974	2458953	27-07-2016 12:20:18	0	0.00094	0.008458	793.2	42.6	-0.863	0.004	0.036	0.234958
PetersonGulch072716_27	PetG	1202923	2458589	27-07-2016 12:23:38	0	0.004932	0.179652	793.3	42.8	-0.175	0.021	0.765	0.234839
PetersonGulch072716_28	PetG	1202528	2458943	27-07-2016 12:28:12	0	0.003753	0.221201	792.9	43.0	-0.972	0.016	0.943	0.234572
PetersonGulch072716_29	PetG	1202949	2459390	27-07-2016 12:32:31	0	0.003047	0.055079	792.5	43.1	-1.797	0.013	0.235	0.23438
PetersonGulch072716_30	PetG	1202879	2459746	27-07-2016 12:35:42	0	0.00727	0.180117	793.0	43.1	-0.356	0.031	0.768	0.234527
PetersonGulch072716_31	PetG	1202522	2459763	27-07-2016 12:38:49	0	0.003518	0.113511	793.5	43.3	-0.923	0.015	0.484	0.234527
PetersonGulch072716_32	PetG	1202545	2459402	27-07-2016 12:41:44	0	0.001876	0.018526	793.7	43.4	-1.875	0.008	0.079	0.234512
PetersonGulch072716_33	PetG	1202074	2459386	27-07-2016 12:46:22	0	0.004452	0.104507	793.3	43.5	-0.865	0.019	0.446	0.23432
PetersonGulch072716_34	PetG	1202123	2459777	27-07-2016 13:05:42	0	0.002105	0.030172	792.1	43.6	-0.954	0.009	0.129	0.233892
PetersonGulch072716_35	PetG	1201693	2459785	27-07-2016 13:10:05	0	0.004686	0.160957	793.2	43.5	0	0.02	0.687	0.23429
PetersonGulch072716_36	PetG	1201693	2460170	27-07-2016 13:15:25	0	0.004682	0.133428	792.5	43.5	0	0.02	0.57	0.234084
PetersonGulch072716_37	PetG	1202143	2460186	27-07-2016 13:18:45	0	0.002581	0.083544	794.5	43.5	0	0.011	0.356	0.234674
PetersonGulch072716_38	PetG	1202508	2460170	27-07-2016 13:21:58	0	0.00633	0.145361	794.0	43.6	-6.642	0.027	0.62	0.234453
PetersonGulch072716_39	PetG	1202128	2460536	27-07-2016 13:26:08	0	0.00398	0.132031	793.3	43.8	-2.001	0.017	0.564	0.234098
PetersonGulch072716_40	PetG	1201735	2460580	27-07-2016 13:29:32	0	0.003279	0.085249	793.9	43.9	0	0.014	0.364	0.234201
PetersonGulch072716_41	PetG	1201332	2460581	27-07-2016 13:32:38	0	0.006095	0.153791	794.7	43.9	0	0.026	0.656	0.234437
PetersonGulch072716_42	PetG	1201291	2460970	27-07-2016 13:35:50	0	0.011954	0.094929	794.8	44.0	0	0.051	0.405	0.234393
PetersonGulch072716_43	PetG	1201050	2460978	27-07-2016 13:38:38	0	0.002345	0.052065	795.5	44.1	0	0.01	0.222	0.234525
PetersonGulch072716_44	PetG	1200887	2460549	27-07-2016 13:42:56	0	0.006321	0.090362	794.8	44.4	-2.103	0.027	0.386	0.234098
PetersonGulch072716_45	PetG	1200519	2460777	27-07-2016 13:46:52	0	0.004904	0.07823	793.6	44.7	0	0.021	0.335	0.233523
PetersonGulch072716_46	PetG	1200502	2461179	27-07-2016 13:50:56	0	0.004672	0.178457	794.3	44.9	-0.522	0.02	0.764	0.233582
PetersonGulch072716_47	PetG	1200177	2461252	27-07-2016 13:54:13	0	0.008647	0.150737	795.2	45.1	-0.229	0.037	0.645	0.2337
PetersonGulch072716_48	PetG	1200187	2461650	27-07-2016 13:57:54	0	0.003506	0.056325	795.5	45.2	-0.435	0.015	0.241	0.233715
PetersonGulch072716_49	PetG	1199705	2461589	27-07-2016 14:02:52	0	0.009099	0.246851	794.9	45.5	-0.548	0.039	1.058	0.233319
PetersonGulch072716_50	PetG	1199361	2461616	27-07-2016 14:06:39	0	0.007941	0.202504	796.5	45.8	0	0.034	0.867	0.233569
PetersonGulch072716_51	PetG	1199333	2461946	27-07-2016 14:10:04	0	0.013075	0.067943	796.7	46.0	-0.14	0.056	0.291	0.233481
PetersonGulch072716_53	PetG	1198531	2462059	27-07-2016 14:18:12	0	0.011662	0.265418	796.6	46.3	-0.114	0.05	1.138	0.233232
PetersonGulch072716_54	PetG	1198144	2462068	27-07-2016 14:22:08	0	0.003504	0.186388	798.0	46.4	-0.592	0.015	0.798	0.233569
PetersonGulch072716_55	PetG	1197805	2461970	27-07-2016 14:28:42	0	0.005612	0.111531	798.6	46.3	-0.946	0.024	0.477	0.233818
PetersonGulch072716_56	PetG	1197817	2462404	27-07-2016 14:34:35	0	0.003041	0.033689	798.3	46.0	-1.081	0.013	0.144	0.23395
PetersonGulch072716_57	PetG	1197305	2462315	27-07-2016 14:40:26	0	0.007727	0.122689	798.7	45.9	-0.573	0.033	0.524	0.23414

SitePt	Area Abbrev	Northing	Easting	DATE TIME:	CH4 flux	H2S flux	CO2 flux	PRESSUR E (HPa):	TEMP DegC	CH4 slope	H2S slope	CO2 slope	AcK
PetersonGulch072716_58	PetG	1197034	2462368	27-07-2016 14:43:52	0	0.005394	0.172363	799.7	45.8	-1.958	0.023	0.735	0.234507
PetersonGulch072716_59	PetG	1196603	2462390	27-07-2016 14:48:23	0	0.001643	0.12842	800.6	45.8	-0.727	0.007	0.547	0.234771
PetersonGulch072716_60	PetG	1196527	2462746	27-07-2016 14:53:27	0	0.006569	0.385932	800.3	45.9	-0.017	0.028	1.645	0.234609
PetersonGulch072716_61	PetG	1196139	2462834	27-07-2016 14:57:51	0	0.002342	0.168421	799.3	46.0	0	0.01	0.719	0.234243
PetersonGulch072716_62	PetG	1195730	2463225	27-07-2016 15:03:28	0	0.004213	0.116565	799.7	46.4	0	0.018	0.498	0.234067
PetersonGulch072716_63	PetG	1195349	2463170	27-07-2016 15:06:33	0	0.007253	0.047498	799.9	46.6	-0.414	0.031	0.203	0.233979
PetersonGulch072716_64	PetG	1195751	2462723	27-07-2016 15:11:05	0	0.006327	0.20621	801.6	46.8	-1.841	0.027	0.88	0.234329
PetersonGulch072716_65	PetG	1195752	2462419	27-07-2016 15:15:16	0	0.002108	0.269344	801.2	46.8	-1.436	0.009	1.15	0.234212
PetersonGulch072716_66	PetG	1196228	2462427	27-07-2016 15:19:42	0	0.002574	0.11304	800.6	46.8	-0.112	0.011	0.483	0.234037
PiedraRiver080816_01	PR	1191047	2464418	08-08-2016 11:08:13	0	0.005004	0.247196	807.2	28.6	-2.116	0.02	0.988	0.250199
PiedraRiver080816_02	PR	1191019	2464832	08-08-2016 11:14:41	0	0.002233	0.103724	807.2	31.1	0	0.009	0.418	0.248143
PiedraRiver080816_03	PR	1191019	2465205	08-08-2016 11:19:52	0	0.002968	0.178342	808.6	32.6	0	0.012	0.721	0.247354
PiedraRiver080816_04	PR	1191047	2465493	08-08-2016 11:26:12	0	0.008123	0.57672	808.6	34.1	-0.628	0.033	2.343	0.246146
PiedraRiver080816_05	PR	1191281	2465311	08-08-2016 11:31:06	0	0.004173	0.233914	809.2	35.2	-2.012	0.017	0.953	0.24545
PiedraRiver080816_06	PR	1191418	2465213	08-08-2016 11:45:02	0	0	0	809.2	38.1	-0.123	-0.024	-1.743	0.243163
PiedraRiver080916_07	PR	1190637	2464829	09-08-2016 08:42:17	0	0.002012	0.216529	809.2	27.8	0	0.008	0.861	0.251485
PiedraRiver080916_08	PR	1190205	2464803	09-08-2016 08:46:55	0	0	0.654135	809.2	28.6	0	0	2.608	0.250819
PiedraRiver080916_09	PR	1189818	2465156	09-08-2016 08:52:22	0	0	0.65891	810.7	29.5	0	-0.003	2.63	0.250536
PiedraRiver080916_10	PR	1190230	2465199	09-08-2016 08:57:38	0	0	0.478427	810.4	30.4	0	-0.005	1.916	0.249701
PiedraRiver080916_11	PR	1190618	2465160	09-08-2016 09:01:46	0	0.002242	0.416789	810.4	31.1	0	0.009	1.673	0.249127
PiedraRiver080916_13	PR	1191424	2464795	09-08-2016 09:16:44	0	0.003439	0.172931	805.1	33.4	0	0.014	0.704	0.24564
PiedraRiver080916_14	PR	1191846	2464392	09-08-2016 09:22:55	0	0.001226	0.153802	806.6	34.4	0	0.005	0.627	0.245298
PiedraRiver080916_15	PR	1191392	2464414	09-08-2016 09:30:33	0	0	0.187656	806.6	35.6	0	-0.003	0.768	0.244344
PiedraRiver080916_16	PR	1191393	2464059	09-08-2016 09:36:43	0	0.003421	0.134867	808.1	36.2	0	0.014	0.552	0.244324
PiedraRiver080916_17	PR	1191824	2463978	09-08-2016 09:42:36	0	0.00146	0.290324	806.2	36.7	0	0.006	1.193	0.243356
PiedraRiver080916_18	PR	1192170	2463869	09-08-2016 09:48:21	0	0.001704	0.265896	807.7	37.1	0	0.007	1.092	0.243495
SquawCreek081016_01	SqC	1210282	2443110	10-08-2016 12:16:34	0	0.002455	0.186328	790.7	28.1	0	0.01	0.759	0.245491
SquawCreek081016_02	SqC	1210153	2443394	10-08-2016 12:20:36	0	0.005133	0.100944	790.9	29.5	0	0.021	0.413	0.244417
SquawCreek081016_03	SqC	1210886	2442240	10-08-2016 12:35:43	0	0.00169	0.185632	791.7	33.6	-0.629	0.007	0.769	0.241394
SquawCreek081016_04	SqC	1210953	2441972	10-08-2016 12:41:35	0	0.0024	0.253876	789.3	34.5	0	0.01	1.058	0.239959
SquawCreek081016_05	SqC	1211016	2441545	10-08-2016 12:47:50	0	0.004788	0.63302	788.8	35.0	-1.777	0.02	2.644	0.239417
SquawCreek081016_06	SqC	1211293	2441165	10-08-2016 12:53:29	0	0.001907	0.381147	786.1	35.3	-0.612	0.008	1.599	0.238366
SquawCreek081016_07	SqC	1211723	2440712	10-08-2016 12:59:45	0	0.001903	0.865263	785.6	35.7	-0.693	0.008	3.637	0.237906
SquawCreek081016_08	SqC	1212152	2440332	10-08-2016 13:06:43	0	0.003092	0.307726	786.3	36.1	-1.908	0.013	1.294	0.23781
SquawCreek081016_09	SqC	1212536	2439918	10-08-2016 13:13:01	0	0.00355	0.331793	783.5	36.5	-2.156	0.015	1.402	0.236657
SquawCreek081016_10	SqC	1212932	2439539	10-08-2016 13:18:31	0	0.006157	0.340527	784.5	36.7	0	0.026	1.438	0.236806
SquawCreek081016_11	SqC	1213337	2439285	10-08-2016 13:28:36	0	0.001887	0.613953	783.9	37.7	-0.83	0.008	2.603	0.235864
SquawCreek081016_12	SqC	1213735	2439130	10-08-2016 13:36:31	0	0.003299	0.170353	784.6	38.3	-1.03	0.014	0.723	0.235619
SquawCreek081016_13	SqC	1213736	2439547	10-08-2016 13:42:15	0	0.003992	0.159199	783.4	38.9	-1.185	0.017	0.678	0.234807
SquawCreek081016_14	SqC	1213419	2440010	10-08-2016 13:48:27	0	0.008177	0.399262	781.2	39.6	-1.318	0.035	1.709	0.233623

SitePt	Area Abbrev	Northing	Easting	DATE TIME:	CH4 flux	H2S flux	CO2 flux	PRESSUR E (HPa):	TEMP DegC	CH4 slope	H2S slope	CO2 slope	AcK
SquawCreek081016_15	SqC	1213367	2440319	10-08-2016 13:54:45	0	0.002798	0.090233	780.9	40.1	-2.412	0.012	0.387	0.233161
SquawCreek081016_16	SqC	1213041	2440014	10-08-2016 14:00:18	0	0.003026	0.157345	780.8	40.6	-1.267	0.013	0.676	0.232759
SquawCreek081016_17	SqC	1212933	2440355	10-08-2016 14:05:13	0	0.006534	0.39528	783.5	40.9	-1.465	0.028	1.694	0.233341
SquawCreek081016_18	SqC	1212650	2440453	10-08-2016 14:09:49	0	0.001635	0.142951	784.8	41.1	-1.051	0.007	0.612	0.23358
SquawCreek081016_19	SqC	1212159	2440862	10-08-2016 14:15:38	0	0.008879	0.243	785.8	41.4	-1.984	0.038	1.04	0.233654
SquawCreek081016_20	SqC	1211838	2441176	10-08-2016 14:19:29	0	0.004442	0.06756	786.7	41.6	-2.798	0.019	0.289	0.233773
SquawCreek081016_21	SqC	1211757	2441451	10-08-2016 14:23:36	0	0.005142	0.147726	787.1	41.8	-2.991	0.022	0.632	0.233743
SquawCreek081016_22	SqC	1211356	2441558	10-08-2016 14:29:54	0	0.003269	0.311264	787.3	42.2	-0.557	0.014	1.333	0.233506
SquawCreek081016_23	SqC	1211377	2441887	10-08-2016 14:35:03	0	0.007247	0.345071	788.5	42.3	-1.684	0.031	1.476	0.233788
SquawCreek081016_24	SqC	1210594	2442832	10-08-2016 14:42:02	0	0.007481	0.588641	788.2	42.2	-2.837	0.032	2.518	0.233773
SquawCreek081016_25	SqC	1213345	2439530	10-08-2016 14:58:48	0	0.006333	0.241816	789.8	41.8	-4.708	0.027	1.031	0.234545

**APPENDIX C**  
**CARBON DIOXIDE FLUX CONTOUR MAP**





**LEGEND**

<p><b>CARBON DIOXIDE FLUX MEASUREMENT (mol/m<sup>2</sup> · day)</b></p> <ul style="list-style-type: none"> <li>● 0.0000 - 0.0100</li> <li>● 0.0101 - 0.5000</li> <li>● 0.5001 - 1.0000</li> <li>● 1.0001 - 25.0000</li> <li>● 25.0001 - 225.0000</li> <li>✂ MINE ENTRANCE</li> </ul>	<p><b>COALBED METHANE WELLS (PETROX RESOURCES, INC.)</b></p> <ul style="list-style-type: none"> <li>● PRODUCING</li> <li>◆ DRILLING</li> <li>○ SHUT IN</li> <li>■ WAITING ON INFORMATION</li> <li>○ PROPOSED WELL</li> <li>○ ABANDONED PRODUCTION WELL</li> <li>○ NATURAL SPRING</li> </ul>	<p>— CARBON DIOXIDE FLUX CONTOUR IN mol/m<sup>2</sup> · day (INTERVAL VARIES)</p> <p>— HIGHWAY</p> <p>— SURFACE WATER</p> <p>— PARCEL BOUNDARY (WHITE)</p> <p>— TOWNSHIP AND RANGE LINES</p> <p><b>GEOLOGY - COLORADO GEOLOGICAL SURVEY, 2011</b></p> <ul style="list-style-type: none"> <li>■ KIRTLAND FORMATION (Kk)</li> <li>■ FRUITLAND FORMATION (Kf)</li> <li>■ PICTURED CLIFFS FORMATION (Kpc)</li> </ul>
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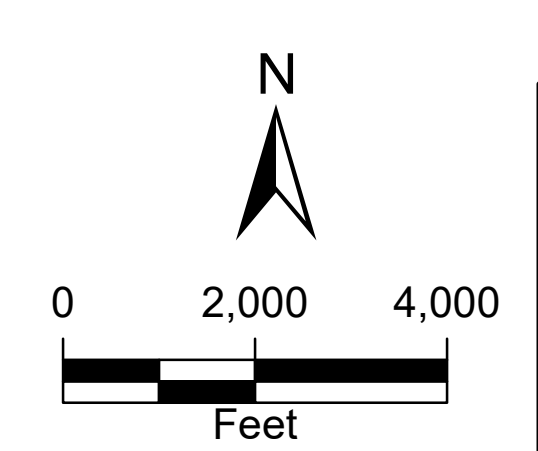
mol/m<sup>2</sup> · day: MOLES PER SQUARE METER PER DAY

APPENDIX D  
CARBON DIOXIDE FLUX CONTOUR MAP  
2016 OUTCROP ZONE REPORT  
ARCHULETA COUNTY, COLORADO

**PETROX RESOURCES AND ELM RIDGE RESOURCES**

P:\San Juan Basin GIS\Archuleta\Fruitland\_OMR\MXD\Subgas\_Flux\2016\2016\_ARCH\_FIG D CO2 FLUX CONTOURS.mxd

IMAGE COURTESY OF ESRI



**APPENDIX D**  
**ABANDONED COAL MINE SUBSURFACE SOIL GAS AND**  
**TEMPERATURE MEASUREMENTS**



Max_PDOP	GPS_Date	GPS_Time	Datafile	Sub_O2____	Sub_CH4_p	Sub_H2S_p	Sub_CO_pp	Sub_CO2_p	TEMP	LAT	LONG
7.00	8/12/2016	07:54:47am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	100.0	4	37.295367	-107.476217
7.00	8/12/2016	07:59:03am	TRIPPLES_MINE.cor	20.90	0.0	0.0	0.0	200.0	6	37.295524	-107.476222
3.50	8/12/2016	08:06:08am	TRIPPLES_MINE.cor	20.90	0.0	0.0	1.0	100.0	9	37.295647	-107.476198
3.80	8/12/2016	08:09:10am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	200.0	9	37.295759	-107.476235
6.60	8/12/2016	08:12:12am	TRIPPLES_MINE.cor	20.90	0.0	0.0	0.0	100.0	6	37.295901	-107.476211
6.10	8/12/2016	08:16:07am	TRIPPLES_MINE.cor	20.30	0.0	0.0	0.0	600.0	7	37.296099	-107.476196
6.00	8/12/2016	08:18:33am	TRIPPLES_MINE.cor	20.20	0.0	0.0	0.0	700.0	9	37.296219	-107.476229
5.60	8/12/2016	08:22:32am	TRIPPLES_MINE.cor	21.00	0.0	0.0	0.0	100.0	10	37.296337	-107.476274
6.10	8/12/2016	08:24:50am	TRIPPLES_MINE.cor	20.50	0.0	0.0	0.0	500.0	9	37.296465	-107.476285
6.80	8/12/2016	08:27:34am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	200.0	9	37.296612	-107.476249
5.40	8/12/2016	08:30:46am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	200.0	4	37.296597	-107.476076
4.60	8/12/2016	08:34:30am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	200.0	7	37.296505	-107.476048
6.30	8/12/2016	08:37:38am	TRIPPLES_MINE.cor	20.50	0.0	0.0	0.0	200.0	7	37.296349	-107.476081
6.70	8/12/2016	08:40:12am	TRIPPLES_MINE.cor	20.90	0.0	0.0	0.0	100.0	8	37.296181	-107.476060
6.10	8/12/2016	08:42:26am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	200.0	8	37.296076	-107.476065
5.80	8/12/2016	08:44:31am	TRIPPLES_MINE.cor	20.80	0.0	0.0	1.0	100.0	8	37.295908	-107.476044
6.30	8/12/2016	08:46:50am	TRIPPLES_MINE.cor	20.50	0.0	0.0	0.0	500.0	8	37.295732	-107.476087
4.00	8/12/2016	08:49:07am	TRIPPLES_MINE.cor	20.90	0.0	0.0	0.0	100.0	9	37.295636	-107.476069
6.10	8/12/2016	08:51:31am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	100.0	9	37.295445	-107.476030
5.90	8/12/2016	08:53:31am	TRIPPLES_MINE.cor	19.90	0.0	0.0	1.0	1000.0	10	37.295343	-107.476039
2.10	8/12/2016	08:55:47am	TRIPPLES_MINE.cor	20.10	0.0	0.0	0.0	900.0	10	37.295342	-107.476056
4.00	8/12/2016	08:57:10am	TRIPPLES_MINE.cor	20.40	0.0	0.0	0.0	500.0	10	37.295343	-107.475846
5.50	8/12/2016	08:58:59am	TRIPPLES_MINE.cor	20.10	0.0	0.0	1.0	500.0	11	37.295340	-107.475748
4.10	8/12/2016	09:01:18am	TRIPPLES_MINE.cor	20.00	0.0	0.0	0.0	600.0	11	37.295518	-107.475869
5.30	8/12/2016	09:03:08am	TRIPPLES_MINE.cor	20.00	0.0	0.0	0.0	600.0	14	37.295625	-107.475834
6.30	8/12/2016	09:05:43am	TRIPPLES_MINE.cor	20.60	0.0	0.0	0.0	200.0	14	37.295814	-107.475878
4.70	8/12/2016	09:08:08am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	200.0	13	37.295921	-107.475876
7.00	8/12/2016	09:10:14am	TRIPPLES_MINE.cor	20.60	0.0	0.0	0.0	600.0	11	37.295998	-107.475851
7.00	8/12/2016	09:12:32am	TRIPPLES_MINE.cor	20.60	0.0	0.0	0.0	400.0	12	37.296162	-107.475865
6.70	8/12/2016	09:14:56am	TRIPPLES_MINE.cor	20.20	0.0	0.0	0.0	700.0	11	37.296356	-107.475882
5.10	8/12/2016	09:16:59am	TRIPPLES_MINE.cor	20.30	0.0	0.0	1.0	400.0	12	37.296492	-107.475875
5.60	8/12/2016	09:19:28am	TRIPPLES_MINE.cor	20.70	0.0	0.0	7.0	100.0	12	37.296653	-107.475843
5.50	8/12/2016	09:21:54am	TRIPPLES_MINE.cor	20.10	0.0	0.0	0.0	800.0	11	37.296608	-107.475753
5.50	8/12/2016	09:25:20am	TRIPPLES_MINE.cor	20.50	0.0	0.0	0.0	500.0	11	37.296465	-107.475704
4.20	8/12/2016	09:29:43am	TRIPPLES_MINE.cor	20.00	0.0	0.0	0.0	900.0	11	37.296348	-107.475672
5.90	8/12/2016	09:31:46am	TRIPPLES_MINE.cor	19.90	0.0	0.0	0.0	900.0	12	37.296191	-107.475724
3.20	8/12/2016	09:33:54am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	100.0	11	37.296104	-107.475684
3.00	8/12/2016	09:36:27am	TRIPPLES_MINE.cor	20.90	0.0	0.0	0.0	100.0	11	37.295946	-107.475729
2.90	8/12/2016	09:38:09am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	0.0	11	37.295761	-107.475784
3.20	8/12/2016	09:39:57am	TRIPPLES_MINE.cor	20.40	0.0	0.0	0.0	500.0	14	37.295668	-107.475696
6.30	8/12/2016	09:42:10am	TRIPPLES_MINE.cor	20.30	0.0	0.0	0.0	500.0	18	37.295515	-107.475686
5.90	8/12/2016	09:44:01am	TRIPPLES_MINE.cor	20.50	0.0	0.0	0.0	400.0	14	37.295470	-107.475547
6.20	8/12/2016	09:46:08am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	200.0	16	37.295354	-107.475517
5.30	8/12/2016	09:48:55am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	100.0	15	37.295648	-107.475542
4.40	8/12/2016	09:52:06am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	100.0	13	37.295784	-107.475503
5.60	8/12/2016	09:54:06am	TRIPPLES_MINE.cor	20.90	0.0	0.0	0.0	100.0	12	37.295929	-107.475499
6.10	8/12/2016	09:56:22am	TRIPPLES_MINE.cor	20.20	0.0	0.0	0.0	700.0	12	37.296045	-107.475547
4.70	8/12/2016	09:59:34am	TRIPPLES_MINE.cor	20.30	0.0	0.0	0.0	600.0	13	37.296293	-107.475490
6.60	8/12/2016	10:01:17am	TRIPPLES_MINE.cor	20.10	0.0	0.0	0.0	900.0	13	37.296398	-107.475554
4.80	8/12/2016	10:04:09am	TRIPPLES_MINE.cor	20.20	0.0	0.0	0.0	600.0	14	37.296575	-107.475499
5.10	8/12/2016	10:07:02am	TRIPPLES_MINE.cor	20.40	0.0	0.0	0.0	700.0	12	37.296652	-107.475522
2.90	8/12/2016	10:09:45am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	200.0	10	37.296596	-107.475372
3.40	8/12/2016	10:12:09am	TRIPPLES_MINE.cor	20.60	0.0	0.0	0.0	400.0	10	37.296464	-107.475372
5.40	8/12/2016	10:14:42am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	600.0	11	37.296382	-107.475338
5.60	8/12/2016	10:16:58am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	200.0	11	37.296241	-107.475339
6.50	8/12/2016	10:19:25am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	200.0	13	37.296034	-107.475318
3.70	8/12/2016	10:22:40am	TRIPPLES_MINE.cor	20.60	0.0	0.0	9.0	400.0	13	37.295909	-107.475384
5.50	8/12/2016	10:24:57am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	100.0	13	37.295822	-107.475362
4.50	8/12/2016	10:27:13am	TRIPPLES_MINE.cor	20.40	0.0	0.0	0.0	500.0	12	37.295679	-107.475390
6.30	8/12/2016	10:30:19am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	300.0	10	37.295481	-107.475357
6.70	8/12/2016	10:33:37am	TRIPPLES_MINE.cor	20.90	0.0	0.0	0.0	0.0	4	37.295339	-107.475311
6.60	8/12/2016	10:35:56am	TRIPPLES_MINE.cor	20.10	0.0	0.0	0.0	700.0	8	37.295359	-107.475139
6.10	8/12/2016	10:37:53am	TRIPPLES_MINE.cor	20.90	0.0	0.0	0.0	0.0	9	37.295360	-107.474999
6.30	8/12/2016	10:39:55am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	100.0	6	37.295501	-107.475004
3.90	8/12/2016	10:42:08am	TRIPPLES_MINE.cor	20.90	0.0	0.0	0.0	0.0	4	37.295519	-107.475132
3.60	8/12/2016	10:44:34am	TRIPPLES_MINE.cor	20.00	0.0	0.0	0.0	1300.0	8	37.295665	-107.474992
5.30	8/12/2016	10:47:03am	TRIPPLES_MINE.cor	20.50	0.0	0.0	0.0	300.0	12	37.295650	-107.475168
3.60	8/12/2016	10:49:15am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	100.0	12	37.295778	-107.475140
5.40	8/12/2016	10:52:07am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	100.0	13	37.295786	-107.474984
5.40	8/12/2016	10:54:08am	TRIPPLES_MINE.cor	20.40	0.0	0.0	0.0	500.0	13	37.295929	-107.474868
6.90	8/12/2016	10:56:19am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	600.0	17	37.295936	-107.474713
4.40	8/12/2016	10:58:15am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	500.0	18	37.296073	-107.474674
4.90	8/12/2016	11:00:41am	TRIPPLES_MINE.cor	20.60	0.0	0.0	0.0	400.0	17	37.296111	-107.474669
2.50	8/12/2016	11:03:00am	TRIPPLES_MINE.cor	20.60	0.0	0.0	0.0	600.0	17	37.296212	-107.474647

5.70	8/12/2016	11:05:34am	TRIPPLES_MINE.cor	20.90	0.0	0.0	12.0	0.0	16	37.296332	-107.474644
6.60	8/12/2016	11:08:05am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	100.0	15	37.296483	-107.474687
5.60	8/12/2016	11:10:12am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	200.0	16	37.296631	-107.474673
5.70	8/12/2016	11:11:43am	TRIPPLES_MINE.cor	20.90	0.0	0.0	0.0	100.0	16	37.296632	-107.474818
6.30	8/12/2016	11:13:36am	TRIPPLES_MINE.cor	20.60	0.0	0.0	0.0	400.0	16	37.296600	-107.475061
3.20	8/12/2016	11:15:54am	TRIPPLES_MINE.cor	20.30	0.0	0.0	0.0	500.0	16	37.296640	-107.475260
2.60	8/12/2016	11:18:38am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	300.0	16	37.296473	-107.475194
3.60	8/12/2016	11:20:48am	TRIPPLES_MINE.cor	20.60	0.0	0.0	0.0	400.0	14	37.296370	-107.475234
4.80	8/12/2016	11:23:16am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	200.0	14	37.296216	-107.475230
4.70	8/12/2016	11:26:53am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	300.0	12	37.296070	-107.475208
6.10	8/12/2016	11:28:44am	TRIPPLES_MINE.cor	20.50	0.0	0.0	0.0	200.0	14	37.295961	-107.475191
2.50	8/12/2016	11:31:03am	TRIPPLES_MINE.cor	20.60	0.0	0.0	0.0	300.0	16	37.295924	-107.475033
4.00	8/12/2016	11:34:37am	TRIPPLES_MINE.cor	20.90	0.0	0.0	0.0	100.0	14	37.296196	-107.475037
3.60	8/12/2016	11:36:44am	TRIPPLES_MINE.cor	20.70	0.0	0.0	0.0	300.0	15	37.296375	-107.474991
5.80	8/12/2016	11:38:57am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	200.0	14	37.296487	-107.475020
6.50	8/12/2016	11:40:31am	TRIPPLES_MINE.cor	20.50	0.0	0.0	0.0	200.0	10	37.296489	-107.474911
4.00	8/12/2016	11:44:16am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	100.0	10	37.296365	-107.474797
4.10	8/12/2016	11:46:47am	TRIPPLES_MINE.cor	20.80	0.0	0.0	0.0	100.0	12	37.296249	-107.474842
4.60	8/12/2016	11:49:58am	TRIPPLES_MINE.cor	20.90	0.0	0.0	0.0	0.0	14	37.296117	-107.474940
6.60	8/12/2016	11:51:29am	TRIPPLES_MINE.cor	20.50	0.0	0.0	0.0	200.0	15	37.296057	-107.474810
6.60	8/16/2016	09:34:47am	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	0.0	13	37.162580	-107.318413
3.20	8/16/2016	09:37:00am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	13	37.162593	-107.318567
3.00	8/16/2016	09:38:36am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	15	37.162579	-107.318780
4.40	8/16/2016	09:39:47am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	14	37.162550	-107.319112
4.20	8/16/2016	09:40:55am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	14	37.162457	-107.319113
6.20	8/16/2016	09:42:36am	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	0.0	13	37.162545	-107.319239
4.80	8/16/2016	09:43:43am	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	200.0	14	37.162431	-107.319280
4.30	8/16/2016	09:45:01am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	15	37.162285	-107.319294
6.60	8/16/2016	09:46:22am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	300.0	15	37.162288	-107.319441
6.80	8/16/2016	09:48:00am	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	100.0	15	37.162314	-107.319589
3.30	8/16/2016	09:49:29am	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	100.0	15	37.162423	-107.319579
2.30	8/16/2016	09:51:07am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	15	37.162413	-107.319425
4.50	8/16/2016	09:52:44am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	15	37.162544	-107.319425
3.50	8/16/2016	09:54:13am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	15	37.162550	-107.319577
4.60	8/16/2016	09:55:40am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	15	37.162681	-107.319617
2.80	8/16/2016	09:57:08am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	300.0	16	37.162689	-107.319761
4.50	8/16/2016	09:58:48am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	16	37.162691	-107.319924
5.60	8/16/2016	10:00:26am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	15	37.162838	-107.319930
3.80	8/16/2016	10:01:55am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	15	37.162837	-107.319827
4.10	8/16/2016	10:03:28am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	15	37.162835	-107.319595
6.10	8/16/2016	10:05:00am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	15	37.162828	-107.319427
4.00	8/16/2016	10:06:04am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	400.0	15	37.162702	-107.319466
5.50	8/16/2016	10:07:11am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	15	37.162690	-107.319259
4.20	8/16/2016	10:08:23am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	15	37.162827	-107.319267
4.60	8/16/2016	10:09:57am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	15	37.162821	-107.319104
5.20	8/16/2016	10:11:12am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	15	37.162702	-107.319120
6.90	8/16/2016	10:12:31am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	300.0	15	37.162717	-107.318924
3.60	8/16/2016	10:13:42am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	400.0	16	37.162825	-107.318934
4.20	8/16/2016	10:15:00am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	16	37.162834	-107.318769
2.80	8/16/2016	10:16:08am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	1000.0	16	37.162714	-107.318784
2.90	8/16/2016	10:17:36am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	17	37.162729	-107.318602
2.40	8/16/2016	10:19:04am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	17	37.162847	-107.318591
6.20	8/16/2016	10:20:34am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	18	37.162856	-107.318426
4.50	8/16/2016	10:22:00am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	17	37.162749	-107.318428
6.20	8/16/2016	10:23:57am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	17	37.162990	-107.318234
6.80	8/16/2016	10:25:03am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	18	37.163124	-107.318239
4.70	8/16/2016	10:26:18am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	18	37.163247	-107.318232
6.10	8/16/2016	10:27:50am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	16	37.163366	-107.318243
4.90	8/16/2016	10:29:38am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	16	37.163381	-107.318405
3.70	8/16/2016	10:31:00am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	17	37.163515	-107.318448
6.60	8/16/2016	10:32:16am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	16	37.163651	-107.318430
6.60	8/16/2016	10:33:46am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	18	37.163811	-107.318479
3.90	8/16/2016	10:35:07am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	17	37.163937	-107.318461
5.40	8/16/2016	10:36:50am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	18	37.164033	-107.318642
6.20	8/16/2016	10:38:15am	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	0.0	18	37.163945	-107.318632
4.40	8/16/2016	10:39:43am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	300.0	19	37.163776	-107.318643
4.90	8/16/2016	10:41:14am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	300.0	19	37.163635	-107.318619
3.80	8/16/2016	10:42:45am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	300.0	19	37.163515	-107.318603
3.50	8/16/2016	10:44:13am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	19	37.163385	-107.318577
4.50	8/16/2016	10:45:54am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	19	37.163259	-107.318437
4.50	8/16/2016	10:47:30am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	18	37.163114	-107.318405
6.80	8/16/2016	10:49:29am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	20	37.162980	-107.318413
4.80	8/16/2016	10:50:59am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	300.0	20	37.162959	-107.318567
5.50	8/16/2016	10:52:45am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	20	37.163119	-107.318605
6.80	8/16/2016	10:53:51am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	17	37.163226	-107.318609

4.00	8/16/2016	10:55:22am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	18	37.163360	-107.318761
5.00	8/16/2016	10:56:37am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	500.0	16	37.163513	-107.318794
6.50	8/16/2016	10:57:42am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	18	37.163638	-107.318790
5.50	8/16/2016	10:58:55am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	1100.0	18	37.163777	-107.318798
2.40	8/16/2016	11:00:12am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	500.0	18	37.163899	-107.318804
4.10	8/16/2016	11:01:28am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	16	37.164039	-107.318848
6.10	8/16/2016	11:02:38am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	15	37.164041	-107.318979
6.40	8/16/2016	11:04:04am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	17	37.163896	-107.318976
7.00	8/16/2016	11:05:04am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	1000.0	18	37.163774	-107.318953
4.00	8/16/2016	11:06:20am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	17	37.163622	-107.318943
5.00	8/16/2016	11:07:22am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	400.0	17	37.163518	-107.318921
6.70	8/16/2016	11:08:59am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	500.0	18	37.163388	-107.318921
5.80	8/16/2016	11:10:32am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	500.0	17	37.163255	-107.318777
5.30	8/16/2016	11:11:48am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	17	37.163098	-107.318749
5.00	8/16/2016	11:12:53am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	19	37.162964	-107.318753
2.70	8/16/2016	11:17:26am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	0	37.162950	-107.318940
3.40	8/16/2016	11:18:42am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	18	37.163091	-107.318935
4.00	8/16/2016	11:20:20am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	500.0	18	37.163242	-107.318969
4.00	8/16/2016	11:21:21am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	19	37.163347	-107.319076
5.80	8/16/2016	11:22:30am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	19	37.163492	-107.319123
4.10	8/16/2016	11:23:48am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	18	37.163627	-107.319146
2.30	8/16/2016	11:25:08am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	600.0	19	37.163763	-107.319157
6.30	8/16/2016	11:26:28am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	18	37.163872	-107.319130
3.10	8/16/2016	11:27:56am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	18	37.164050	-107.319148
5.00	8/16/2016	11:29:05am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	18	37.164032	-107.319307
4.90	8/16/2016	11:30:10am	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	0.0	19	37.163891	-107.319316
4.00	8/16/2016	11:31:40am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	19	37.163771	-107.319317
5.10	8/16/2016	11:33:16am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	19	37.163634	-107.319310
3.80	8/16/2016	11:34:44am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	18	37.163502	-107.319311
6.90	8/16/2016	11:35:45am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	400.0	19	37.163370	-107.319284
5.20	8/16/2016	11:36:50am	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	100.0	19	37.163255	-107.319259
6.80	8/16/2016	11:38:20am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	20	37.163234	-107.319096
6.70	8/16/2016	11:39:54am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	300.0	20	37.163111	-107.319118
6.90	8/16/2016	11:41:27am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	20	37.162964	-107.319120
5.60	8/16/2016	11:42:49am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	600.0	20	37.162929	-107.319264
5.80	8/16/2016	11:44:20am	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	100.0	20	37.163078	-107.319277
2.10	8/16/2016	11:45:58am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	20	37.163214	-107.319438
2.10	8/16/2016	11:47:23am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	900.0	20	37.163349	-107.319475
2.10	8/16/2016	11:48:59am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	600.0	20	37.163494	-107.319469
2.10	8/16/2016	11:50:24am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	800.0	20	37.163628	-107.319507
2.10	8/16/2016	11:51:29am	CHIMNEYROCKMINE_081	20.40	0.0	0.0	0.0	0.0	19	37.163786	-107.319503
2.10	8/16/2016	11:52:52am	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	0.0	20	37.163900	-107.319495
5.80	8/16/2016	11:54:12am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	400.0	20	37.164055	-107.319520
6.00	8/16/2016	11:55:49am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	500.0	20	37.164055	-107.319703
4.90	8/16/2016	11:59:13am	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	1000.0	20	37.163888	-107.319680
6.80	8/16/2016	12:00:25pm	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	100.0	20	37.163793	-107.319639
6.50	8/16/2016	12:01:55pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	21	37.163639	-107.319625
4.70	8/16/2016	12:03:29pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	800.0	21	37.163521	-107.319620
4.70	8/16/2016	12:04:48pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	1000.0	22	37.163384	-107.319625
2.60	8/16/2016	12:05:59pm	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	100.0	24	37.163270	-107.319611
5.50	8/16/2016	12:07:20pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	21	37.163104	-107.319587
2.50	8/16/2016	12:08:38pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	21	37.163065	-107.319439
4.70	8/16/2016	12:09:49pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	22	37.162946	-107.319459
3.00	8/16/2016	12:11:26pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	21	37.162954	-107.319618
1.90	8/16/2016	12:13:09pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	20	37.162972	-107.319788
3.40	8/16/2016	12:14:20pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	300.0	19	37.163089	-107.319817
1.80	8/16/2016	12:15:42pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	19	37.163248	-107.319811
2.90	8/16/2016	12:16:49pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	400.0	20	37.163394	-107.319809
1.60	8/16/2016	12:18:01pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	20	37.163496	-107.319801
2.10	8/16/2016	12:19:14pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	20	37.163652	-107.319831
2.70	8/16/2016	12:20:22pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	21	37.163642	-107.319983
2.20	8/16/2016	12:21:40pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	21	37.163773	-107.320016
2.00	8/16/2016	12:23:03pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	23	37.163810	-107.319848
4.00	8/16/2016	12:24:03pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	300.0	22	37.163899	-107.319838
2.90	8/16/2016	12:25:04pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	22	37.163907	-107.320013
4.90	8/16/2016	12:25:59pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	20	37.164070	-107.319997
3.60	8/16/2016	12:27:35pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	21	37.164068	-107.319831
1.90	8/16/2016	12:29:12pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	22	37.164197	-107.319999
2.20	8/16/2016	12:30:28pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	21	37.164208	-107.320154
2.60	8/16/2016	12:31:29pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	20	37.164091	-107.320176
2.70	8/16/2016	12:32:34pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	20	37.163933	-107.320159
6.50	8/16/2016	12:33:37pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	20	37.163790	-107.320184
3.90	8/16/2016	12:34:37pm	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	0.0	18	37.163654	-107.320160
3.20	8/16/2016	12:35:45pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	100.0	19	37.163628	-107.320300
3.50	8/16/2016	12:36:46pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	600.0	18	37.163788	-107.320330

1.80	8/16/2016	12:37:42pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	19	37.163921	-107.320349
3.10	8/16/2016	12:38:35pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	19	37.164064	-107.320339
6.60	8/16/2016	12:39:41pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	19	37.164060	-107.320516
3.30	8/16/2016	12:40:39pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	18	37.163937	-107.320513
5.00	8/16/2016	12:41:40pm	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	700.0	17	37.163774	-107.320493
6.10	8/16/2016	12:42:36pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	500.0	19	37.163651	-107.320494
1.80	8/16/2016	12:43:38pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	200.0	19	37.163660	-107.320642
2.00	8/16/2016	12:44:36pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	18	37.163787	-107.320653
1.70	8/16/2016	12:45:21pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	400.0	15	37.163907	-107.320675
2.70	8/16/2016	12:46:17pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	400.0	18	37.164060	-107.320644
6.10	8/16/2016	12:48:30pm	CHIMNEYROCKMINE_081	20.70	0.0	0.0	0.0	0.0	18	37.163527	-107.320003
6.40	8/16/2016	12:49:29pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	600.0	20	37.163377	-107.319971
4.80	8/16/2016	12:50:29pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	0.0	21	37.163254	-107.319969
6.80	8/16/2016	12:51:46pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	700.0	21	37.163083	-107.319964
6.70	8/16/2016	12:52:37pm	CHIMNEYROCKMINE_081	20.80	0.0	0.0	0.0	400.0	22	37.162967	-107.319975
4.00	8/15/2016	08:49:30am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	8	37.280484	-107.452150
3.60	8/15/2016	08:52:54am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	7	37.280449	-107.452041
6.80	8/15/2016	08:54:34am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	200.0	8	37.280478	-107.451816
6.00	8/15/2016	08:56:40am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	300.0	8	37.280483	-107.451636
6.00	8/15/2016	08:59:15am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	7	37.280469	-107.451443
6.80	8/15/2016	09:01:24am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	6	37.280448	-107.451264
4.60	8/15/2016	09:03:53am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	8	37.280436	-107.451072
5.20	8/15/2016	09:05:49am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	9	37.280378	-107.451070
6.00	8/15/2016	09:07:42am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	9	37.280299	-107.450956
5.90	8/15/2016	09:09:43am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	10	37.280488	-107.450945
4.50	8/15/2016	09:11:29am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	10	37.280475	-107.450798
5.30	8/15/2016	09:13:23am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	10	37.280502	-107.450629
4.10	8/15/2016	09:15:44am	COLUMBINE_081516.cor	20.60	0.0	0.0	0.0	100.0	10	37.280336	-107.450590
4.40	8/15/2016	09:18:20am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	0.0	11	37.280340	-107.450762
3.90	8/15/2016	09:20:18am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	12	37.280223	-107.450926
6.50	8/15/2016	09:23:35am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	100.0	12	37.280356	-107.451283
6.80	8/15/2016	09:26:04am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	0.0	10	37.280361	-107.451404
6.40	8/15/2016	09:28:52am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	100.0	10	37.280354	-107.451615
3.20	8/15/2016	09:30:56am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	400.0	11	37.280360	-107.451808
5.20	8/15/2016	09:33:02am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	10	37.280368	-107.451978
5.30	8/15/2016	09:34:34am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	11	37.280348	-107.452180
5.10	8/15/2016	09:37:17am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	15	37.280248	-107.451755
5.50	8/15/2016	09:38:43am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	14	37.280200	-107.451626
5.30	8/15/2016	09:40:17am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	14	37.280196	-107.451426
3.10	8/15/2016	09:41:54am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	500.0	15	37.280212	-107.451255
5.70	8/15/2016	09:43:59am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	200.0	14	37.280232	-107.451182
5.70	8/15/2016	09:45:52am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	17	37.280099	-107.451136
5.30	8/15/2016	09:47:26am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	13	37.280081	-107.451016
6.80	8/15/2016	09:49:01am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	300.0	15	37.280061	-107.450799
5.70	8/15/2016	09:50:49am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	14	37.280209	-107.450736
2.60	8/15/2016	09:52:57am	COLUMBINE_081516.cor	20.60	0.0	0.0	0.0	100.0	14	37.280212	-107.450540
5.20	8/15/2016	09:56:11am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	300.0	12	37.280049	-107.450585
5.10	8/15/2016	09:57:39am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	0.0	13	37.279969	-107.450560
2.90	8/15/2016	10:01:11am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	0.0	14	37.279784	-107.450610
3.50	8/15/2016	10:03:07am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	100.0	14	37.279741	-107.450564
4.30	8/15/2016	10:06:11am	COLUMBINE_081516.cor	20.60	0.0	0.0	0.0	100.0	14	37.279940	-107.450741
4.40	8/15/2016	10:09:37am	COLUMBINE_081516.cor	20.60	0.0	0.0	0.0	100.0	12	37.279895	-107.450912
6.10	8/15/2016	10:11:21am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	10	37.279909	-107.451035
6.20	8/15/2016	10:13:38am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	400.0	13	37.279939	-107.451227
3.20	8/15/2016	10:15:16am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	11	37.279922	-107.451454
6.10	8/15/2016	10:18:22am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	100.0	12	37.280059	-107.451299
7.00	8/15/2016	10:22:03am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	11	37.280095	-107.451445
6.60	8/15/2016	10:27:44am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	14	37.280069	-107.451610
5.20	8/15/2016	10:30:08am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	500.0	15	37.280065	-107.451810
11.80	8/15/2016	10:31:52am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	15	37.280197	-107.451929
5.10	8/15/2016	10:33:43am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	13	37.280169	-107.452155
2.90	8/15/2016	10:35:42am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	300.0	15	37.280080	-107.452079
6.90	8/15/2016	10:37:17am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	15	37.280046	-107.452006
34.50	8/15/2016	10:39:41am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	15	37.279922	-107.452135
4.40	8/15/2016	10:41:27am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	15	37.279820	-107.452139
4.60	8/15/2016	10:43:29am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	14	37.279789	-107.452007
6.20	8/15/2016	10:45:15am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	15	37.279920	-107.451961
6.40	8/15/2016	10:47:30am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	13	37.279940	-107.451777
5.40	8/15/2016	10:50:08am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	0.0	15	37.279855	-107.451638
6.40	8/15/2016	10:52:10am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	0.0	13	37.279712	-107.451774
3.60	8/15/2016	10:54:22am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	0.0	15	37.279751	-107.451594
7.10	8/15/2016	10:57:27am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	300.0	11	37.279762	-107.451392
3.70	8/15/2016	10:59:54am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	100.0	10	37.279758	-107.451225
5.20	8/15/2016	11:01:36am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	100.0	10	37.279747	-107.451060
3.20	8/15/2016	11:03:37am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	10	37.279780	-107.450876

3.00	8/15/2016	11:05:35am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	10	37.279762	-107.450735
6.20	8/15/2016	11:10:38am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	0.0	10	37.279613	-107.450801
3.60	8/15/2016	11:12:26am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	10	37.279615	-107.450915
6.90	8/15/2016	11:14:27am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	10	37.279521	-107.450867
3.80	8/15/2016	11:17:00am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	12	37.279522	-107.450663
5.10	8/15/2016	11:19:15am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	0.0	14	37.279503	-107.450518
6.80	8/15/2016	11:21:19am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	14	37.279391	-107.450498
4.00	8/15/2016	11:24:28am	COLUMBINE_081516.cor	20.40	0.0	0.0	0.0	100.0	12	37.279299	-107.450513
2.90	8/15/2016	11:27:19am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	100.0	11	37.279229	-107.450696
3.00	8/15/2016	11:29:55am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	13	37.279247	-107.450907
3.30	8/15/2016	11:31:04am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	13	37.279292	-107.451065
2.60	8/15/2016	11:32:45am	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	100.0	12	37.279362	-107.451027
5.80	8/15/2016	11:34:41am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	13	37.279373	-107.450929
5.50	8/15/2016	11:36:47am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	11	37.279430	-107.451081
3.70	8/15/2016	11:38:23am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	12	37.279396	-107.451178
2.80	8/15/2016	11:41:03am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	14	37.279371	-107.451247
5.30	8/15/2016	11:43:10am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	11	37.279418	-107.451119
3.50	8/15/2016	11:45:10am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	13	37.279263	-107.451275
6.80	8/15/2016	11:47:11am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	13	37.279262	-107.451415
5.20	8/15/2016	11:49:10am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	14	37.279378	-107.451384
5.90	8/15/2016	11:51:26am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	500.0	13	37.279243	-107.451516
3.50	8/15/2016	11:53:17am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	14	37.279363	-107.451594
5.00	8/15/2016	11:55:31am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	14	37.279203	-107.451718
6.20	8/15/2016	11:58:06am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	13	37.279217	-107.451907
5.00	8/15/2016	11:59:58am	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	14	37.279328	-107.451697
5.70	8/15/2016	12:02:17pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	14	37.279280	-107.451979
9.90	8/15/2016	12:03:58pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	14	37.279237	-107.452020
5.20	8/15/2016	12:06:09pm	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	0.0	15	37.279385	-107.452073
3.70	8/15/2016	12:07:58pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	300.0	15	37.279502	-107.452112
75.80	8/15/2016	12:09:57pm	COLUMBINE_081516.cor	20.70	0.0	0.0	0.0	100.0	15	37.279474	-107.451974
2.90	8/15/2016	12:11:37pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	15	37.279443	-107.451812
4.60	8/15/2016	12:13:18pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	15	37.279373	-107.451844
6.20	8/15/2016	12:15:43pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	15	37.279495	-107.451624
2.70	8/15/2016	12:17:15pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	15	37.279485	-107.451467
6.20	8/15/2016	12:18:59pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	14	37.279523	-107.451234
6.20	8/15/2016	12:20:29pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	15	37.279591	-107.451161
3.70	8/15/2016	12:22:14pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	0.0	15	37.279632	-107.451248
2.20	8/15/2016	12:24:01pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	14	37.279624	-107.451492
3.90	8/15/2016	12:25:24pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	300.0	14	37.279578	-107.451607
2.70	8/15/2016	12:26:53pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	14	37.279617	-107.451747
4.50	8/15/2016	12:28:36pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	100.0	13	37.279608	-107.452000
3.00	8/15/2016	12:30:08pm	COLUMBINE_081516.cor	20.80	0.0	0.0	0.0	200.0	12	37.279672	-107.452133
5.60	8/17/2016	07:35:50am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	5	37.162638	-107.313431
5.60	8/17/2016	07:37:53am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	5	37.162661	-107.313231
6.40	8/17/2016	07:39:03am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	5	37.162676	-107.313097
4.50	8/17/2016	07:40:27am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	6	37.162648	-107.312983
6.30	8/17/2016	07:42:02am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	500.0	7	37.162629	-107.312804
4.60	8/17/2016	07:43:16am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	200.0	8	37.162670	-107.312609
3.50	8/17/2016	07:44:44am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	8	37.162618	-107.312392
2.90	8/17/2016	07:45:53am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	8	37.162636	-107.312287
6.80	8/17/2016	07:47:11am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	9	37.162637	-107.312125
3.30	8/17/2016	07:48:24am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	9	37.162654	-107.311918
2.20	8/17/2016	07:49:27am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.162806	-107.311918
3.70	8/17/2016	07:50:18am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.162914	-107.311915
3.80	8/17/2016	07:51:14am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163059	-107.311896
2.40	8/17/2016	07:52:08am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	9	37.163194	-107.311906
2.60	8/17/2016	07:53:06am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	9	37.163344	-107.311933
5.90	8/17/2016	07:54:22am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	10	37.163484	-107.311918
3.30	8/17/2016	07:55:19am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	9	37.163638	-107.311927
2.70	8/17/2016	07:56:15am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163765	-107.311917
4.50	8/17/2016	07:57:27am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	9	37.163878	-107.311901
6.30	8/17/2016	07:58:34am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163884	-107.312066
4.40	8/17/2016	07:59:41am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163743	-107.312093
3.00	8/17/2016	08:00:26am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163634	-107.312112
4.90	8/17/2016	08:01:24am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	200.0	10	37.163463	-107.312126
3.10	8/17/2016	08:02:22am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	200.0	9	37.163355	-107.312088
2.70	8/17/2016	08:03:27am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	10	37.163178	-107.312113
4.10	8/17/2016	08:04:26am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163068	-107.312070
2.90	8/17/2016	08:05:35am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.162932	-107.312046
4.90	8/17/2016	08:06:45am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.162768	-107.312095
4.20	8/17/2016	08:07:56am	STOLLSTEIMERCREEKMIN	20.70	0.0	0.0	0.0	300.0	10	37.162730	-107.312255
6.00	8/17/2016	08:09:13am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	400.0	10	37.162886	-107.312196
6.60	8/17/2016	08:10:19am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163040	-107.312217
5.40	8/17/2016	08:11:16am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	200.0	10	37.163174	-107.312270
5.90	8/17/2016	08:12:22am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163345	-107.312243

6.30	8/17/2016	08:13:22am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163467	-107.312286
2.90	8/17/2016	08:14:19am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163601	-107.312267
6.60	8/17/2016	08:14:58am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	200.0	10	37.163739	-107.312238
4.60	8/17/2016	08:15:46am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	10	37.163895	-107.312267
5.80	8/17/2016	08:16:32am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	10	37.163904	-107.312410
2.80	8/17/2016	08:17:26am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	400.0	10	37.163755	-107.312431
6.00	8/17/2016	08:18:13am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163691	-107.312428
6.50	8/17/2016	08:19:03am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	10	37.163619	-107.312443
2.70	8/17/2016	08:20:08am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163537	-107.312427
6.00	8/17/2016	08:21:01am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163473	-107.312423
4.80	8/17/2016	08:21:42am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	10	37.163402	-107.312430
2.50	8/17/2016	08:22:30am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	10	37.163324	-107.312451
4.40	8/17/2016	08:23:21am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	200.0	10	37.163181	-107.312439
6.30	8/17/2016	08:24:17am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	200.0	11	37.163077	-107.312414
6.10	8/17/2016	08:25:53am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	11	37.162916	-107.312432
2.60	8/17/2016	08:27:08am	STOLLSTEIMERCREEKMIN	20.70	0.0	0.0	0.0	400.0	11	37.162772	-107.312424
5.70	8/17/2016	08:28:16am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	9	37.162737	-107.312603
6.10	8/17/2016	08:29:28am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	8	37.162899	-107.312550
4.60	8/17/2016	08:30:43am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	8	37.163041	-107.312550
6.70	8/17/2016	08:31:54am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	9	37.163186	-107.312587
6.70	8/17/2016	08:33:02am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	9	37.163283	-107.312600
6.60	8/17/2016	08:34:10am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	10	37.163443	-107.312616
4.00	8/17/2016	08:34:48am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	11	37.163577	-107.312594
5.80	8/17/2016	08:35:43am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	12	37.163737	-107.312591
4.90	8/17/2016	08:36:47am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	12	37.163889	-107.312619
6.10	8/17/2016	08:37:50am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	500.0	14	37.163856	-107.312764
6.80	8/17/2016	08:39:04am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	13	37.163737	-107.312758
4.10	8/17/2016	08:40:09am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	12	37.163601	-107.312795
3.30	8/17/2016	08:41:18am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	300.0	12	37.163443	-107.312747
3.90	8/17/2016	08:42:09am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	14	37.163346	-107.312835
6.90	8/17/2016	08:43:20am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	13	37.163220	-107.312791
4.70	8/17/2016	08:44:24am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	11	37.163059	-107.312788
3.30	8/17/2016	08:45:38am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	12	37.162868	-107.312749
5.50	8/17/2016	08:46:43am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	13	37.162726	-107.312759
2.50	8/17/2016	08:48:34am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	600.0	12	37.162756	-107.312908
4.70	8/17/2016	08:49:35am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	13	37.162904	-107.312924
3.00	8/17/2016	08:50:40am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	14	37.163045	-107.312947
4.20	8/17/2016	08:51:57am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	13	37.163217	-107.312940
6.70	8/17/2016	08:52:51am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	11	37.163328	-107.312962
4.60	8/17/2016	08:54:01am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	13	37.163486	-107.312946
4.80	8/17/2016	08:55:05am	STOLLSTEIMERCREEKMIN	20.70	0.0	0.0	0.0	300.0	14	37.163612	-107.312963
6.70	8/17/2016	08:56:01am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	14	37.163739	-107.312952
4.20	8/17/2016	08:57:30am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	200.0	14	37.163876	-107.312923
3.70	8/17/2016	08:58:46am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	13	37.163866	-107.313109
5.70	8/17/2016	08:59:53am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	300.0	13	37.163766	-107.313106
4.20	8/17/2016	09:00:47am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	12	37.163630	-107.313148
5.90	8/17/2016	09:01:49am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	14	37.163445	-107.313164
1.80	8/17/2016	09:02:58am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	14	37.163352	-107.313158
2.80	8/17/2016	09:03:52am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	200.0	14	37.163168	-107.313090
3.40	8/17/2016	09:04:47am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	500.0	15	37.163032	-107.313118
6.70	8/17/2016	09:05:58am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	200.0	14	37.162926	-107.313126
4.00	8/17/2016	09:06:54am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	14	37.162763	-107.313120
6.60	8/17/2016	09:08:01am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	12	37.162764	-107.313285
2.80	8/17/2016	09:08:48am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	13	37.162869	-107.313304
2.70	8/17/2016	09:09:53am	STOLLSTEIMERCREEKMIN	20.70	0.0	0.0	0.0	1000.0	13	37.163035	-107.313276
5.30	8/17/2016	09:10:56am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	500.0	13	37.163193	-107.313287
5.20	8/17/2016	09:11:57am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	12	37.163338	-107.313276
5.20	8/17/2016	09:13:05am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	14	37.163438	-107.313334
4.90	8/17/2016	09:14:09am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	12	37.163591	-107.313321
3.40	8/17/2016	09:15:12am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	200.0	12	37.163738	-107.313305
3.00	8/17/2016	09:16:10am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	200.0	13	37.163880	-107.313309
5.70	8/17/2016	09:17:17am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	14	37.163839	-107.313444
3.20	8/17/2016	09:18:36am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	15	37.163729	-107.313472
4.10	8/17/2016	09:20:11am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	14	37.163558	-107.313482
4.90	8/17/2016	09:21:05am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	13	37.163414	-107.313473
1.80	8/17/2016	09:21:47am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	12	37.163335	-107.313492
2.70	8/17/2016	09:22:46am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	14	37.163157	-107.313476
4.60	8/17/2016	09:23:32am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	100.0	14	37.163069	-107.313473
6.40	8/17/2016	09:24:31am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	13	37.162905	-107.313457
2.80	8/17/2016	09:26:10am	STOLLSTEIMERCREEKMIN	20.80	0.0	0.0	0.0	0.0	12	37.162795	-107.313460

**APPENDIX E**  
**NATURAL SPRINGS LABORATORY ANALYTICAL REPORTS**



		<b>Four Corners Geoscience, Inc.</b>			
		<b>P.O. Box 4224</b>			
		<b>Durango, CO 81302</b>			
		<b>Methane Analysis Report</b>			
<b>Client</b>					
<b>L T Environmental, Inc.</b>					
<b>848 East 2nd Avenue</b>					
<b>Durango, CO 81301</b>					
<b>Project</b>	<b>Manager</b>				
Devin	Hencmann				
<b>Project Name:</b>	Archuleta Springs				
<b>Project Number</b>	19116001				
<b>Report Date:</b>	5/31/2016				
<b>Sampled By:</b>	Josh Adams				
	Michael Wicker				
				<b>Results:</b>	
<b>FCGeo #</b>	<b>Sample Date</b>	<b>Sample Time</b>	<b>Site ID-Location</b>	<b>CH4</b>	<b>Limit</b>
		<i>(Hrs)</i>		<i>(mg/L)</i>	<i>(mg/L)</i>
052316-L1	5/23/2016	11:30	Corrigan Spring	<0.02	0.02
052316-L2	5/23/2016	14:00	Section 14 Reich Sprin	<0.02	0.02
052316-LB1	5/23/2016	NA	LAB BLANK	<0.02	0.02
052316-LB2	5/23/2016	NA	LAB BLANK	<0.02	0.02
<i>Samples delivered to FCGeo by LTE Geologist-analysis by Lynn Fechter</i>					
<i>Analyses conducted-SRI gas chromatograph within 24 hours of delivery.</i>					
<i>Conducted Methane analysis per protocol and method established</i>					
<i>by BLM San Juan Resource Area 1993 and USGS method.</i>					
<i>Laboratory calibration quality control conducted for project.</i>					
<i>Lab blanks-(duplicates run if received from techs)</i>					
	<b>Analyst</b>	Lynn M. Fechter, B.S. Geology			







		<b>Four Corners Geoscience, Inc.</b>			
		P.O. Box 4224			
		Durango, CO 81302			
		<b>Methane Analysis Report</b>			
<b>Client</b>					
<b>L T Environmental, Inc.</b>					
848 East 2nd Avenue					
Durango, CO 81301					
<b>Project</b>	<b>Manager</b>				
Devin	Hencmann				
<b>Project Name:</b>	Archuleta				
<b>Project Number</b>	19116001				
<b>Report Date</b>	5/30/2016				
<b>Sampled By:</b>	Josh Adams				
<b>Analysis:</b>	Lynn Fechter			<b>Results:</b>	
<b>FCGeo #</b>	<b>Sample Date</b>	<b>Sample Time</b>	<b>Site ID-Location</b>	<b>CH4</b>	<b>Limit</b>
		<b>(Hrs)</b>		<b>(mg/L)</b>	<b>(mg/L)</b>
052516-L1	5/25/2016	12:15	Gov 2	<0.02	0.02
052516-L2	5/25/2016	14:40	Munger 2	<0.02	0.02
052516-L3	5/25/2016	15:10	Munger 1	<0.02	0.02
052516-LB1	5/25/2016	NA	LAB BLANK	<0.02	0.02
052516-LB2	5/25/2016	NA	LAB BLANK	<0.02	0.02
052516-LB3	5/25/2016	NA	LAB BLANK	<0.02	0.02
<i>Samples delivered to FCGeo by LTE Geologist-analysis by Lynn Fechter</i>					
<i>Analyses conducted-SRI gas chromatograph within 24 hours of delivery.</i>					
<i>Conducted Methane analysis per protocol and method established</i>					
<i>by BLM San Juan Resource Area 1993 and USGS method.</i>					
<i>Laboratory calibration quality control conducted for project.</i>					
<i>Lab blanks-(duplicates run if received from techs)</i>					
		Lynn M. Fechter, B.S. Geology			

P O Box 4224  
 Durango, CO 81301

Phone: 970-247-5046  
 www.fogeo.com

Client: LT Environmental  
 Contact: Devin Herzmann  
 Address: 848 E 2nd Ave  
 City: Durango  
 State: CO Zip: 81301  
 Phone: 970-385-1096  
 Email: dherzmanna@ltenv.com  
 Fax: \_\_\_\_\_

Project Name	Archuleta
Project #	05216502
Collector's Name	Josh Adams
Matrix	Check One
Groundwater	<input type="checkbox"/>
Surface Water	<input checked="" type="checkbox"/>
Domestic Well	<input type="checkbox"/>
Other	<input type="checkbox"/>

Sample Identification	Date	Time	Matrix	# of Containers	Preservatives	ANALYSIS REQUIRED						COMMENTS
						Dissolved	Metane					
1. G012	5/25/16	1215	SW	3	NA	X						FCG #
2. Munger 2		1440	SW	3	NA	X						052516-L2
3. Munger 1		1510	SW	3	NA	X						052516-L3
4.												
5.												
6.												
7.												

Chain of Custody Record  
 Relinquished by: Devin Herzmann  
 Received by: \_\_\_\_\_  
 Relinquished by: \_\_\_\_\_  
 Received by: \_\_\_\_\_  
 Company: LT env.  
 Date: 5/25/16  
 Time: 1552

		<b>Four Corners Geoscience, Inc.</b>			
		<b>P.O. Box 4224</b>			
		<b>Durango, CO 81302</b>			
		<b>Methane Analysis Report</b>			
<b>Client</b>					
<b>L T Environmental, Inc.</b>					
<b>848 East 2nd Avenue</b>					
<b>Durango, CO 81301</b>					
<b>Project</b>	<b>Manager</b>				
Devin	Hencmann				
<b>Project Name:</b>	Archuleta	Springs			
<b>Project Number</b>	19116001				
<b>Report Date:</b>	5/31/2016				
<b>Sampled By:</b>	Josh Adams				
<b>Sampled By:</b>					
<b>Analysis:</b>	Lynn Fechter			<b>Results:</b>	
<b>FCGeo #</b>	<b>Sample Date</b>	<b>Sample Time</b>	<b>Site ID-Location</b>	<b>CH4</b>	<b>Limit</b>
		<b>(Hrs)</b>		<b>(mg/L)</b>	<b>(mg/L)</b>
051916-L1	5/19/2016	11:45	Thick Spring	<0.02	0.02
051916-L2	5/19/2016	12:55	Walt Spring	<0.02	0.02
051916-LB1	5/19/2016	NA	LAB BLANK	<0.02	0.02
051916-LB2	5/19/2016	NA	LAB BLANK	<0.02	0.02
<i>Samples delivered to FCGEO by LTE Geologist-analysis by Lynn Fechter</i>					
<i>Analyses conducted-SRI gas chromatograph within 24 hours of delivery.</i>					
<i>Conducted Methane analysis per protocol and method established</i>					
<i>by BLM San Juan Resource Area 1993 and USGS method.</i>					
<i>Laboratory calibration quality control conducted for project.</i>					
<i>Lab blanks-(duplicates runs if received from techs)</i>					
		Lynn M. Fechter, B.S. Geology			

P O Box 4224

Durango, CO 81301

Client: LT Environmental

Contact: Devin Hergmann

Address: 848 E. 2<sup>nd</sup> Ave.

City: Durango

State: Colorado Zip: 81301

Phone: 970-385-1696

Email: dhermann@ltenv.com

Fax: \_\_\_\_\_

Phone: 970-247-5046  
www.lfgeo.com

Project Name	<u>Archuleta Springs</u>
Project #	<u>05216002</u>
Collector's Name	<u>Josh Adams</u>
Matrix	Check One
Groundwater	GW
Surface Water	SW <input checked="" type="checkbox"/>
Domestic Well	DW
Other	

Sample Identification	Date	Time	Matrix	# of Containers	Preservatives	ANALYSIS REQUIRED				COMMENTS
						Dissolved Methane				
1. <u>Thick Spring</u>	<u>5-19-16</u>	<u>1145</u>	<u>Surface H<sub>2</sub>O</u>	<u>3</u>	<u>none</u>	<input checked="" type="checkbox"/>				<u>051916-21</u>
2. <u>Walt Spring</u>	<u>5-19-16</u>	<u>1255</u>	<u>Surface H<sub>2</sub>O</u>	<u>3</u>	<u>none</u>	<input checked="" type="checkbox"/>				<u>051916-22</u>
3.										
4.										
5.										
6.										
7.										

Chain of Custody Record Signature

Company

Date

Time

Relinquished by:

LT Environmental

5-19-2016

2:20pm

Received by:

*[Signature]*

FCG ea

5-19-2016

2:20pm

Relinquished by:

Received by:



75 Suttle Street  
Durango, CO 81303  
970.247.4220 Phone  
970.247.4227 Fax  
[www.greenanalytical.com](http://www.greenanalytical.com)

18 August 2016

Devin Hencmann  
LT Environmental  
848 E 2nd Ave  
Durango, CO 81301  
RE: Archuleta County

Enclosed are the results of analyses for samples received by the laboratory on 08/09/16 16:00.  
If you need any further assistance, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Debbie Zufelt". The signature is written in a cursive, flowing style.

Debbie Zufelt  
Reports Manager

All accredited analytes contained in this report are denoted by an asterisk (\*). For a complete list of accredited analytes please do not hesitate to contact us via any of the contact information contained in this report. All of our certifications can be viewed at <http://greenanalytical.com/certifications/>

Green Analytical Laboratories is NELAP accredited through the Texas Commission on Environmental Quality. Accreditation applies to drinking water and non-potable water matrices for trace metals and a variety of inorganic parameters. Green Analytical Laboratories is also accredited through the Colorado Department of Public Health and Environment and EPA region 8 for trace metals, Cyanide, Fluoride, Nitrate, and Nitrite in drinking water.

Our affiliate laboratory, Cardinal Laboratories, is also NELAP accredited through the Texas Commission on Environmental Quality for a variety of organic constituents in drinking water, non-potable water and solid matrices. Cardinal is also accredited for regulated VOCs, TTHM, and HAA-5 in drinking water through the Colorado Department of Public Health and Environment and EPA region 8.



LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta County Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	<b>Reported:</b> 08/18/16 13:20
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**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Spring 3424	1608091-01	Water	08/09/16 12:00	08/09/16 16:00

Green Analytical Laboratories

Debbie Zufelt, Reports Manager

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta County Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 08/18/16 13:20
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**Spring 3424**

**1608091-01 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	300	10.0		mg/L	10	08/10/16	2320 B		KDG
Alkalinity, Carbonate*	<10.0	10.0		mg/L	10	08/10/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	10	08/10/16	2320 B		KDG
Alkalinity, Total*	300	10.0		mg/L	10	08/10/16	2320 B		KDG
Bromide	0.170	0.100	0.00845	mg/L	1	08/10/16	EPA300.0		JDA
Chloride	2.87	1.00	0.0519	mg/L	1	08/10/16	EPA300.0		JDA
Conductivity*	702	10.0		uS/cm	1	08/10/16	2510 B		KDG
Fluoride*	0.373	0.100	0.00763	mg/L	1	08/10/16	EPA300.0		JDA
Nitrate/Nitrite as N*	0.042	0.020	0.011	mg/L	1	08/15/16	EPA353.2		JDA
pH*	6.85			pH Units	1	08/10/16	EPA150.1		KDG
Total Dissolved Solids	565	10.0		mg/L	1	08/11/16	EPA160.1		KDG
Sulfate	224	10.0	0.615	mg/L	10	08/11/16	EPA300.0		JDA

**Dissolved Metals by ICP**

Calcium*	109	0.050	0.003	mg/L	1	08/16/16	EPA200.7		ICP
Iron*	0.239	0.050	0.003	mg/L	1	08/16/16	EPA200.7		ICP
Magnesium*	42.8	0.100	0.032	mg/L	1	08/16/16	EPA200.7		ICP
Potassium*	2.57	1.00	0.335	mg/L	1	08/16/16	EPA200.7		ICP
Sodium*	24.8	1.00	0.305	mg/L	1	08/16/16	EPA200.7		ICP

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Debbie Zufelt, Reports Manager

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta County Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 08/18/16 13:20
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**General Chemistry - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B608092 - General Prep - Wet Chem**

<b>Blank (B608092-BLK1)</b>		Prepared & Analyzed: 08/10/16								
Bromide	ND	0.100	mg/L							
<b>LCS (B608092-BS1)</b>		Prepared & Analyzed: 08/10/16								
Bromide	2.52	0.100	mg/L	2.50		101	90-110			
<b>LCS Dup (B608092-BSD1)</b>		Prepared & Analyzed: 08/10/16								
Bromide	2.54	0.100	mg/L	2.50		102	90-110	0.829	20	

**Batch B608093 - General Prep - Wet Chem**

<b>Blank (B608093-BLK1)</b>		Prepared & Analyzed: 08/10/16								
Chloride	ND	1.00	mg/L							
Fluoride	ND	0.100	mg/L							
Sulfate	ND	1.00	mg/L							
<b>LCS (B608093-BS1)</b>		Prepared & Analyzed: 08/10/16								
Chloride	24.0	1.00	mg/L	25.0		96.1	90-110			
Fluoride	2.45	0.100	mg/L	2.50		98.1	90-110			
Sulfate	24.2	1.00	mg/L	25.0		96.7	90-110			
<b>LCS Dup (B608093-BSD1)</b>		Prepared & Analyzed: 08/10/16								
Chloride	23.9	1.00	mg/L	25.0		95.5	90-110	0.576	20	
Fluoride	2.45	0.100	mg/L	2.50		98.0	90-110	0.122	20	
Sulfate	24.0	1.00	mg/L	25.0		96.1	90-110	0.693	20	

**Batch B608106 - General Prep - Wet Chem**

<b>Duplicate (B608106-DUP1)</b>		<b>Source: 1608091-01</b>		Prepared & Analyzed: 08/10/16						
pH	6.93		pH Units	6.85				1.16	20	
<b>Reference (B608106-SRM1)</b>		Prepared & Analyzed: 08/10/16								
pH	8.98		pH Units	9.08		98.9	7.807-102.19			

**Batch B608107 - General Prep - Wet Chem**

<b>Duplicate (B608107-DUP1)</b>		<b>Source: 1608091-01</b>		Prepared & Analyzed: 08/10/16						
Conductivity	695	10.0	uS/cm	702				1.00	20	
<b>Reference (B608107-SRM1)</b>		Prepared & Analyzed: 08/10/16								
Conductivity	533		uS/cm	486		110	90-110			

**Batch B608108 - General Prep - Wet Chem**

<b>Blank (B608108-BLK1)</b>		Prepared & Analyzed: 08/10/16								
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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta County Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 08/18/16 13:20
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**General Chemistry - Quality Control  
(Continued)**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B608108 - General Prep - Wet Chem (Continued)**

**Blank (B608108-BLK1) (Continued)**

Prepared & Analyzed: 08/10/16

Alkalinity, Total	ND	10.0	mg/L							
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**LCS (B608108-BS1)**

Prepared & Analyzed: 08/10/16

Alkalinity, Total	106	10.0	mg/L	100		106	85-115			
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**LCS Dup (B608108-BSD1)**

Prepared & Analyzed: 08/10/16

Alkalinity, Total	106	10.0	mg/L	100		106	85-115	0.00	20	
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**Batch B608114 - General Prep - Wet Chem**

**Blank (B608114-BLK1)**

Prepared & Analyzed: 08/11/16

Total Dissolved Solids	ND	10.0	mg/L							
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**Duplicate (B608114-DUP1)**

Source: 1608091-01 Prepared & Analyzed: 08/11/16

Total Dissolved Solids	560	10.0	mg/L		565			0.889	20	
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**Reference (B608114-SRM1)**

Prepared & Analyzed: 08/11/16

Total Dissolved Solids	385	10.0	mg/L	400		96.3	85-115			
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**Batch B608128 - General Prep - Wet Chem**

**Blank (B608128-BLK1)**

Prepared & Analyzed: 08/15/16

Nitrate/Nitrite as N	ND	0.020	mg/L							
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**LCS (B608128-BS1)**

Prepared & Analyzed: 08/15/16

Nitrate/Nitrite as N	1.01	0.020	mg/L	1.00		101	90-110			
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**LCS Dup (B608128-BSD1)**

Prepared & Analyzed: 08/15/16

Nitrate/Nitrite as N	1.01	0.020	mg/L	1.00		101	90-110	0.198	20	
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Debbie Zufelt, Reports Manager

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta County Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 08/18/16 13:20
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**Dissolved Metals by ICP - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B608133 - Dissolved Metals, E200.7/E200.8**

**Blank (B608133-BLK1)**

Prepared & Analyzed: 08/16/16

Calcium	ND	0.050	mg/L							
Iron	ND	0.050	mg/L							
Magnesium	ND	0.100	mg/L							
Potassium	ND	1.00	mg/L							
Sodium	ND	1.00	mg/L							

**LCS (B608133-BS1)**

Prepared & Analyzed: 08/16/16

Calcium	5.07	0.050	mg/L	5.00		101	85-115			
Iron	5.11	0.050	mg/L	5.00		102	85-115			
Magnesium	25.0	0.100	mg/L	25.0		100	85-115			
Potassium	9.89	1.00	mg/L	10.0		98.9	85-115			
Sodium	8.07	1.00	mg/L	8.10		99.7	85-115			

**LCS Dup (B608133-BSD1)**

Prepared & Analyzed: 08/16/16

Calcium	4.99	0.050	mg/L	5.00		99.9	85-115	1.60	20	
Iron	5.06	0.050	mg/L	5.00		101	85-115	0.881	20	
Magnesium	24.7	0.100	mg/L	25.0		98.6	85-115	1.47	20	
Potassium	9.79	1.00	mg/L	10.0		97.9	85-115	0.983	20	
Sodium	8.02	1.00	mg/L	8.10		99.0	85-115	0.628	20	

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LT Environmental  
848 E 2nd Ave  
Durango CO, 81301

Project: Archuleta County  
Project Name / Number: Archuleta Springs  
Project Manager: Devin Hencmann

Reported:  
08/18/16 13:20

Notes and Definitions

- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis  
\*Results reported on as received basis unless designated as dry.
- RPD Relative Percent Difference
- LCS Laboratory Control Sample (Blank Spike)
- RL Report Limit
- MDL Method Detection Limit

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Debbie Zufelt, Reports Manager

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## Project Information

### LT Environmental

848 E 2nd Ave  
Durango, CO 81301

Laboratory PM: **Debbie Zufelt**

Phone: (970) 385-1096

Fax: -

LTE

5/16/2016

---

<b>Project Name:</b>	Archuleta Springs	<b>Invoice To:</b>	LT Environmental
<b>Project Number:</b>	[none]	<b>Invoice Bid:</b>	(list pricing)
<b>Client PM:</b>	Devin Hencmann	<b>Invoice Manager:</b>	Devin Hencmann

**Comments:**

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Analysis	Comment
Alkalinity, Bicarbonate	
Alkalinity, Carbonate	
Alkalinity, Hydroxide	
Alkalinity, Total	
Bromide	
Calcium Dissolved by ICP	
Chloride	
Conductivity	
Fluoride	
Iron Dissolved by ICP	
Magnesium Dissolved by ICP	
Nitrate/Nitrite as N	
pH	
Potassium Dissolved by ICP	
Sodium Dissolved by ICP	
Solids, Total Dissolved (TDS)	
Sulfate	

---



75 Suttle Street  
Durango, CO 81303  
970.247.4220 Phone  
970.247.4227 Fax  
[www.greenanalytical.com](http://www.greenanalytical.com)

08 June 2016

Devin Hencmann  
LT Environmental  
848 E 2nd Ave  
Durango, CO 81301  
RE: Archuleta Springs

Enclosed are the results of analyses for samples received by the laboratory on 05/25/16 16:20.  
If you need any further assistance, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Debbie Zufelt". The signature is written in a cursive, flowing style.

Debbie Zufelt  
Reports Manager

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Project Manager: Devin Hencmann	Reported: 06/08/16 14:06
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**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
GOV 2	1605269-01	Water	05/25/16 12:15	05/25/16 16:20
Munger 2	1605269-02	Water	05/25/16 14:40	05/25/16 16:20
Munger 1	1605269-03	Water	05/25/16 15:10	05/25/16 16:20

Green Analytical Laboratories

Debbie Zufelt, Reports Manager

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Project Manager: Devin Hencmann	Reported: 06/08/16 14:06
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**GOV 2**

**1605269-01 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	195	10.0		mg/L	1	06/06/16	2320 B		KDG
Alkalinity, Carbonate*	20.0	10.0		mg/L	1	06/06/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	1	06/06/16	2320 B		KDG
Alkalinity, Total*	215	10.0		mg/L	1	06/06/16	2320 B		KDG
Bromide	<0.100	0.100	0.00845	mg/L	1	05/26/16	EPA300.0		JDA
Chloride	1.39	1.00	0.0519	mg/L	1	05/30/16	EPA300.0		JDA
Conductivity*	584	10.0		uS/cm	1	05/31/16	2510 B		KDG
Fluoride*	0.269	0.100	0.00763	mg/L	1	05/30/16	EPA300.0		JDA
Nitrate/Nitrite as N*	<0.020	0.020	0.011	mg/L	1	05/30/16	EPA353.2		JDA
pH*	7.34			pH Units	1	05/31/16	EPA150.1	H4	KDG
Total Dissolved Solids	340	10.0		mg/L	1	06/03/16	EPA160.1		KDG
Sulfate	84.0	5.00	0.307	mg/L	5	05/30/16	EPA300.0		JDA

**Dissolved Metals by ICP**

Calcium*	72.8	0.020	0.003	mg/L	1	06/07/16	EPA200.7		JLM
Iron*	<0.050	0.050	0.003	mg/L	1	06/07/16	EPA200.7		JLM
Magnesium*	20.0	0.100	0.032	mg/L	1	06/07/16	EPA200.7		JLM
Potassium*	1.23	1.00	0.335	mg/L	1	06/07/16	EPA200.7		JLM
Sodium*	14.1	1.00	0.305	mg/L	1	06/07/16	EPA200.7		JLM

Green Analytical Laboratories

Debbie Zufelt, Reports Manager

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Project Manager: Devin Hencmann	Reported: 06/08/16 14:06
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**Munger 2**

**1605269-02 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	190	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Carbonate*	<10.0	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Total*	190	10.0		mg/L	10	06/06/16	2320 B		KDG
Bromide	0.218	0.100	0.00845	mg/L	1	05/26/16	EPA300.0		JDA
Chloride	16.9	1.00	0.0519	mg/L	1	05/30/16	EPA300.0		JDA
Conductivity*	410	10.0		uS/cm	1	05/31/16	2510 B		KDG
Fluoride*	0.193	0.100	0.00763	mg/L	1	05/30/16	EPA300.0		JDA
Nitrate/Nitrite as N*	0.027	0.020	0.011	mg/L	1	05/30/16	EPA353.2		JDA
pH*	7.01			pH Units	1	05/31/16	EPA150.1	H4	KDG
Total Dissolved Solids	225	10.0		mg/L	1	06/03/16	EPA160.1		KDG
Sulfate	15.4	1.00	0.0615	mg/L	1	05/30/16	EPA300.0		JDA

**Dissolved Metals by ICP**

Calcium*	48.6	0.020	0.003	mg/L	1	06/07/16	EPA200.7		JLM
Iron*	0.081	0.050	0.003	mg/L	1	06/07/16	EPA200.7		JLM
Magnesium*	8.77	0.100	0.032	mg/L	1	06/07/16	EPA200.7		JLM
Potassium*	1.87	1.00	0.335	mg/L	1	06/07/16	EPA200.7		JLM
Sodium*	18.8	1.00	0.305	mg/L	1	06/07/16	EPA200.7		JLM

Green Analytical Laboratories

Debbie Zufelt, Reports Manager

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Project Manager: Devin Hencmann	Reported: 06/08/16 14:06
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**Munger 1**

**1605269-03 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	190	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Carbonate*	<10.0	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Total*	190	10.0		mg/L	10	06/06/16	2320 B		KDG
Bromide	0.861	0.100	0.00845	mg/L	1	05/26/16	EPA300.0		JDA
Chloride	64.2	5.00	0.260	mg/L	5	05/30/16	EPA300.0		JDA
Conductivity*	606	10.0		uS/cm	1	05/31/16	2510 B		KDG
Fluoride*	0.148	0.100	0.00763	mg/L	1	05/30/16	EPA300.0		JDA
Nitrate/Nitrite as N*	0.251	0.020	0.011	mg/L	1	05/30/16	EPA353.2		JDA
pH*	6.99			pH Units	1	05/31/16	EPA150.1	H4	KDG
Total Dissolved Solids	340	10.0		mg/L	1	06/03/16	EPA160.1		KDG
Sulfate	26.0	1.00	0.0615	mg/L	1	05/30/16	EPA300.0		JDA

**Dissolved Metals by ICP**

Calcium*	70.2	0.020	0.003	mg/L	1	06/07/16	EPA200.7		JLM
Iron*	<0.050	0.050	0.003	mg/L	1	06/07/16	EPA200.7		JLM
Magnesium*	13.9	0.100	0.032	mg/L	1	06/07/16	EPA200.7		JLM
Potassium*	2.24	1.00	0.335	mg/L	1	06/07/16	EPA200.7		JLM
Sodium*	21.3	1.00	0.305	mg/L	1	06/07/16	EPA200.7		JLM

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Project Manager: Devin Hencmann	Reported: 06/08/16 14:06
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**General Chemistry - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B605232 - General Prep - Wet Chem**

<b>Blank (B605232-BLK1)</b>		Prepared: 05/25/16 Analyzed: 05/26/16								
Bromide	ND	0.100	mg/L							
<b>LCS (B605232-BS1)</b>		Prepared: 05/25/16 Analyzed: 05/26/16								
Bromide	2.48	0.100	mg/L	2.50		99.4	90-110			
<b>LCS Dup (B605232-BSD1)</b>		Prepared: 05/25/16 Analyzed: 05/26/16								
Bromide	2.47	0.100	mg/L	2.50		98.9	90-110	0.484	20	

**Batch B605274 - General Prep - Wet Chem**

<b>Blank (B605274-BLK1)</b>		Prepared & Analyzed: 05/29/16								
Chloride	ND	1.00	mg/L							
Fluoride	ND	0.100	mg/L							
Sulfate	ND	1.00	mg/L							
<b>LCS (B605274-BS1)</b>		Prepared & Analyzed: 05/29/16								
Chloride	23.9	1.00	mg/L	25.0		95.8	90-110			
Fluoride	2.43	0.100	mg/L	2.50		97.2	90-110			
Sulfate	24.3	1.00	mg/L	25.0		97.1	90-110			
<b>LCS Dup (B605274-BSD1)</b>		Prepared & Analyzed: 05/29/16								
Chloride	23.5	1.00	mg/L	25.0		93.9	90-110	1.92	20	
Fluoride	2.39	0.100	mg/L	2.50		95.4	90-110	1.83	20	
Sulfate	23.8	1.00	mg/L	25.0		95.2	90-110	1.93	20	

**Batch B605279 - General Prep - Wet Chem**

<b>Blank (B605279-BLK1)</b>		Prepared & Analyzed: 05/30/16								
Nitrate/Nitrite as N	ND	0.020	mg/L							
<b>LCS (B605279-BS1)</b>		Prepared & Analyzed: 05/30/16								
Nitrate/Nitrite as N	0.964	0.020	mg/L	1.00		96.4	90-110			
<b>LCS Dup (B605279-BSD1)</b>		Prepared & Analyzed: 05/30/16								
Nitrate/Nitrite as N	0.966	0.020	mg/L	1.00		96.6	90-110	0.197	20	

**Batch B606002 - General Prep - Wet Chem**

<b>Blank (B606002-BLK1)</b>		Prepared: 06/01/16 Analyzed: 06/03/16								
Total Dissolved Solids	ND	10.0	mg/L							
<b>Duplicate (B606002-DUP1)</b>		Source: 1605223-02 Prepared: 06/01/16 Analyzed: 06/03/16								
Total Dissolved Solids	125	10.0	mg/L		135			7.69	20	

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Project Manager: Devin Hencmann	Reported: 06/08/16 14:06
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**General Chemistry - Quality Control  
(Continued)**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B606002 - General Prep - Wet Chem (Continued)**

<b>Reference (B606002-SRM1)</b>				Prepared: 06/01/16 Analyzed: 06/03/16						
Total Dissolved Solids	385	10.0	mg/L	400		96.3	85-115			

**Batch B606013 - General Prep - Wet Chem**

<b>Duplicate (B606013-DUP1)</b>		<b>Source: 1605269-01</b>		Prepared & Analyzed: 05/31/16						
pH	7.36		pH Units		7.34			0.272	20	

<b>Reference (B606013-SRM1)</b>				Prepared & Analyzed: 05/31/16						
pH	9.02		pH Units	9.13		98.8	7.807-102.19			

**Batch B606019 - General Prep - Wet Chem**

<b>Duplicate (B606019-DUP1)</b>		<b>Source: 1605269-01</b>		Prepared & Analyzed: 05/31/16						
Conductivity	585	10.0	uS/cm		584			0.171	20	

<b>Reference (B606019-SRM1)</b>				Prepared & Analyzed: 05/31/16						
Conductivity	585		uS/cm	543		108	90-110			

**Batch B606060 - General Prep - Wet Chem**

<b>Blank (B606060-BLK1)</b>				Prepared & Analyzed: 06/06/16						
Alkalinity, Total	ND	10.0	mg/L							

<b>LCS (B606060-BS1)</b>				Prepared & Analyzed: 06/06/16						
Alkalinity, Total	106	10.0	mg/L	100		106	85-115			

<b>LCS Dup (B606060-BSD1)</b>				Prepared & Analyzed: 06/06/16						
Alkalinity, Total	107	10.0	mg/L	100		107	85-115	0.939	20	

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Project Manager: Devin Hencmann	Reported: 06/08/16 14:06
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**Dissolved Metals by ICP - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B606067 - Dissolved Metals, E200.7/E200.8**

**Blank (B606067-BLK1)**

Prepared & Analyzed: 06/07/16

Calcium	0.022	0.020	mg/L							B1
Iron	ND	0.050	mg/L							
Magnesium	ND	0.100	mg/L							
Potassium	ND	1.00	mg/L							
Sodium	ND	1.00	mg/L							

**LCS (B606067-BS1)**

Prepared & Analyzed: 06/07/16

Calcium	4.87	0.020	mg/L	5.00		97.4	85-115			
Iron	4.93	0.050	mg/L	5.00		98.5	85-115			
Magnesium	24.0	0.100	mg/L	25.0		95.9	85-115			
Potassium	9.71	1.00	mg/L	10.0		97.1	85-115			
Sodium	7.97	1.00	mg/L	8.10		98.4	85-115			

**LCS Dup (B606067-BSD1)**

Prepared & Analyzed: 06/07/16

Calcium	4.70	0.020	mg/L	5.00		94.0	85-115	3.54	20	
Iron	4.83	0.050	mg/L	5.00		96.6	85-115	2.01	20	
Magnesium	23.3	0.100	mg/L	25.0		93.2	85-115	2.82	20	
Potassium	9.45	1.00	mg/L	10.0		94.5	85-115	2.71	20	
Sodium	7.78	1.00	mg/L	8.10		96.0	85-115	2.40	20	

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Project Manager: Devin Hencmann	Reported: 06/08/16 14:06
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Notes and Definitions

- H4 pH analysis performed more than 48 hours after sampling.
- B1 Target analyte detected in method blank at or above method reporting limit. Sample concentration found to be 10 times above the concentration found in the method blank or less than the reporting limit.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis  
\*Results reported on as received basis unless designated as dry.
- RPD Relative Percent Difference
- LCS Laboratory Control Sample (Blank Spike)
- RL Report Limit
- MDL Method Detection Limit

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## Project Information

### LT Environmental

848 E 2nd Ave  
Durango, CO 81301

Phone: (970) 385-1096

LTE

5/16/2016

Laboratory PM: **Debbie Zufelt**

Fax: -

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<b>Project Name:</b>	Archuletta Springs	<b>Invoice To:</b>	LT Environmental
<b>Project Number:</b>	[none]	<b>Invoice Bid:</b>	(list pricing)
<b>Client PM:</b>	Devin Henemann	<b>Invoice Manager:</b>	Devin Henemann

**Comments:**

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Analysis	Comment
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Alkalinity, Bicarbonate

Alkalinity, Carbonate

Alkalinity, Hydroxide

Alkalinity, Total

Bromide

Calcium Dissolved by ICP

Chloride

Conductivity

Fluoride

Iron Dissolved by ICP

Magnesium Dissolved by ICP

Nitrate/Nitrite as N

pH

Potassium Dissolved by ICP

Sodium Dissolved by ICP

Solids, Total Dissolved (TDS)

Sulfate

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08 June 2016

Devin Hencmann  
LT Environmental  
848 E 2nd Ave  
Durango, CO 81301  
RE: Archuleta Springs

Enclosed are the results of analyses for samples received by the laboratory on 05/24/16 16:05.  
If you need any further assistance, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Debbie Zufelt". The signature is written in a cursive, flowing style.

Debbie Zufelt  
Reports Manager

All accredited analytes contained in this report are denoted by an asterisk (\*). For a complete list of accredited analytes please do not hesitate to contact us via any of the contact information contained in this report. All of our certifications can be viewed at <http://greenanalytical.com/certifications/>

Green Analytical Laboratories is NELAP accredited through the Texas Commission on Environmental Quality. Accreditation applies to drinking water and non-potable water matrices for trace metals and a variety of inorganic parameters. Green Analytical Laboratories is also accredited through the Colorado Department of Public Health and Environment and EPA region 8 for trace metals, Cyanide, Fluoride, Nitrate, and Nitrite in drinking water.

Our affiliate laboratory, Cardinal Laboratories, is also NELAP accredited through the Texas Commission on Environmental Quality for a variety of organic constituents in drinking water, non-potable water and solid matrices. Cardinal is also accredited for regulated VOCs, TTHM, and HAA-5 in drinking water through the Colorado Department of Public Health and Environment and EPA region 8.



LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 06/08/16 14:43
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**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Grassy Spring	1605254-01	Water	05/24/16 10:45	05/24/16 16:05
Watson Well Spring	1605254-02	Water	05/24/16 11:15	05/24/16 16:05
Crain Spring	1605254-03	Water	05/24/16 12:00	05/24/16 16:05
Vance 1 Spring	1605254-04	Water	05/24/16 13:30	05/24/16 16:05
Vance 2 Spring	1605254-05	Water	05/24/16 14:30	05/24/16 16:05

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 06/08/16 14:43
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**Grassy Spring**

**1605254-01 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	300	10.0		mg/L	10	06/03/16	2320 B		KDG
Alkalinity, Carbonate*	<10.0	10.0		mg/L	10	06/03/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	10	06/03/16	2320 B		KDG
Alkalinity, Total*	300	10.0		mg/L	10	06/03/16	2320 B		KDG
Bromide	<0.100	0.100	0.00845	mg/L	1	05/26/16	EPA300.0		JDA
Chloride	2.17	1.00	0.0519	mg/L	1	05/29/16	EPA300.0		JDA
Conductivity*	754	10.0		uS/cm	1	05/26/16	2510 B		KDG
Fluoride*	0.242	0.100	0.00763	mg/L	1	05/29/16	EPA300.0		JDA
Nitrate/Nitrite as N*	0.121	0.020	0.011	mg/L	1	05/30/16	EPA353.2		JDA
pH*	7.02			pH Units	1	05/26/16	EPA150.1	H4	KDG
Total Dissolved Solids	450	10.0		mg/L	1	06/01/16	EPA160.1		KDG
Sulfate	129	5.00	0.307	mg/L	5	05/30/16	EPA300.0	M5	JDA

**Dissolved Metals by ICP**

Calcium*	96.3	0.100	0.014	mg/L	5	05/31/16	EPA200.7		LLG
Iron*	<0.250	0.250	0.017	mg/L	5	05/31/16	EPA200.7		LLG
Magnesium*	27.5	0.500	0.162	mg/L	5	05/31/16	EPA200.7		LLG
Potassium*	<5.00	5.00	1.67	mg/L	5	05/31/16	EPA200.7		LLG
Sodium*	23.3	5.00	1.53	mg/L	5	05/31/16	EPA200.7		LLG

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**Watson Well Spring**

**1605254-02 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	380	10.0		mg/L	10	06/03/16	2320 B		KDG
Alkalinity, Carbonate*	40.0	10.0		mg/L	10	06/03/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	10	06/03/16	2320 B		KDG
Alkalinity, Total*	420	10.0		mg/L	10	06/03/16	2320 B		KDG
Bromide	<0.100	0.100	0.00845	mg/L	1	05/26/16	EPA300.0		JDA
Chloride	2.16	1.00	0.0519	mg/L	1	05/29/16	EPA300.0		JDA
Conductivity*	826	10.0		uS/cm	1	05/26/16	2510 B		KDG
Fluoride*	0.138	0.100	0.00763	mg/L	1	05/29/16	EPA300.0		JDA
Nitrate/Nitrite as N*	2.53	0.020	0.011	mg/L	1	05/30/16	EPA353.2		JDA
pH*	7.13			pH Units	1	05/26/16	EPA150.1	H4	KDG
Total Dissolved Solids	460	10.0		mg/L	1	06/01/16	EPA160.1		KDG
Sulfate	76.0	5.00	0.307	mg/L	5	05/30/16	EPA300.0	M5	JDA

**Dissolved Metals by ICP**

Calcium*	104	0.100	0.014	mg/L	5	05/31/16	EPA200.7		LLG
Iron*	<0.250	0.250	0.017	mg/L	5	05/31/16	EPA200.7		LLG
Magnesium*	39.2	0.500	0.162	mg/L	5	05/31/16	EPA200.7		LLG
Potassium*	<5.00	5.00	1.67	mg/L	5	05/31/16	EPA200.7		LLG
Sodium*	17.8	5.00	1.53	mg/L	5	05/31/16	EPA200.7		LLG

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**Crain Spring**

**1605254-03 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	260	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Carbonate*	40.0	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Total*	300	10.0		mg/L	10	06/06/16	2320 B		KDG
Bromide	0.490	0.100	0.00845	mg/L	1	05/26/16	EPA300.0		JDA
Chloride	1.45	1.00	0.0519	mg/L	1	05/30/16	EPA300.0		JDA
Conductivity*	603	10.0		uS/cm	1	05/26/16	2510 B		KDG
Fluoride*	0.127	0.100	0.00763	mg/L	1	05/30/16	EPA300.0		JDA
Nitrate/Nitrite as N*	0.077	0.020	0.011	mg/L	1	05/30/16	EPA353.2		JDA
pH*	7.21			pH Units	1	05/26/16	EPA150.1		KDG
Total Dissolved Solids	350	10.0		mg/L	1	06/01/16	EPA160.1		KDG
Sulfate	85.2	5.00	0.307	mg/L	5	05/30/16	EPA300.0		JDA

**Dissolved Metals by ICP**

Calcium*	75.0	0.100	0.014	mg/L	5	05/31/16	EPA200.7		LLG
Iron*	<0.250	0.250	0.017	mg/L	5	05/31/16	EPA200.7		LLG
Magnesium*	20.5	0.500	0.162	mg/L	5	05/31/16	EPA200.7		LLG
Potassium*	<5.00	5.00	1.67	mg/L	5	05/31/16	EPA200.7		LLG
Sodium*	20.4	5.00	1.53	mg/L	5	05/31/16	EPA200.7		LLG

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**Vance 1 Spring**

**1605254-04 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	230	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Carbonate*	60.0	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Total*	290	10.0		mg/L	10	06/06/16	2320 B		KDG
Bromide	<0.100	0.100	0.00845	mg/L	1	05/26/16	EPA300.0		JDA
Chloride	1.79	1.00	0.0519	mg/L	1	05/30/16	EPA300.0		JDA
Conductivity*	445	10.0		uS/cm	1	05/26/16	2510 B		KDG
Fluoride*	0.197	0.100	0.00763	mg/L	1	05/30/16	EPA300.0		JDA
Nitrate/Nitrite as N*	<0.020	0.020	0.011	mg/L	1	05/30/16	EPA353.2		JDA
pH*	8.04			pH Units	1	05/26/16	EPA150.1		KDG
Total Dissolved Solids	235	10.0		mg/L	1	06/01/16	EPA160.1		KDG
Sulfate	12.5	1.00	0.0615	mg/L	1	05/30/16	EPA300.0		JDA

**Dissolved Metals by ICP**

Calcium*	58.8	0.100	0.014	mg/L	5	05/31/16	EPA200.7		LLG
Iron*	<0.250	0.250	0.017	mg/L	5	05/31/16	EPA200.7		LLG
Magnesium*	7.33	0.500	0.162	mg/L	5	05/31/16	EPA200.7		LLG
Potassium*	10.7	5.00	1.67	mg/L	5	05/31/16	EPA200.7		LLG
Sodium*	13.9	5.00	1.53	mg/L	5	05/31/16	EPA200.7		LLG

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 06/08/16 14:43
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**Vance 2 Spring**

**1605254-05 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	270	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Carbonate*	<10.0	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	10	06/06/16	2320 B		KDG
Alkalinity, Total*	270	10.0		mg/L	10	06/06/16	2320 B		KDG
Bromide	<0.100	0.100	0.00845	mg/L	1	05/26/16	EPA300.0		JDA
Chloride	1.17	1.00	0.0519	mg/L	1	05/30/16	EPA300.0		JDA
Conductivity*	476	10.0		uS/cm	1	05/26/16	2510 B		KDG
Fluoride*	0.139	0.100	0.00763	mg/L	1	05/30/16	EPA300.0		JDA
Nitrate/Nitrite as N*	<0.020	0.020	0.011	mg/L	1	05/30/16	EPA353.2		JDA
pH*	7.16			pH Units	1	05/26/16	EPA150.1		KDG
Total Dissolved Solids	275	10.0		mg/L	1	06/01/16	EPA160.1		KDG
Sulfate	53.3	5.00	0.307	mg/L	5	05/30/16	EPA300.0		JDA

**Dissolved Metals by ICP**

Calcium*	66.1	0.100	0.014	mg/L	5	05/31/16	EPA200.7		LLG
Iron*	<0.250	0.250	0.017	mg/L	5	05/31/16	EPA200.7		LLG
Magnesium*	11.8	0.500	0.162	mg/L	5	05/31/16	EPA200.7		LLG
Potassium*	<5.00	5.00	1.67	mg/L	5	05/31/16	EPA200.7		LLG
Sodium*	10.5	5.00	1.53	mg/L	5	05/31/16	EPA200.7		LLG

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 06/08/16 14:43
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**General Chemistry - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B605232 - General Prep - Wet Chem**

<b>Blank (B605232-BLK1)</b>		Prepared: 05/25/16 Analyzed: 05/26/16								
Bromide	ND	0.100	mg/L							
<b>LCS (B605232-BS1)</b>		Prepared: 05/25/16 Analyzed: 05/26/16								
Bromide	2.48	0.100	mg/L	2.50		99.4	90-110			
<b>LCS Dup (B605232-BSD1)</b>		Prepared: 05/25/16 Analyzed: 05/26/16								
Bromide	2.47	0.100	mg/L	2.50		98.9	90-110	0.484	20	

**Batch B605247 - General Prep - Wet Chem**

<b>Blank (B605247-BLK1)</b>		Prepared: 05/26/16 Analyzed: 06/01/16								
Total Dissolved Solids	ND	10.0	mg/L							
<b>Duplicate (B605247-DUP1)</b>		Source: 1605238-01 Prepared: 05/26/16 Analyzed: 06/01/16								
Total Dissolved Solids	800	10.0	mg/L		815			1.86	20	
<b>Reference (B605247-SRM1)</b>		Prepared: 05/26/16 Analyzed: 06/01/16								
Total Dissolved Solids	400	10.0	mg/L	400		100	85-115			

**Batch B605253 - General Prep - Wet Chem**

<b>Blank (B605253-BLK1)</b>		Prepared & Analyzed: 06/03/16								
Alkalinity, Bicarbonate	ND	10.0	mg/L							
Alkalinity, Carbonate	ND	10.0	mg/L							
Alkalinity, Hydroxide	ND	10.0	mg/L							
Alkalinity, Total	ND	10.0	mg/L							
<b>LCS (B605253-BS1)</b>		Prepared & Analyzed: 06/03/16								
Alkalinity, Bicarbonate	ND	10.0	mg/L				85-115			
Alkalinity, Carbonate	ND	10.0	mg/L				85-115			
Alkalinity, Hydroxide	ND	10.0	mg/L				85-115			
Alkalinity, Total	107	10.0	mg/L	100		107	85-115			
<b>LCS Dup (B605253-BSD1)</b>		Prepared & Analyzed: 06/03/16								
Alkalinity, Bicarbonate	ND	10.0	mg/L				85-115		20	
Alkalinity, Carbonate	ND	10.0	mg/L				85-115		20	
Alkalinity, Hydroxide	ND	10.0	mg/L				85-115		20	
Alkalinity, Total	107	10.0	mg/L	100		107	85-115	0.00	20	

**Batch B605274 - General Prep - Wet Chem**

<b>Blank (B605274-BLK1)</b>		Prepared & Analyzed: 05/29/16								
Chloride	ND	1.00	mg/L							

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 06/08/16 14:43
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**General Chemistry - Quality Control  
(Continued)**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B605274 - General Prep - Wet Chem (Continued)**

**Blank (B605274-BLK1) (Continued)**

Prepared & Analyzed: 05/29/16

Fluoride	ND	0.100	mg/L							
Sulfate	ND	1.00	mg/L							

**LCS (B605274-BS1)**

Prepared & Analyzed: 05/29/16

Chloride	23.9	1.00	mg/L	25.0		95.8	90-110			
Fluoride	2.43	0.100	mg/L	2.50		97.2	90-110			
Sulfate	24.3	1.00	mg/L	25.0		97.1	90-110			

**LCS Dup (B605274-BSD1)**

Prepared & Analyzed: 05/29/16

Chloride	23.5	1.00	mg/L	25.0		93.9	90-110	1.92	20	
Fluoride	2.39	0.100	mg/L	2.50		95.4	90-110	1.83	20	
Sulfate	23.8	1.00	mg/L	25.0		95.2	90-110	1.93	20	

**Batch B605279 - General Prep - Wet Chem**

**Blank (B605279-BLK1)**

Prepared & Analyzed: 05/30/16

Nitrate/Nitrite as N	ND	0.020	mg/L							
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**LCS (B605279-BS1)**

Prepared & Analyzed: 05/30/16

Nitrate/Nitrite as N	0.964	0.020	mg/L	1.00		96.4	90-110			
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**LCS Dup (B605279-BSD1)**

Prepared & Analyzed: 05/30/16

Nitrate/Nitrite as N	0.966	0.020	mg/L	1.00		96.6	90-110	0.197	20	
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**Batch B606015 - General Prep - Wet Chem**

**Duplicate (B606015-DUP2)**

Source: 1605266-02

Prepared & Analyzed: 05/26/16

pH	7.31		pH Units		7.26			0.686	20	
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**Reference (B606015-SRM1)**

Prepared & Analyzed: 05/26/16

pH	8.98		pH Units	9.13		98.4	7.807-102.19			
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**Batch B606017 - General Prep - Wet Chem**

**Duplicate (B606017-DUP2)**

Source: 1605266-02

Prepared & Analyzed: 05/26/16

Conductivity	722	10.0	uS/cm		697			3.52	20	
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**Reference (B606017-SRM1)**

Prepared & Analyzed: 05/26/16

Conductivity	583		uS/cm	543		107	90-110			
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**Batch B606060 - General Prep - Wet Chem**

**Blank (B606060-BLK1)**

Prepared & Analyzed: 06/06/16

Alkalinity, Total	ND	10.0	mg/L							
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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 06/08/16 14:43
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**General Chemistry - Quality Control  
(Continued)**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B606060 - General Prep - Wet Chem (Continued)**

<b>LCS (B606060-BS1)</b>		Prepared & Analyzed: 06/06/16								
Alkalinity, Total	106	10.0	mg/L	100		106	85-115			
<b>LCS Dup (B606060-BSD1)</b>		Prepared & Analyzed: 06/06/16								
Alkalinity, Total	107	10.0	mg/L	100		107	85-115	0.939	20	

**Dissolved Metals by ICP - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B605287 - Dissolved Metals, E200.7/E200.8**

<b>Blank (B605287-BLK1)</b>		Prepared & Analyzed: 05/31/16								
Calcium	ND	0.020	mg/L							
Iron	ND	0.050	mg/L							
Magnesium	ND	0.100	mg/L							
Potassium	ND	1.00	mg/L							
Sodium	ND	1.00	mg/L							
<b>LCS (B605287-BS1)</b>		Prepared & Analyzed: 05/31/16								
Calcium	5.08	0.020	mg/L	5.00		102	85-115			
Iron	5.08	0.050	mg/L	5.00		102	85-115			
Magnesium	25.0	0.100	mg/L	25.0		100	85-115			
Potassium	10.0	1.00	mg/L	10.0		100	85-115			
Sodium	8.18	1.00	mg/L	8.10		101	85-115			
<b>LCS Dup (B605287-BSD1)</b>		Prepared & Analyzed: 05/31/16								
Calcium	5.23	0.020	mg/L	5.00		105	85-115	2.77	20	
Iron	5.31	0.050	mg/L	5.00		106	85-115	4.56	20	
Magnesium	25.8	0.100	mg/L	25.0		103	85-115	3.05	20	
Potassium	10.3	1.00	mg/L	10.0		103	85-115	2.60	20	
Sodium	8.34	1.00	mg/L	8.10		103	85-115	2.03	20	

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	<b>Reported:</b> 06/08/16 14:43
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**Notes and Definitions**

- M5 Sample was chosen for matrix spike. Spike recovery did not meet laboratory acceptance criteria, possible matrix interference in sample.
- H4 pH analysis performed more than 48 hours after sampling.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis  
\*Results reported on as received basis unless designated as dry.
- RPD Relative Percent Difference
- LCS Laboratory Control Sample (Blank Spike)
- RL Report Limit
- MDL Method Detection Limit

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## Project Information

### LT Environmental

848 E 2nd Ave  
Durango, CO 81301

Laboratory PM: **Debbie Zufelt**

Phone: (970) 385-1096

Fax: -

**LTE**  
5/16/2016

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<b>Project Name:</b>	Archuleta Springs	<b>Invoice To:</b>	LT Environmental
<b>Project Number:</b>	[none]	<b>Invoice Bid:</b>	(list pricing)
<b>Client PM:</b>	Devin Henemann	<b>Invoice Manager:</b>	Devin Henemann

**Comments:**

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Analysis	Comment
Alkalinity, Bicarbonate	
Alkalinity, Carbonate	
Alkalinity, Hydroxide	
Alkalinity, Total	
Bromide	
Calcium Dissolved by ICP	
Chloride	
Conductivity	
Fluoride	
Iron Dissolved by ICP	
Magnesium Dissolved by ICP	
Nitrate/Nitrite as N	
pH	
Potassium Dissolved by ICP	
Sodium Dissolved by ICP	
Solids, Total Dissolved (TDS)	
Sulfate	

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07 June 2016

Devin Hencmann  
LT Environmental  
848 E 2nd Ave  
Durango, CO 81301  
RE: Archuleta Springs

Enclosed are the results of analyses for samples received by the laboratory on 05/23/16 15:45.  
If you need any further assistance, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Debbie Zufelt". The signature is written in a cursive, flowing style.

Debbie Zufelt  
Reports Manager

All accredited analytes contained in this report are denoted by an asterisk (\*). For a complete list of accredited analytes please do not hesitate to contact us via any of the contact information contained in this report. All of our certifications can be viewed at <http://greenanalytical.com/certifications/>

Green Analytical Laboratories is NELAP accredited through the Texas Commission on Environmental Quality. Accreditation applies to drinking water and non-potable water matrices for trace metals and a variety of inorganic parameters. Green Analytical Laboratories is also accredited through the Colorado Department of Public Health and Environment and EPA region 8 for trace metals, Cyanide, Fluoride, Nitrate, and Nitrite in drinking water.

Our affiliate laboratory, Cardinal Laboratories, is also NELAP accredited through the Texas Commission on Environmental Quality for a variety of organic constituents in drinking water, non-potable water and solid matrices. Cardinal is also accredited for regulated VOCs, TTHM, and HAA-5 in drinking water through the Colorado Department of Public Health and Environment and EPA region 8.



LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Spring Sampling Project Manager: Devin Hencmann	Reported: 06/07/16 12:41
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**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Corigan Spring	1605229-01	Water	05/23/16 11:30	05/23/16 15:45
Section 14 Reich Spring	1605229-02	Water	05/23/16 14:00	05/23/16 15:45

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Spring Sampling Project Manager: Devin Hencmann	Reported: 06/07/16 12:41
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**Corigan Spring**

**1605229-01 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	45.0	10.0		mg/L	1	06/03/16	2320 B		KDG
Alkalinity, Carbonate*	<10.0	10.0		mg/L	1	06/03/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	1	06/03/16	2320 B		KDG
Alkalinity, Total*	45.0	10.0		mg/L	1	06/03/16	2320 B		KDG
Bromide	<0.100	0.100	0.00845	mg/L	1	05/26/16	EPA300.0		JDA
Chloride	<1.00	1.00	0.0519	mg/L	1	05/28/16	EPA300.0		JDA
Conductivity*	128	10.0		uS/cm	1	05/23/16	2510 B		KDG
Fluoride*	<0.100	0.100	0.00763	mg/L	1	05/28/16	EPA300.0		JDA
Nitrate/Nitrite as N*	<0.020	0.020	0.011	mg/L	1	05/30/16	EPA353.2		JDA
pH*	8.17			pH Units	1	05/23/16	EPA150.1		KDG
Total Dissolved Solids	120	10.0		mg/L	1	06/01/16	EPA160.1		KDG
Sulfate	8.76	1.00	0.0615	mg/L	1	05/28/16	EPA300.0		JDA

**Dissolved Metals by ICP**

Calcium*	14.9	0.100	0.014	mg/L	5	05/31/16	EPA200.7		LLG
Iron*	<0.250	0.250	0.017	mg/L	5	05/31/16	EPA200.7		LLG
Magnesium*	3.36	0.500	0.162	mg/L	5	05/31/16	EPA200.7		LLG
Potassium*	<5.00	5.00	1.67	mg/L	5	05/31/16	EPA200.7		LLG
Sodium*	<5.00	5.00	1.53	mg/L	5	05/31/16	EPA200.7		LLG

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Spring Sampling Project Manager: Devin Hencmann	Reported: 06/07/16 12:41
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**Section 14 Reich Spring**

**1605229-02 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	207	10.0		mg/L	1	06/03/16	2320 B		KDG
Alkalinity, Carbonate*	20.0	10.0		mg/L	1	06/03/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	1	06/03/16	2320 B		KDG
Alkalinity, Total*	227	10.0		mg/L	1	06/03/16	2320 B		KDG
Bromide	<0.100	0.100	0.00845	mg/L	1	05/26/16	EPA300.0		JDA
Chloride	1.36	1.00	0.0519	mg/L	1	05/28/16	EPA300.0		JDA
Conductivity*	569	10.0		uS/cm	1	05/23/16	2510 B		KDG
Fluoride*	0.555	0.100	0.00763	mg/L	1	05/28/16	EPA300.0		JDA
Nitrate/Nitrite as N*	0.511	0.020	0.011	mg/L	1	05/30/16	EPA353.2		JDA
pH*	7.57			pH Units	1	05/23/16	EPA150.1		KDG
Total Dissolved Solids	340	10.0		mg/L	1	06/01/16	EPA160.1		KDG
Sulfate	58.4	5.00	0.307	mg/L	5	05/29/16	EPA300.0		JDA

**Dissolved Metals by ICP**

Calcium*	77.0	0.100	0.014	mg/L	5	05/31/16	EPA200.7		LLG
Iron*	<0.250	0.250	0.017	mg/L	5	05/31/16	EPA200.7		LLG
Magnesium*	9.70	0.500	0.162	mg/L	5	05/31/16	EPA200.7		LLG
Potassium*	<5.00	5.00	1.67	mg/L	5	05/31/16	EPA200.7		LLG
Sodium*	28.8	5.00	1.53	mg/L	5	05/31/16	EPA200.7		LLG

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Debbie Zufelt, Reports Manager

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Spring Sampling Project Manager: Devin Hencmann	Reported: 06/07/16 12:41
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**General Chemistry - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B605221 - General Prep - Wet Chem**

**Blank (B605221-BLK1)** Prepared: 05/24/16 Analyzed: 06/01/16

Total Dissolved Solids	ND	10.0	mg/L							
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**Batch B605232 - General Prep - Wet Chem**

**Blank (B605232-BLK1)** Prepared: 05/25/16 Analyzed: 05/26/16

Bromide	ND	0.100	mg/L							
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**LCS (B605232-BS1)** Prepared: 05/25/16 Analyzed: 05/26/16

Bromide	2.48	0.100	mg/L	2.50		99.4	90-110			
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**LCS Dup (B605232-BSD1)** Prepared: 05/25/16 Analyzed: 05/26/16

Bromide	2.47	0.100	mg/L	2.50		98.9	90-110	0.484	20	
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**Batch B605247 - General Prep - Wet Chem**

**Blank (B605247-BLK1)** Prepared: 05/26/16 Analyzed: 06/01/16

Total Dissolved Solids	ND	10.0	mg/L							
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**Duplicate (B605247-DUP1)** Source: 1605238-01 Prepared: 05/26/16 Analyzed: 06/01/16

Total Dissolved Solids	800	10.0	mg/L		815			1.86	20	
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**Reference (B605247-SRM1)** Prepared: 05/26/16 Analyzed: 06/01/16

Total Dissolved Solids	400	10.0	mg/L	400		100	85-115			
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**Batch B605253 - General Prep - Wet Chem**

**Blank (B605253-BLK1)** Prepared & Analyzed: 06/03/16

Alkalinity, Bicarbonate	ND	10.0	mg/L							
Alkalinity, Carbonate	ND	10.0	mg/L							
Alkalinity, Hydroxide	ND	10.0	mg/L							
Alkalinity, Total	ND	10.0	mg/L							

**LCS (B605253-BS1)** Prepared & Analyzed: 06/03/16

Alkalinity, Bicarbonate	ND	10.0	mg/L				85-115			
Alkalinity, Carbonate	ND	10.0	mg/L				85-115			
Alkalinity, Hydroxide	ND	10.0	mg/L				85-115			
Alkalinity, Total	107	10.0	mg/L	100		107	85-115			

**LCS Dup (B605253-BSD1)** Prepared & Analyzed: 06/03/16

Alkalinity, Bicarbonate	ND	10.0	mg/L				85-115		20	
Alkalinity, Carbonate	ND	10.0	mg/L				85-115		20	
Alkalinity, Hydroxide	ND	10.0	mg/L				85-115		20	
Alkalinity, Total	107	10.0	mg/L	100		107	85-115	0.00	20	

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Spring Sampling Project Manager: Devin Hencmann	Reported: 06/07/16 12:41
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**General Chemistry - Quality Control  
(Continued)**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B605257 - General Prep - Wet Chem**

<b>Duplicate (B605257-DUP2)</b>		<b>Source: 1605229-01</b>		<b>Prepared &amp; Analyzed: 05/23/16</b>						
pH	8.21		pH Units		8.17			0.488	20	
<b>Reference (B605257-SRM1)</b>		<b>Prepared &amp; Analyzed: 05/23/16</b>								
pH	9.10		pH Units	9.13		99.7	7.807-102.19			

**Batch B605259 - General Prep - Wet Chem**

<b>Reference (B605259-SRM1)</b>		<b>Prepared &amp; Analyzed: 05/23/16</b>								
Conductivity	569		uS/cm	543		105	90-110			

**Batch B605273 - General Prep - Wet Chem**

<b>Blank (B605273-BLK1)</b>		<b>Prepared: 05/27/16 Analyzed: 05/28/16</b>								
Chloride	ND	1.00	mg/L							
Fluoride	ND	0.100	mg/L							
Sulfate	ND	1.00	mg/L							

<b>LCS (B605273-BS1)</b>		<b>Prepared: 05/27/16 Analyzed: 05/28/16</b>								
Chloride	23.8	1.00	mg/L	25.0		95.3	90-110			
Fluoride	2.41	0.100	mg/L	2.50		96.6	90-110			
Sulfate	24.0	1.00	mg/L	25.0		96.1	90-110			

<b>LCS Dup (B605273-BSD1)</b>		<b>Prepared: 05/27/16 Analyzed: 05/28/16</b>								
Chloride	23.5	1.00	mg/L	25.0		94.0	90-110	1.39	20	
Fluoride	2.40	0.100	mg/L	2.50		95.9	90-110	0.707	20	
Sulfate	24.1	1.00	mg/L	25.0		96.4	90-110	0.349	20	

**Batch B605278 - General Prep - Wet Chem**

<b>Blank (B605278-BLK1)</b>		<b>Prepared &amp; Analyzed: 05/30/16</b>								
Nitrate/Nitrite as N	ND	0.020	mg/L							

<b>LCS (B605278-BS1)</b>		<b>Prepared &amp; Analyzed: 05/30/16</b>								
Nitrate/Nitrite as N	1.01	0.020	mg/L	1.00		101	90-110			

<b>LCS Dup (B605278-BSD1)</b>		<b>Prepared &amp; Analyzed: 05/30/16</b>								
Nitrate/Nitrite as N	1.01	0.020	mg/L	1.00		101	90-110	0.604	20	

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Spring Sampling Project Manager: Devin Hencmann	Reported: 06/07/16 12:41
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**Dissolved Metals by ICP - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B605287 - Dissolved Metals, E200.7/E200.8**

**Blank (B605287-BLK1)**

Prepared & Analyzed: 05/31/16

Calcium	ND	0.020	mg/L							
Iron	ND	0.050	mg/L							
Magnesium	ND	0.100	mg/L							
Potassium	ND	1.00	mg/L							
Sodium	ND	1.00	mg/L							

**LCS (B605287-BS1)**

Prepared & Analyzed: 05/31/16

Calcium	5.08	0.020	mg/L	5.00		102	85-115			
Iron	5.08	0.050	mg/L	5.00		102	85-115			
Magnesium	25.0	0.100	mg/L	25.0		100	85-115			
Potassium	10.0	1.00	mg/L	10.0		100	85-115			
Sodium	8.18	1.00	mg/L	8.10		101	85-115			

**LCS Dup (B605287-BSD1)**

Prepared & Analyzed: 05/31/16

Calcium	5.23	0.020	mg/L	5.00		105	85-115	2.77	20	
Iron	5.31	0.050	mg/L	5.00		106	85-115	4.56	20	
Magnesium	25.8	0.100	mg/L	25.0		103	85-115	3.05	20	
Potassium	10.3	1.00	mg/L	10.0		103	85-115	2.60	20	
Sodium	8.34	1.00	mg/L	8.10		103	85-115	2.03	20	

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Spring Sampling Project Manager: Devin Hencmann	<b>Reported:</b> 06/07/16 12:41
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**Notes and Definitions**

- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis  
\*Results reported on as received basis unless designated as dry.
- RPD Relative Percent Difference
- LCS Laboratory Control Sample (Blank Spike)
- RL Report Limit
- MDL Method Detection Limit

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Debbie Zufelt, Reports Manager

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 Fax: (970) 247-4227

service@greenanalytical.com or dzufelt@greenanalytical.com  
 75 Suttle St Durango, CO 81303

**CHAIN-OF-CUSTODY AND ANALYSIS REQUEST**

<b>Company Name (if Applicable):</b> LT Environmental, Inc.		<b>Contact Person:</b> Devin Heilmann		<b>Address:</b> 848 E 2nd Ave		<b>City:</b> Durango		<b>State:</b> CO		<b>zip:</b> 81301	
<b>Phone #:</b> (970) 385-1096		<b>Email:</b> DHeilmann@LTEnv.com		<b>Project Name (optional):</b> Archuleta Spring Sampling		<b>Project Number (optional):</b> 052116002		<b>Sampler Name (Print):</b> S. Adams / M. Wicker		<b>Bill to (if different):</b>	
<b>For Lab Use</b>		<b>Sample Name or Location</b>		<b>Collected</b>		<b>Matrix (check one)</b>		<b># of containers</b>		<b>ANALYSIS REQUEST</b>	
						<input type="checkbox"/> GROUNDWATER <input checked="" type="checkbox"/> SURFACEWATER <input type="checkbox"/> WASTEWATER <input type="checkbox"/> PRODUCEDWATER <input type="checkbox"/> SOIL <input type="checkbox"/> DRINKING WATER <input type="checkbox"/> OTHER :		<input checked="" type="checkbox"/> No preservation (general) <input type="checkbox"/> HNO <sub>3</sub> <input type="checkbox"/> HCl <input type="checkbox"/> H <sub>2</sub> SO <sub>4</sub> <input type="checkbox"/> Other: <input type="checkbox"/> Other:			
		1105-224-1 -2 Corgan Spring Section 14 Reids Spring		5-23-16 5-23-16		1130 1400				XX See Attached	
<b>Relinquished By:</b>		<b>Date:</b> 5-23-16		<b>Received By:</b> Michael Valentine		<b>Date:</b> 5-23-16		<b>Time:</b> 1545		<b>Report to State? (Circle)</b> Yes      No	
<b>Relinquished By:</b>		<b>Date:</b>		<b>Received By:</b>		<b>Date:</b>		<b>Time:</b>			
<b>Relinquished By:</b>		<b>Date:</b>		<b>Received By:</b>		<b>Date:</b>		<b>Time:</b>			
<b>Delivered By: (Circle One)</b> Sampler - UPS - FedEx - Kangaroo - Other:		<b>Temperature at receipt:</b> 5.7 °C		<b>Checked By:</b> MW							

PLEASE NOTE: GAL's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by GAL within 30 days after completion. In no event shall GAL be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by GAL, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

\* Chain of Custody must be signed in "Relinquished By:" as an acceptance of services and all applicable charges.

## Project Information

### LT Environmental

848 E 2nd Ave  
Durango, CO 81301

Phone: (970) 385-1096  
Fax: -

LTE  
5/16/2016

Laboratory PM: Debbie Zufelt

---

Project Name:	Archuleta Springs	Invoice To:	LT Environmental
Project Number:	[none]	Invoice Bid:	(list pricing)
Client PM:	Devin Henemann	Invoice Manager:	Devin Henemann

Comments:

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Analysis	Comment
Alkalinity, Bicarbonate	
Alkalinity, Carbonate	
Alkalinity, Hydroxide	
Alkalinity, Total	
Bromide	
Calcium Dissolved by ICP	
Chloride	
Conductivity	
Fluoride	
Iron Dissolved by ICP	
Magnesium Dissolved by ICP	
Nitrate/Nitrite as N	
pH	
Potassium Dissolved by ICP	
Sodium Dissolved by ICP	
Solids, Total Dissolved (TDS)	
Sulfate	

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06 June 2016

Devin Hencmann  
LT Environmental  
848 E 2nd Ave  
Durango, CO 81301  
RE: Archuleta Springs

Enclosed are the results of analyses for samples received by the laboratory on 05/19/16 15:23.  
If you need any further assistance, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Debbie Zufelt". The signature is written in a cursive, flowing style.

Debbie Zufelt  
Reports Manager

All accredited analytes contained in this report are denoted by an asterisk (\*). For a complete list of accredited analytes please do not hesitate to contact us via any of the contact information contained in this report. All of our certifications can be viewed at <http://greenanalytical.com/certifications/>

Green Analytical Laboratories is NELAP accredited through the Texas Commission on Environmental Quality. Accreditation applies to drinking water and non-potable water matrices for trace metals and a variety of inorganic parameters. Green Analytical Laboratories is also accredited through the Colorado Department of Public Health and Environment and EPA region 8 for trace metals, Cyanide, Fluoride, Nitrate, and Nitrite in drinking water.

Our affiliate laboratory, Cardinal Laboratories, is also NELAP accredited through the Texas Commission on Environmental Quality for a variety of organic constituents in drinking water, non-potable water and solid matrices. Cardinal is also accredited for regulated VOCs, TTHM, and HAA-5 in drinking water through the Colorado Department of Public Health and Environment and EPA region 8.



LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 06/06/16 16:16
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**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Thick Spring	1605210-01	Water	05/19/16 11:45	05/19/16 15:23
Walt Spring	1605210-02	Water	05/19/16 12:55	05/19/16 15:23

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 06/06/16 16:16
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**Thick Spring**

**1605210-01 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	130	10.0		mg/L	1	05/24/16	2320 B		KDG
Alkalinity, Carbonate*	<10.0	10.0		mg/L	1	05/24/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	1	05/24/16	2320 B		KDG
Alkalinity, Total*	130	10.0		mg/L	1	05/24/16	2320 B		KDG
Bromide	<0.100	0.100	0.00845	mg/L	1	05/26/16	EPA300.0		JDA
Chloride	77.6	5.00	0.260	mg/L	5	05/28/16	EPA300.0		JDA
Conductivity*	594	10.0		uS/cm	1	05/20/16	2510 B		KDG
Fluoride*	<0.500	0.500	0.0382	mg/L	5	05/28/16	EPA300.0		JDA
Nitrate/Nitrite as N*	0.026	0.020	0.011	mg/L	1	05/30/16	EPA353.2		JDA
pH*	7.01			pH Units	1	05/20/16	EPA150.1		KDG
Total Dissolved Solids	365	10.0		mg/L	1	06/01/16	EPA160.1		KDG
Sulfate	28.0	5.00	0.307	mg/L	5	05/28/16	EPA300.0		JDA

**Dissolved Metals by ICP**

Calcium*	72.9	0.020	0.003	mg/L	1	05/27/16	EPA200.7		LLG
Iron*	<0.050	0.050	0.003	mg/L	1	05/27/16	EPA200.7		LLG
Magnesium*	13.7	0.100	0.032	mg/L	1	05/27/16	EPA200.7		LLG
Potassium*	1.10	1.00	0.335	mg/L	1	05/27/16	EPA200.7		LLG
Sodium*	19.0	1.00	0.305	mg/L	1	05/27/16	EPA200.7		LLG

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**Walt Spring**

**1605210-02 (Water)**

Analyte	Result	RL	MDL	Units	Dilution	Analyzed	Method	Notes	Analyst
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**General Chemistry**

Alkalinity, Bicarbonate*	136	10.0		mg/L	1	05/24/16	2320 B		KDG
Alkalinity, Carbonate*	<10.0	10.0		mg/L	1	05/24/16	2320 B		KDG
Alkalinity, Hydroxide*	<10.0	10.0		mg/L	1	05/24/16	2320 B		KDG
Alkalinity, Total*	136	10.0		mg/L	1	05/24/16	2320 B		KDG
Bromide	<0.100	0.100	0.00845	mg/L	1	05/26/16	EPA300.0		JDA
Chloride	1.18	1.00	0.0519	mg/L	1	05/28/16	EPA300.0		JDA
Conductivity*	382	10.0		uS/cm	1	05/20/16	2510 B		KDG
Fluoride*	0.137	0.100	0.00763	mg/L	1	05/28/16	EPA300.0		JDA
Nitrate/Nitrite as N*	<0.020	0.020	0.011	mg/L	1	05/30/16	EPA353.2		JDA
pH*	7.20			pH Units	1	05/20/16	EPA150.1		KDG
Total Dissolved Solids	230	10.0		mg/L	1	06/01/16	EPA160.1		KDG
Sulfate	50.5	5.00	0.307	mg/L	5	05/29/16	EPA300.0		JDA

**Dissolved Metals by ICP**

Calcium*	44.2	0.020	0.003	mg/L	1	05/27/16	EPA200.7		LLG
Iron*	<0.050	0.050	0.003	mg/L	1	05/27/16	EPA200.7		LLG
Magnesium*	13.5	0.100	0.032	mg/L	1	05/27/16	EPA200.7		LLG
Potassium*	1.23	1.00	0.335	mg/L	1	05/27/16	EPA200.7		LLG
Sodium*	12.2	1.00	0.305	mg/L	1	05/27/16	EPA200.7		LLG

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LT Environmental 848 E 2nd Ave Durango CO, 81301	Project: Archuleta Springs Project Name / Number: Archuleta Springs Project Manager: Devin Hencmann	Reported: 06/06/16 16:16
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**General Chemistry - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B605221 - General Prep - Wet Chem**

<b>Blank (B605221-BLK1)</b>		Prepared: 05/24/16 Analyzed: 06/01/16								
Total Dissolved Solids	ND	10.0	mg/L							
<b>Duplicate (B605221-DUP1)</b>		Source: 1605210-01 Prepared: 05/24/16 Analyzed: 06/01/16								
Total Dissolved Solids	350	10.0	mg/L		365			4.20	20	
<b>Reference (B605221-SRM1)</b>		Prepared: 05/24/16 Analyzed: 06/01/16								
Total Dissolved Solids	415	10.0	mg/L	400		104	85-115			

**Batch B605232 - General Prep - Wet Chem**

<b>Blank (B605232-BLK1)</b>		Prepared: 05/25/16 Analyzed: 05/26/16								
Bromide	ND	0.100	mg/L							
<b>LCS (B605232-BS1)</b>		Prepared: 05/25/16 Analyzed: 05/26/16								
Bromide	2.48	0.100	mg/L	2.50		99.4	90-110			
<b>LCS Dup (B605232-BSD1)</b>		Prepared: 05/25/16 Analyzed: 05/26/16								
Bromide	2.47	0.100	mg/L	2.50		98.9	90-110	0.484	20	

**Batch B605252 - General Prep - Wet Chem**

<b>Blank (B605252-BLK1)</b>		Prepared & Analyzed: 05/24/16								
Alkalinity, Total	ND	10.0	mg/L							
<b>LCS (B605252-BS1)</b>		Prepared & Analyzed: 05/24/16								
Alkalinity, Total	107	10.0	mg/L	100		107	85-115			
<b>LCS Dup (B605252-BSD1)</b>		Prepared & Analyzed: 05/24/16								
Alkalinity, Total	108	10.0	mg/L	100		108	85-115	0.930	20	

**Batch B605254 - General Prep - Wet Chem**

<b>Blank (B605254-BLK1)</b>		Prepared: 05/26/16 Analyzed: 05/27/16								
Chloride	ND	1.00	mg/L							
Fluoride	ND	0.100	mg/L							
Sulfate	ND	1.00	mg/L							
<b>LCS (B605254-BS1)</b>		Prepared: 05/26/16 Analyzed: 05/27/16								
Chloride	23.3	1.00	mg/L	25.0		93.3	90-110			
Fluoride	2.40	0.100	mg/L	2.50		96.0	90-110			
Sulfate	23.7	1.00	mg/L	25.0		94.8	90-110			
<b>LCS Dup (B605254-BSD1)</b>		Prepared: 05/26/16 Analyzed: 05/27/16								
Chloride	23.6	1.00	mg/L	25.0		94.3	90-110	1.04	20	

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**General Chemistry - Quality Control  
(Continued)**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B605254 - General Prep - Wet Chem (Continued)**

**LCS Dup (B605254-BSD1) (Continued)**

Prepared: 05/26/16 Analyzed: 05/27/16

Fluoride	2.41	0.100	mg/L	2.50		96.5	90-110	0.499	20	
Sulfate	23.8	1.00	mg/L	25.0		95.1	90-110	0.312	20	

**Batch B605256 - General Prep - Wet Chem**

**Duplicate (B605256-DUP1)**

Source: 1605210-01 Prepared & Analyzed: 05/20/16

pH	7.04		pH Units		7.01			0.427	20	
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**Reference (B605256-SRM1)**

Prepared & Analyzed: 05/20/16

pH	9.05		pH Units	9.13		99.1	7.807-102.19			
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**Batch B605258 - General Prep - Wet Chem**

**Duplicate (B605258-DUP1)**

Source: 1605210-01 Prepared & Analyzed: 05/20/16

Conductivity	612	10.0	uS/cm		594			2.99	20	
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**Reference (B605258-SRM1)**

Prepared & Analyzed: 05/20/16

Conductivity	502		uS/cm	543		92.4	90-110			
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**Batch B605278 - General Prep - Wet Chem**

**Blank (B605278-BLK1)**

Prepared & Analyzed: 05/30/16

Nitrate/Nitrite as N	ND	0.020	mg/L							
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**LCS (B605278-BS1)**

Prepared & Analyzed: 05/30/16

Nitrate/Nitrite as N	1.01	0.020	mg/L	1.00		101	90-110			
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**LCS Dup (B605278-BSD1)**

Prepared & Analyzed: 05/30/16

Nitrate/Nitrite as N	1.01	0.020	mg/L	1.00		101	90-110	0.604	20	
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**Dissolved Metals by ICP - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B605268 - Dissolved Metals, E200.7/E200.8**

**Blank (B605268-BLK1)**

Prepared & Analyzed: 05/27/16

Calcium	0.044	0.020	mg/L							B1
Iron	ND	0.050	mg/L							
Magnesium	ND	0.100	mg/L							
Potassium	ND	1.00	mg/L							
Sodium	ND	1.00	mg/L							

**LCS (B605268-BS1)**

Prepared & Analyzed: 05/27/16

Calcium	4.86	0.020	mg/L	5.00		97.2	85-115			
Iron	4.91	0.050	mg/L	5.00		98.1	85-115			
Magnesium	23.6	0.100	mg/L	25.0		94.4	85-115			
Potassium	9.54	1.00	mg/L	10.0		95.4	85-115			
Sodium	7.64	1.00	mg/L	8.10		94.3	85-115			

**LCS Dup (B605268-BSD1)**

Prepared & Analyzed: 05/27/16

Calcium	4.87	0.020	mg/L	5.00		97.4	85-115	0.262	20	
Iron	4.97	0.050	mg/L	5.00		99.5	85-115	1.36	20	
Magnesium	23.7	0.100	mg/L	25.0		94.9	85-115	0.472	20	
Potassium	9.54	1.00	mg/L	10.0		95.4	85-115	0.00859	20	
Sodium	7.61	1.00	mg/L	8.10		93.9	85-115	0.381	20	

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**Notes and Definitions**

- B1 Target analyte detected in method blank at or above method reporting limit. Sample concentration found to be 10 times above the concentration found in the method blank or less than the reporting limit.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis  
\*Results reported on as received basis unless designated as dry.
- RPD Relative Percent Difference
- LCS Laboratory Control Sample (Blank Spike)
- RL Report Limit
- MDL Method Detection Limit

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## Project Information

### LT Environmental

848 E 2nd Ave  
Durango, CO 81301

Phone: (970) 385-1096

LTE

5/16/2016

Fax: -

Laboratory PM: **Debbie Zufelt**

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<b>Project Name:</b>	Archuletta Springs	<b>Invoice To:</b>	LT Environmental
<b>Project Number:</b>	[none]	<b>Invoice Bid:</b>	(list pricing)
<b>Client PM:</b>	Devin Henemann	<b>Invoice Manager:</b>	Devin Henemann

**Comments:**

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Analysis	Comment
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Alkalinity, Bicarbonate

Alkalinity, Carbonate

Alkalinity, Hydroxide

Alkalinity, Total

Bromide

Calcium Dissolved by ICP

Chloride

Conductivity

Fluoride

Iron Dissolved by ICP

Magnesium Dissolved by ICP

Nitrate/Nitrite as N

pH

Potassium Dissolved by ICP

Sodium Dissolved by ICP

Solids, Total Dissolved (TDS)

Sulfate

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