# APPENDIX C

# VOLUMETRIC FLUX CALCULATIONS

# VOLUMETRIC FLUX CALCULATIONS

## HOMOGENEOUS POROUS MEDIA FLOW

Since the field mapping incorporated a grid network for sampling, LTE assumed that the gas flow is through a porous medium. Given the various hypotheses that suggest methane may also migrate up-dip from within the basin toward the outcrop along pathways of preferential flow, for example in coal cleats and fracture systems, the assumption of gas flow through a porous medium may not be valid.

However, the spatial distribution of data suggests that the flow may mimic a homogeneous medium on a large scale because we observe relatively large areas containing contiguous sampling points that exhibit similar methane flux. If the system is fracture-dominated, we might expect to see more discontinuous areas of flux or a spatial component distributing gas flow in the direction of the predominant fracture system which is in the direction of the formation dip. This type of spatial distribution is not readily observed in the data set. Rather, a spatial component to the data set in the direction of bedding (parallel to strike) is apparent.

Therefore, when looking at gas flux on a large scale, the grid spacing appears adequate to identify the extent of seepage and provide an estimate of total flux from the project area.

LTE's experience has found that a smaller grid will likely identify discontinuities within a given seep area and that these discontinuities are likely related to stratigraphy of individual coal beds and/or subsurface structure patterns.

## VARIABLE FLOW OVER TIME

Previous work by LTE has documented both daily and seasonal changes in flow rate over time. It is not feasible to collect gas flux data from all the data points at the same time of day or within a period of one day. Therefore, there will be variations in the flow rate among each of the sampling points. In order to calculate a flux from the project area, LTE assumed that all measurements were collected at the same time.

The 2008 methane seep mapping occurred in October 2008. It is important to recognize that the estimated flux from this sampling event is for a given time period and may vary throughout the year. Determining seasonal variation may be important in estimating total annual methane flux from the Kf outcrop.

## ESTIMATION METHOD

The flux estimation method used by LTE is comprised of six steps, including data processing, grid interpolation, grid math, contouring, volume calculations, and the resultant total flux calculation. Each step involved in the method is described below.

**Data Processing**

The Flux Manager® data files for each sample point were processed in order to determine the flux of each sample point. As previously mentioned, the slope of the flux curve created in the Flux Manager® software is proportional to the flux of the sample point. The flux of each sample point, measured in moles/$m^2$•day, was calculated using the following formula:

$$\text{Flux of Sample Point} = S \times K$$

where,

S = slope of flux curve (ppm/second)
K = accumulation chamber factor

The accumulation chamber factor (K) incorporates the air temperature, barometric pressure, volume of the accumulation chamber, and surface area of the inlet to the accumulation chamber. The accumulation factor was calculated using the following formula:

$$K = \frac{86{,}400 \times P}{10^6 \times R \times T_K} \times \frac{V}{A}$$

where,

K = accumulation factor
P = barometric pressure (mBar)
V = net volume of the accumulation chamber ($m^3$)
R = gas constant (0.08314510 bar $LK^{-1}$ $mol^{-1}$)
$T_K$ = air temperature (Kelvin)
A = net area of inlet to the accumulation chamber ($m^2$)

By applying the aforementioned formulas to each data file, the flux of methane was calculated for each sample point.

**Interpolation Gridding – Kriging Method**

LTE interpolated the data using the Kriging method. The interpolation was performed using Surfer® version 8.0 by Golden Software, Inc. Surfer® is a grid-based graphics program that interpolates irregularly spaced data with Cartesian coordinated into a regulatory spaced grid.

The Kriging method is a popular geostatistical gridding method. LTE utilized this method to interpolate a grid of methane flux and carbon dioxide flux at each of the seep areas using each of the measurement points. Detailed explanation of this statistical method is described by Cressie (1993) and Armstrong and Champigny (1988).

In general, Kriging is a regression technique used in geostatistics to approximate or interpolate data. LTE utilized the Kriging defaults in Surfer® to generate grids. The Kriging algorithm can result in negative value in the regions beyond the areas where data were collected. Negative values were excluded from the maps and the area and volume calculations.

**Contouring**

Once the grids of methane flux were generated, LTE exported the positive contours from Surfer® to ArcMap to generate the contour maps of methane flux areas.

**Total Flux Calculations**

In order to estimate the total flux of each seep area, the grid volume capability in Surfer® was utilized. The Surfer® Grid Volume output files, presenting the volume estimates for each seep area, are included as Attachment C-1. Under the heading "Cut & Fill Volumes", the "Positive Volume [Cut]" represents the volume between the contoured surface and the zero plane. The units of the contoured values are in moles/$m^2$•day. Since the units for the X and Y coordinates were feet, a z-scale factor of 0.0929 $m^2/ft^2$ was used, such that the resulting volume has units of moles/$m^2$•day x $m^2/ft^2$. When the resulting volume is multiplied by the area of seepage ($ft^2$), these units are equal to moles/day.

For a better perspective of the methane 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 methane flux, the calculation is as follows:

$$\frac{\text{mol } CH_4}{\text{day}} \times \frac{16.04276\text{g } CH_4}{\text{mol } CH_4} \times \frac{0.0698 \text{ ft}^3 CH_4}{\text{g } CH_4} = \frac{\text{ft}^3 CH_4}{\text{day}}$$

For example,

$$1.0 \text{ mole/day } CH_4 = 1.12 \text{ CFD } CH_4$$

# ATTACHEMENT C-1

# SURFER® GRID VOLUME OUTPUT FILES

# Basin Creek Methane 2008
# Grid Volume Computations

Wed Jan 28 12:11:33 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\BCbln.grd |
| Grid Size: | 400 rows x 500 columns |
| X Minimum: | 2299800.16 |
| X Maximum: | 2333158.02 |
| X Spacing: | 66.849418837675 |
| Y Minimum: | 1208388.36 |
| Y Maximum: | 1235946.83 |
| Y Spacing: | 69.068847117794 |
| Z Minimum: | -0.57184890154751 |
| Z Maximum: | 7.3587641243798 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 46822.023933581 |
| Simpson's Rule: | 47356.725550053 |
| Simpson's 3/8 Rule: | 45947.996542999 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 48582.080630396 |
| Negative Volume [Fill]: | 1760.0566968143 |
| Net Volume [Cut-Fill]: | 46822.023933581 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 918666.7870885 |
| Negative Planar Area [Fill]: | 247179.31603873 |
| Blanked Planar Area: | 918125737.97107 |
| Total Planar Area: | 919291584.0742 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 918667.84143001 |
| Negative Surface Area [Fill]: | 247179.32710181 |

# Basin Creek North Methane 2008 Grid Volume Computations

Wed Jan 28 12:48:13 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\BCNbln.grd |
| Grid Size: | 400 rows x 500 columns |
| X Minimum: | 2299800.16 |
| X Maximum: | 2333158.02 |
| X Spacing: | 66.849418837675 |
| Y Minimum: | 1208388.36 |
| Y Maximum: | 1235946.83 |
| Y Spacing: | 69.068847117794 |
| Z Minimum: | -0.14415771375763 |
| Z Maximum: | 1.439433737545 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 6626.2188554706 |
| Simpson's Rule: | 7125.03491308 |
| Simpson's 3/8 Rule: | 6781.2832450949 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 6888.0274543417 |
| Negative Volume [Fill]: | 261.80859887112 |
| Net Volume [Cut-Fill]: | 6626.2188554706 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 239558.07464659 |
| Negative Planar Area [Fill]: | 129818.90852244 |
| Blanked Planar Area: | 918922207.09103 |
| Total Planar Area: | 919291584.0742 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 239558.08675739 |
| Negative Surface Area [Fill]: | 129818.90889369 |

# Carbon Junction West Methane 2008 Grid Volume Computations

Wed Jan 28 11:37:32 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\CJWbln.grd |
| Grid Size: | 400 rows x 500 columns |
| X Minimum: | 2299800.16 |
| X Maximum: | 2333158.02 |
| X Spacing: | 66.849418837675 |
| Y Minimum: | 1208388.36 |
| Y Maximum: | 1235946.83 |
| Y Spacing: | 69.068847117794 |
| Z Minimum: | -0.36215598751177 |
| Z Maximum: | 6.0053547802912 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 79488.467955336 |
| Simpson's Rule: | 79791.852198146 |
| Simpson's 3/8 Rule: | 79488.906059744 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 83274.368387595 |
| Negative Volume [Fill]: | 3785.9004322589 |
| Net Volume [Cut-Fill]: | 79488.467955336 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 2244885.2476668 |
| Negative Planar Area [Fill]: | 560071.21827295 |
| Blanked Planar Area: | 916486627.60826 |
| Total Planar Area: | 919291584.0742 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 2244885.7826838 |
| Negative Surface Area [Fill]: | 560071.22355627 |

# Carbon Junction East Methane 2008 Grid Volume Computations

Wed Jan 28 11:34:14 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\CJEbln.grd |
| Grid Size: | 400 rows x 500 columns |
| X Minimum: | 2299800.16 |
| X Maximum: | 2333158.02 |
| X Spacing: | 66.849418837675 |
| Y Minimum: | 1208388.36 |
| Y Maximum: | 1235946.83 |
| Y Spacing: | 69.068847117794 |
| Z Minimum: | -1.911087221769 |
| Z Maximum: | 65.101800763953 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 217151.3173069 |
| Simpson's Rule: | 209806.35517073 |
| Simpson's 3/8 Rule: | 209511.13165434 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 263082.49797414 |
| Negative Volume [Fill]: | 45931.180667233 |
| Net Volume [Cut-Fill]: | 217151.3173069 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 2800194.4425651 |
| Negative Planar Area [Fill]: | 1449949.4700235 |
| Blanked Planar Area: | 915041440.16161 |
| Total Planar Area: | 919291584.0742 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 2800242.4904707 |
| Negative Surface Area [Fill]: | 1449949.9360784 |

# Florida River West Methane 2008 Grid Volume Computations

Wed Jan 28 13:06:17 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\FRWbln.grd |
| Grid Size: | 400 rows x 500 columns |
| X Minimum: | 2299800.16 |
| X Maximum: | 2333158.02 |
| X Spacing: | 66.849418837675 |
| Y Minimum: | 1208388.36 |
| Y Maximum: | 1235946.83 |
| Y Spacing: | 69.068847117794 |
| Z Minimum: | -0.012250845623511 |
| Z Maximum: | 0.19899238227583 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 6385.711473237 |
| Simpson's Rule: | 6220.3727224076 |
| Simpson's 3/8 Rule: | 6375.1282084968 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 6391.2118938383 |
| Negative Volume [Fill]: | 5.5004206012912 |
| Net Volume [Cut-Fill]: | 6385.711473237 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 927352.75828366 |
| Negative Planar Area [Fill]: | 21484.367231764 |
| Blanked Planar Area: | 918342746.94868 |
| Total Planar Area: | 919291584.0742 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 927352.75899154 |
| Negative Surface Area [Fill]: | 21484.367234227 |

# Florida River East Methane 2008
# Grid Volume Computations

Wed Jan 28 13:04:49 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\FREbln.grd |
| Grid Size: | 400 rows x 500 columns |
| X Minimum: | 2299800.16 |
| X Maximum: | 2333158.02 |
| X Spacing: | 66.849418837675 |
| Y Minimum: | 1208388.36 |
| Y Maximum: | 1235946.83 |
| Y Spacing: | 69.068847117794 |
| Z Minimum: | -0.034781694878944 |
| Z Maximum: | 3.6572840709951 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 33314.836072048 |
| Simpson's Rule: | 33410.810340486 |
| Simpson's 3/8 Rule: | 33235.269873131 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 33323.176931184 |
| Negative Volume [Fill]: | 18.28879377371 |
| Net Volume [Cut-Fill]: | 33304.88813741 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 1279054.3048349 |
| Negative Planar Area [Fill]: | 11456.530111915 |
| Blanked Planar Area: | 918001073.23925 |
| Total Planar Area: | 919291584.0742 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 1279054.5075661 |
| Negative Surface Area [Fill]: | 11456.530157009 |

# Vosberg Pike Methane 2008
# Grid Volume Computations

Wed Mar 25 15:14:52 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\VP2008_bln2007.grd |
| Grid Size: | 35 rows x 50 columns |
| X Minimum: | 2348650 |
| X Maximum: | 2351250 |
| X Spacing: | 53.061224489796 |
| Y Minimum: | 1243200 |
| Y Maximum: | 1244450 |
| Y Spacing: | 36.764705882353 |
| Z Minimum: | -0.041527038367065 |
| Z Maximum: | 1.5341162808202 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 12909.856125498 |
| Simpson's Rule: | 12797.063481772 |
| Simpson's 3/8 Rule: | 13015.576701289 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 12986.717110286 |
| Negative Volume [Fill]: | 76.860984787882 |
| Net Volume [Cut-Fill]: | 12909.856125498 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 700742.47340047 |
| Negative Planar Area [Fill]: | 93225.113634344 |
| Blanked Planar Area: | 2456032.4129652 |
| Total Planar Area: | 3250000 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 700742.51218822 |
| Negative Surface Area [Fill]: | 93225.113690002 |

# SFTC Central and West Methane 2008 GridVolume Computations
## (excludes the SFTC Main Seep Area)

Wed Mar 25 13:23:08 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\TCTCW_no_msa_bln.grd |
| Grid Size: | 100 rows x 300 columns |
| X Minimum: | 2370551.31 |
| X Maximum: | 2389166.71 |
| X Spacing: | 62.258862876254 |
| Y Minimum: | 1237547.03 |
| Y Maximum: | 1244549.3 |
| Y Spacing: | 70.73 |
| Z Minimum: | -33.660708451199 |
| Z Maximum: | 26.742788346676 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | -712493.94054678 |
| Simpson's Rule: | -719625.83391973 |
| Simpson's 3/8 Rule: | -705636.15421034 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 155066.57711718 |
| Negative Volume [Fill]: | 867560.51766397 |
| Net Volume [Cut-Fill]: | -712493.94054678 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 1778482.5290427 |
| Negative Planar Area [Fill]: | 1306217.8155091 |
| Blanked Planar Area: | 127265356.61345 |
| Total Planar Area: | 130350056.958 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 1778489.6377549 |
| Negative Surface Area [Fill]: | 1306294.801259 |

# SFTC Main Seep Area Methane 2008
# Grid Volume Computations

Wed Mar 25 13:21:40 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\TCmsa_bln.grd |
| Grid Size: | 100 rows x 300 columns |
| X Minimum: | 2370551.31 |
| X Maximum: | 2389166.71 |
| X Spacing: | 62.258862876254 |
| Y Minimum: | 1237547.03 |
| Y Maximum: | 1244549.3 |
| Y Spacing: | 70.73 |
| Z Minimum: | -32.245497506158 |
| Z Maximum: | 189.99182374144 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | -137591.86185541 |
| Simpson's Rule: | -168853.98846993 |
| Simpson's 3/8 Rule: | -120890.08961923 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 276824.14336604 |
| Negative Volume [Fill]: | 414416.00522145 |
| Net Volume [Cut-Fill]: | -137591.8618554 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 166530.60586402 |
| Negative Planar Area [Fill]: | 256212.05377477 |
| Blanked Planar Area: | 129927314.29836 |
| Total Planar Area: | 130350056.958 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 167157.04038842 |
| Negative Surface Area [Fill]: | 256252.11911783 |

# Texas Creek East Methane 2008
# Grid Volume Computations

Wed Mar 25 13:53:18 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\TCEbln.grd |
| Grid Size: | 100 rows x 300 columns |
| X Minimum: | 2370551.31 |
| X Maximum: | 2389166.71 |
| X Spacing: | 62.258862876254 |
| Y Minimum: | 1237547.03 |
| Y Maximum: | 1244549.3 |
| Y Spacing: | 70.73 |
| Z Minimum: | -1.0445713354189 |
| Z Maximum: | 16.97759153733 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 162087.29069692 |
| Simpson's Rule: | 162557.95352597 |
| Simpson's 3/8 Rule: | 159026.22729268 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 166865.93360604 |
| Negative Volume [Fill]: | 4778.6429091123 |
| Net Volume [Cut-Fill]: | 162087.29069692 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 689860.45966196 |
| Negative Planar Area [Fill]: | 263512.30921095 |
| Blanked Planar Area: | 129396684.18913 |
| Total Planar Area: | 130350056.958 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 689867.16190868 |
| Negative Surface Area [Fill]: | 263512.35861335 |

# BP Highlands Methane 2008
# Grid Volume Computations

Wed Jan 28 15:39:05 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\HPbln.grd |
| Grid Size: | 100 rows x 300 columns |
| X Minimum: | 2370551.31 |
| X Maximum: | 2389166.71 |
| X Spacing: | 62.258862876254 |
| Y Minimum: | 1237547.03 |
| Y Maximum: | 1244549.3 |
| Y Spacing: | 70.73 |
| Z Minimum: | -2.4062609073157 |
| Z Maximum: | 27.741073331506 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 110328.00351183 |
| Simpson's Rule: | 111419.06974111 |
| Simpson's 3/8 Rule: | 109645.00283287 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 132033.07345607 |
| Negative Volume [Fill]: | 21705.069944241 |
| Net Volume [Cut-Fill]: | 110328.00351183 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 414593.06364512 |
| Negative Planar Area [Fill]: | 569604.69082645 |
| Blanked Planar Area: | 129365859.20353 |
| Total Planar Area: | 130350056.958 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 414602.48362396 |
| Negative Surface Area [Fill]: | 569604.87282752 |

# Pine River Methane 2008
# Grid Volume Computations

Wed Jan 28 15:40:22 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\PRbln.grd |
| Grid Size: | 100 rows x 300 columns |
| X Minimum: | 2370551.31 |
| X Maximum: | 2389166.71 |
| X Spacing: | 62.258862876254 |
| Y Minimum: | 1237547.03 |
| Y Maximum: | 1244549.3 |
| Y Spacing: | 70.73 |
| Z Minimum: | -8.606958818056 |
| Z Maximum: | 176.96420057375 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 2160180.3497632 |
| Simpson's Rule: | 2161365.3154625 |
| Simpson's 3/8 Rule: | 2200060.1595944 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 2467707.00985 |
| Negative Volume [Fill]: | 307526.6600868 |
| Net Volume [Cut-Fill]: | 2160180.3497632 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 3280555.6424588 |
| Negative Planar Area [Fill]: | 3522959.036103 |
| Blanked Planar Area: | 123546542.27944 |
| Total Planar Area: | 130350056.958 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 3281142.9176216 |
| Negative Surface Area [Fill]: | 3522964.6620555 |

# Western Section Methane 2008
# Grid Volume Computations

Wed Jan 28 13:09:39 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\LeftBln.grd |
| Grid Size: | 400 rows x 500 columns |
| X Minimum: | 2299800.16 |
| X Maximum: | 2333158.02 |
| X Spacing: | 66.849418837675 |
| Y Minimum: | 1208388.36 |
| Y Maximum: | 1235946.83 |
| Y Spacing: | 69.068847117794 |
| Z Minimum: | -1.911087221769 |
| Z Maximum: | 65.101800763953 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 1271937.2033116 |
| Simpson's Rule: | 1263519.106366 |
| Simpson's 3/8 Rule: | 1263996.1589457 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 1387438.4826016 |
| Negative Volume [Fill]: | 115510.80013193 |
| Net Volume [Cut-Fill]: | 1271927.6824696 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 55153154.724879 |
| Negative Planar Area [Fill]: | 13320103.530078 |
| Blanked Planar Area: | 850818325.81924 |
| Total Planar Area: | 919291584.0742 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 55153214.552806 |
| Negative Surface Area [Fill]: | 13320104.088996 |

# Central Section Methane 2008
# Grid Volume Computations

Wed Jan 28 13:52:33 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\VPbln.grd |
| Grid Size: | 35 rows x 50 columns |
| X Minimum: | 2348650 |
| X Maximum: | 2351250 |
| X Spacing: | 53.061224489796 |
| Y Minimum: | 1243200 |
| Y Maximum: | 1244450 |
| Y Spacing: | 36.764705882353 |
| Z Minimum: | -0.041527038367065 |
| Z Maximum: | 1.5341162808202 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 18092.058459375 |
| Simpson's Rule: | 18230.902866007 |
| Simpson's 3/8 Rule: | 18191.668260911 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 18389.322321107 |
| Negative Volume [Fill]: | 297.26386173228 |
| Net Volume [Cut-Fill]: | 18092.058459375 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 1805792.0998637 |
| Negative Planar Area [Fill]: | 409318.94455405 |
| Blanked Planar Area: | 1034888.9555822 |
| Total Planar Area: | 3250000 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 1805792.1437488 |
| Negative Surface Area [Fill]: | 409318.94467663 |

# Eastern Section Methane 2008 Grid Volume Computations

Wed Jan 28 14:50:45 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\rightbln.grd |
| Grid Size: | 100 rows x 300 columns |
| X Minimum: | 2370551.31 |
| X Maximum: | 2389166.71 |
| X Spacing: | 62.258862876254 |
| Y Minimum: | 1237547.03 |
| Y Maximum: | 1244549.3 |
| Y Spacing: | 70.73 |
| Z Minimum: | -33.660708451199 |
| Z Maximum: | 189.99182374144 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 1535638.8909595 |
| Simpson's Rule: | 1501030.3305766 |
| Simpson's 3/8 Rule: | 1594101.7118282 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 3375267.7176854 |
| Negative Volume [Fill]: | 1839628.8267259 |
| Net Volume [Cut-Fill]: | 1535638.8909595 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 15127208.741124 |
| Negative Planar Area [Fill]: | 10303404.377772 |
| Blanked Planar Area: | 104919443.8391 |
| Total Planar Area: | 130350056.958 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 15128459.503295 |
| Negative Surface Area [Fill]: | 10303540.575104 |

# Western Section CO2 2008 – Grid Volume Computations

Fri Feb 20 14:42:38 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\LeftCO2.grd |
| Grid Size: | 550 rows x 650 columns |
| X Minimum: | 2299800.16 |
| X Maximum: | 2333158.02 |
| X Spacing: | 51.398859784283 |
| Y Minimum: | 1208388.36 |
| Y Maximum: | 1235946.83 |
| Y Spacing: | 50.197577413479 |
| Z Minimum: | -1.4905159839471 |
| Z Maximum: | 20.163594912323 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 1311386.238437 |
| Simpson's Rule: | 1309554.7278149 |
| Simpson's 3/8 Rule: | 1310766.4999213 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 1320485.3660679 |
| Negative Volume [Fill]: | 9101.4791168014 |
| Net Volume [Cut-Fill]: | 1311383.8869511 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 47036608.455246 |
| Negative Planar Area [Fill]: | 502991.72089464 |
| Blanked Planar Area: | 871751983.89805 |
| Total Planar Area: | 919291584.0742 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 47036620.372643 |
| Negative Surface Area [Fill]: | 502991.95337957 |

# Vosburg Pike CO2 2008 - Grid Volume Computations

Fri Feb 20 15:01:44 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\VP_CO2.grd |
| Grid Size: | 21 rows x 50 columns |
| X Minimum: | 2348757.75 |
| X Maximum: | 2351166.22 |
| X Spacing: | 49.152448979596 |
| Y Minimum: | 1243336.25 |
| Y Maximum: | 1244351.04 |
| Y Spacing: | 50.739500000002 |
| Z Minimum: | 0.027327776458673 |
| Z Maximum: | 1.4809742535902 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 37536.703717811 |
| Simpson's Rule: | 37401.389123498 |
| Simpson's 3/8 Rule: | 37580.993004894 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 37536.703717811 |
| Negative Volume [Fill]: | 0 |
| Net Volume [Cut-Fill]: | 37536.703717811 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 1759496.3182677 |
| Negative Planar Area [Fill]: | 0 |
| Blanked Planar Area: | 684594.95303258 |
| Total Planar Area: | 2444091.2713003 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 1759496.3552015 |
| Negative Surface Area [Fill]: | 0 |

# Eastern Section CO2 2008 - Grid Volume Computations

Fri Feb 20 14:56:32 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\rightCO2.grd |
| Grid Size: | 140 rows x 375 columns |
| X Minimum: | 2370551.31 |
| X Maximum: | 2389166.71 |
| X Spacing: | 49.773796791444 |
| Y Minimum: | 1237547.03 |
| Y Maximum: | 1244549.3 |
| Y Spacing: | 50.376043165468 |
| Z Minimum: | -0.073295509084999 |
| Z Maximum: | 6.711726587168 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 725222.80461288 |
| Simpson's Rule: | 726012.89185111 |
| Simpson's 3/8 Rule: | 724236.56980068 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 725261.37130733 |
| Negative Volume [Fill]: | 38.566694452776 |
| Net Volume [Cut-Fill]: | 725222.80461288 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 16448411.842518 |
| Negative Planar Area [Fill]: | 7699.8763172065 |
| Blanked Planar Area: | 113893945.23916 |
| Total Planar Area: | 130350056.958 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 16448413.306044 |
| Negative Surface Area [Fill]: | 7699.8767164545 |

# Western Section CO2 2008 - Gridding Report

Fri Feb 20 14:39:44 2009
Elasped time for gridding: 0.81 seconds

## Data Source

| | |
|---|---|
| Source Data File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\Left.txt |
| X Column: | B |
| Y Column: | C |
| Z Column: | E |

## Data Counts

| | |
|---|---|
| Active Data: | 1127 |
| Original Data: | 1127 |
| Excluded Data: | 0 |
| Deleted Duplicates: | 0 |
| Retained Duplicates: | 0 |
| Artificial Data: | 0 |
| Superseded Data: | 0 |

## Univariate Statistics

| | X | Y | Z |
|---|---|---|---|
| Minimum: | 2299800.16 | 1208388.36 | 0 |
| 25%-tile: | 2305987.45 | 1213609.63 | 0.07 |
| Median: | 2315408.5 | 1220581.52 | 0.13 |
| 75%-tile: | 2322981.33 | 1229185.36 | 0.25 |
| Maximum: | 2333158.02 | 1235946.83 | 21.54 |
| Midrange: | 2316479.09 | 1222167.595 | 10.77 |
| Range: | 33357.86 | 27558.47 | 21.54 |
| Interquartile Range: | 16993.88 | 15575.73 | 0.18 |
| Median Abs. Deviation: | 8598.4900000002 | 7413.5 | 0.08 |
| Mean: | 2315275.5935936 | 1221347.8087578 | 0.30436887409938 |
| Trim Mean (10%): | 2315141.4485616 | 1221279.8102759 | 0.17394088669951 |
| Standard Deviation: | 9248.8326622228 | 8566.4428044858 | 1.0624401231135 |
| Variance: | 85540905.613799 | 73383942.322526 | 1.1287790152014 |
| Coef. of Variation: | | | 3.4906332858681 |
| Coef. of Skewness: | | | 13.032428774764 |

## Inter-Variable Correlation

| | X | Y | Z |
|---|---|---|---|
| X: | 1.000 | 0.991 | -0.034 |
| Y: | | 1.000 | -0.035 |
| Z: | | | 1.000 |

## Inter-Variable Covariance

| | X | Y | Z |
|---|---|---|---|
| X: | 85540905.613799 | 78546603.145322 | -335.09727193509 |
| Y: | | 73383942.322526 | -317.06919051935 |
| Z: | | | 1.1287790152014 |

## Planar Regression: Z = AX+BY+C

**Fitted Parameters**

| | A | B | C |
|---|---|---|---|
| Parameter Value: | 2.9134036790603E-006 | | -7.4390439911211E-006 |
| Standard Error: | 2.6135234024707E-005 | | 2.8217127175208E-005 |

**Inter-Parameter Correlations**

| | A | B | C |
|---|---|---|---|
| A: | 1.000 | 0.991 | -0.986 |
| B: | | 1.000 | -0.955 |
| C: | | | 1.000 |

**ANOVA Table**

| Source | df | Sum of Squares | Mean Square | F |
|---|---|---|---|---|
| Regression: | 2 | 1.5579821569038 | 0.7789910784519 | 0.68913 |
| Residual: | 1124 | 1270.5759679751 | 1.1304056654582 | |
| Total: | 1126 | 1272.133950132 | | |

Coefficient of Multiple Determination (R^2): 0.0012246997706037

## Nearest Neighbor Statistics

| | Separation | \|Delta Z\| |
|---|---|---|
| Minimum: | 34.252357582997 | 0 |
| 25%-tile: | 182.68511406225 | 0.04 |
| Median: | 189.85777439952 | 0.1 |
| 75%-tile: | 195.44552821712 | 0.21 |
| Maximum: | 446.35540379826 | 19.85 |
| Midrange: | 240.30388069063 | 9.925 |
| Range: | 412.10304621526 | 19.85 |
| Interquartile Range: | 12.760414154869 | 0.17 |
| Median Abs. Deviation: | 6.2670251771804 | 0.07 |
| Mean: | 185.00060825585 | 0.40313891755457 |
| Trim Mean (10%): | 187.85704329654 | 0.16454278466305 |
| Standard Deviation: | 24.300399047244 | 1.4940710762149 |
| Variance: | 590.50939385532 | 2.2322483807818 |
| Coef. of Variation: | 0.13135307649171 | 3.706094874883 |
| Coef. of Skewness: | -1.6679522220323 | 8.4240511058939 |
| Root Mean Square: | 186.58974904557 | 1.5475042383234 |
| Mean Square: | 34815.73444889 | 2.3947693676289 |

**Complete Spatial Randomness**

| | |
|---|---|
| Lambda: | 1.2259439981004E-006 |
| Clark and Evans: | 0.40967406185823 |
| Skellam: | 302.23863374799 |

## Exclusion Filtering

Exclusion Filter String: Not In Use

## Duplicate Filtering

Duplicate Points to Keep: First
X Duplicate Tolerance: 0.0039
Y Duplicate Tolerance: 0.0032

No duplicate data were found.

## Breakline Filtering

Breakline Filtering: Not In Use

## Gridding Rules

| | |
|---|---|
| Gridding Method: | Kriging |
| Kriging Type: | Point |
| Polynomial Drift Order: | 0 |
| Kriging std. deviation grid: | no |

**Semi-Variogram Model**

| | |
|---|---|
| Component Type: | Linear |
| Anisotropy Angle: | 0 |
| Anisotropy Ratio: | 1 |
| Variogram Slope: | 1 |

**Search Parameters**

| | |
|---|---|
| Search Ellipse Radius #1: | 300 |
| Search Ellipse Radius #2: | 300 |
| Search Ellipse Angle: | 0 |
| Number of Search Sectors: | 4 |
| Maximum Data Per Sector: | 16 |
| Maximum Empty Sectors: | 3 |
| Minimum Data: | 3 |
| Maximum Data: | 64 |

## Output Grid

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\LeftCO2.grd |
| Grid Size: | 550 rows x 650 columns |
| Total Nodes: | 357500 |
| Filled Nodes: | 19927 |
| Blanked Nodes: | 337573 |

**Grid Geometry**

| | |
|---|---|
| X Minimum: | 2299800.16 |
| X Maximum: | 2333158.02 |
| X Spacing: | 51.398859784283 |
| Y Minimum: | 1208388.36 |
| Y Maximum: | 1235946.83 |
| Y Spacing: | 50.197577413479 |

**Grid Statistics**

| | |
|---|---|
| Z Minimum: | -1.4905159839471 |
| Z 25%-tile: | 0.083769758395644 |
| Z Median: | 0.15053998550404 |
| Z 75%-tile: | 0.26506867679136 |
| Z Maximum: | 20.163594912323 |

| | |
|---|---|
| Z Midrange: | 9.3365394641881 |
| Z Range: | 21.65411089627 |
| Z Interquartile Range: | 0.18129891839572 |
| Z Median Abs. Deviation: | 0.079859644145246 |
| | |
| Z Mean: | 0.27469442432854 |
| Z Trim Mean (10%): | 0.1892625911297 |
| Z Standard Deviation: | 0.66240011596735 |
| Z Variance: | 0.43877391363356 |
| | |
| Z Coef. of Variation: | 2.411407212165 |
| Z Coef. of Skewness: | 11.716566874224 |
| | |
| Z Root Mean Square: | 0.71709897531007 |
| Z Mean Square: | 0.51423094039075 |

# Vosburg Pike CO2 2008 - Grid Volume Computations

Fri Feb 20 15:01:44 2009

## Upper Surface

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\VP_CO2.grd |
| Grid Size: | 21 rows x 50 columns |
| X Minimum: | 2348757.75 |
| X Maximum: | 2351166.22 |
| X Spacing: | 49.152448979596 |
| Y Minimum: | 1243336.25 |
| Y Maximum: | 1244351.04 |
| Y Spacing: | 50.739500000002 |
| Z Minimum: | 0.027327776458673 |
| Z Maximum: | 1.4809742535902 |

## Lower Surface

Level Surface defined by Z = 0

## Volumes

| | |
|---|---|
| Z Scale Factor: | 0.0929 |

**Total Volumes by:**

| | |
|---|---|
| Trapezoidal Rule: | 37536.703717811 |
| Simpson's Rule: | 37401.389123498 |
| Simpson's 3/8 Rule: | 37580.993004894 |

**Cut & Fill Volumes**

| | |
|---|---|
| Positive Volume [Cut]: | 37536.703717811 |
| Negative Volume [Fill]: | 0 |
| Net Volume [Cut-Fill]: | 37536.703717811 |

## Areas

**Planar Areas**

| | |
|---|---|
| Positive Planar Area [Cut]: | 1759496.3182677 |
| Negative Planar Area [Fill]: | 0 |
| Blanked Planar Area: | 684594.95303258 |
| Total Planar Area: | 2444091.2713003 |

**Surface Areas**

| | |
|---|---|
| Positive Surface Area [Cut]: | 1759496.3552015 |
| Negative Surface Area [Fill]: | 0 |

# Eastern Section CO2 2008 - Gridding Report

Fri Feb 20 14:48:12 2009
Elasped time for gridding: 0.22 seconds

## Data Source

| | |
|---|---|
| Source Data File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\right.txt |
| X Column: | B |
| Y Column: | C |
| Z Column: | E |

## Data Counts

| | |
|---|---|
| Active Data: | 582 |
| Original Data: | 582 |
| Excluded Data: | 0 |
| Deleted Duplicates: | 0 |
| Retained Duplicates: | 0 |
| Artificial Data: | 0 |
| Superseded Data: | 0 |

## Univariate Statistics

| | X | Y | Z |
|---|---|---|---|
| Minimum: | 2370551.31 | 1237547.03 | 0 |
| 25%-tile: | 2373882.06 | 1240165.27 | 0.15 |
| Median: | 2377552.58 | 1242747.44 | 0.3 |
| 75%-tile: | 2382765.9 | 1243344.84 | 0.54 |
| Maximum: | 2389166.71 | 1244549.3 | 7.47 |
| Midrange: | 2379859.01 | 1241048.165 | 3.735 |
| Range: | 18615.4 | 7002.27 | 7.47 |
| Interquartile Range: | 8883.8399999999 | 3179.5700000001 | 0.39 |
| Median Abs. Deviation: | 3894.8500000001 | 760.05000000005 | 0.18 |
| Mean: | 2378288.9572337 | 1241860.3246735 | 0.44298472560533 |
| Trim Mean (10%): | 2378137.9004389 | 1241939.2700954 | 0.36553435114504 |
| Standard Deviation: | 5177.7405188756 | 1852.5339641942 | 0.58709180963183 |
| Variance: | 26808996.880806 | 3431882.0884933 | 0.34467679293677 |
| Coef. of Variation: | | | 1.3253093745604 |
| Coef. of Skewness: | | | 6.2104478562642 |

## Inter-Variable Correlation

| | X | Y | Z |
|---|---|---|---|
| X: | 1.000 | -0.948 | -0.134 |
| Y: | | 1.000 | 0.113 |
| Z: | | | 1.000 |

## Inter-Variable Covariance

| | X | Y | Z |
|---|---|---|---|
| X: | 26808996.880806 | -9097913.0253724 | -408.18477086285 |
| Y: | | 3431882.0884933 | 122.59505089602 |
| Z: | | | 0.34467679293677 |

## Planar Regression: Z = AX+BY+C

**Fitted Parameters**

| | A | B | C |
|---|---|---|---|
| Parameter Value: | -3.0922556325911E-005 | | -4.6249006895548E-005 |
| Standard Error: | 1.4725022202844E-005 | | 4.1155706471783E-005 |

**Inter-Parameter Correlations**

| | A | B | C |
|---|---|---|---|
| A: | 1.000 | -0.948 | -0.982 |
| B: | | 1.000 | 0.991 |
| C: | | | 1.000 |

**ANOVA Table**

| Source | df | Sum of Squares | Mean Square | F |
|---|---|---|---|---|
| Regression: | 2 | 4.0461936345264 | 2.0230968172632 | 5.9595 |
| Residual: | 579 | 196.55569985468 | 0.3394744384364 | |
| Total: | 581 | 200.6018934892 | | |

Coefficient of Multiple Determination (R^2): 0.020170266412487

## Nearest Neighbor Statistics

| | Separation | \|Delta Z\| |
|---|---|---|
| Minimum: | 5.4124393763972 | 0 |
| 25%-tile: | 79.691710986884 | 0.08 |
| Median: | 184.344700222 | 0.2 |
| 75%-tile: | 192.82191784129 | 0.43 |
| Maximum: | 222.48722974584 | 7.26 |
| Midrange: | 113.94983456112 | 3.63 |
| Range: | 217.07479036944 | 7.26 |
| Interquartile Range: | 113.1302068544 | 0.35 |
| Median Abs. Deviation: | 12.861316927261 | 0.15 |
| Mean: | 147.23467029023 | 0.40192936374175 |
| Trim Mean (10%): | 151.42302270775 | 0.2893757436979 |
| Standard Deviation: | 65.143951082492 | 0.72462188898158 |
| Variance: | 4243.7343626382 | 0.52507688199123 |
| Coef. of Variation: | 0.44244980447934 | 1.8028587964704 |
| Coef. of Skewness: | -0.99941196832253 | 5.4270276156867 |
| Root Mean Square: | 161.00243010002 | 0.8286278389175 |
| Mean Square: | 25921.782498111 | 0.68662409542908 |

**Complete Spatial Randomness**

| | |
|---|---|
| Lambda: | 4.4649002354293E-006 |
| Clark and Evans: | 0.62222286111561 |
| Skellam: | 423.23295304898 |

## Exclusion Filtering

Exclusion Filter String: Not In Use

## Duplicate Filtering

| | |
|---|---|
| Duplicate Points to Keep: | First |
| X Duplicate Tolerance: | 0.0022 |
| Y Duplicate Tolerance: | 0.00083 |

No duplicate data were found.

## Breakline Filtering

Breakline Filtering: Not In Use

## Gridding Rules

| | |
|---|---|
| Gridding Method: | Kriging |
| Kriging Type: | Point |
| Polynomial Drift Order: | 0 |
| Kriging std. deviation grid: | no |

**Semi-Variogram Model**

| | |
|---|---|
| Component Type: | Linear |
| Anisotropy Angle: | 0 |
| Anisotropy Ratio: | 1 |
| Variogram Slope: | 1 |

**Search Parameters**

| | |
|---|---|
| Search Ellipse Radius #1: | 250 |
| Search Ellipse Radius #2: | 250 |
| Search Ellipse Angle: | 0 |
| Number of Search Sectors: | 4 |
| Maximum Data Per Sector: | 16 |
| Maximum Empty Sectors: | 3 |
| Minimum Data: | 3 |
| Maximum Data: | 64 |

## Output Grid

| | |
|---|---|
| Grid File Name: | P:\LaPlata\2008 Detailed Seep Mapping\Surfer\rightCO2.grd |
| Grid Size: | 140 rows x 375 columns |
| Total Nodes: | 52500 |
| Filled Nodes: | 7220 |
| Blanked Nodes: | 45280 |

**Grid Geometry**

| | |
|---|---|
| X Minimum: | 2370551.31 |
| X Maximum: | 2389166.71 |
| X Spacing: | 49.773796791444 |
| Y Minimum: | 1237547.03 |
| Y Maximum: | 1244549.3 |
| Y Spacing: | 50.376043165468 |

**Grid Statistics**

| | |
|---|---|
| Z Minimum: | -0.073295509084999 |
| Z 25%-tile: | 0.2007713590376 |
| Z Median: | 0.33424908967218 |
| Z 75%-tile: | 0.51959081511349 |
| Z Maximum: | 6.711726587168 |

| | |
|---|---|
| Z Midrange: | 3.3192155390415 |
| Z Range: | 6.785022096253 |
| Z Interquartile Range: | 0.31881945607589 |
| Z Median Abs. Deviation: | 0.15147187369874 |
| | |
| Z Mean: | 0.43193666045866 |
| Z Trim Mean (10%): | 0.37626056094093 |
| Z Standard Deviation: | 0.44304027139336 |
| Z Variance: | 0.1962846820763 |
| | |
| Z Coef. of Variation: | 1.0257065721694 |
| Z Coef. of Skewness: | 5.2792184511934 |
| | |
| Z Root Mean Square: | 0.61875193795615 |
| Z Mean Square: | 0.38285396072449 |

**APPENDIX D**

**SUSPECT AREA PHOTOS**

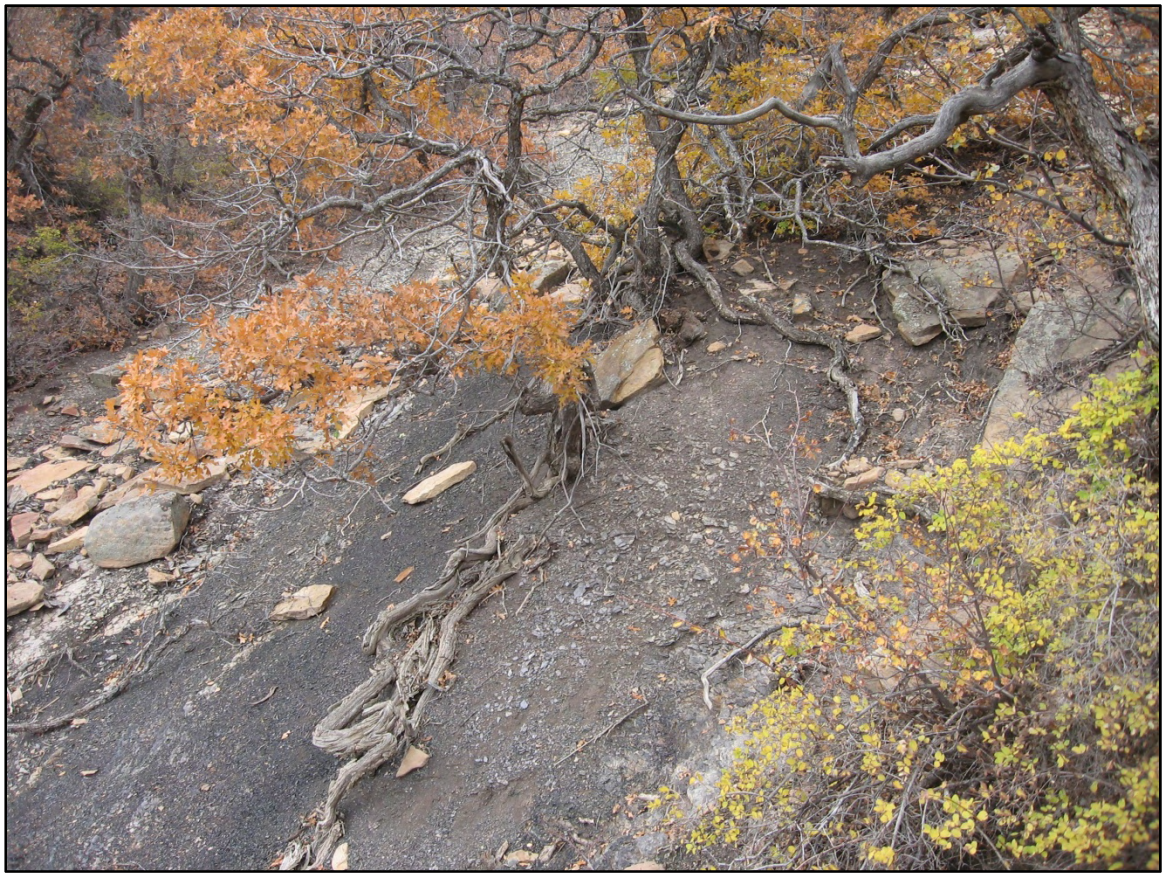

**Photo 1 - Suspect Area 8, October 20, 2008.**

**Photo 2 - Suspect Area 8, October 20, 2008.**

**Photo 3 - Suspect Area 12, October 20, 2008.**

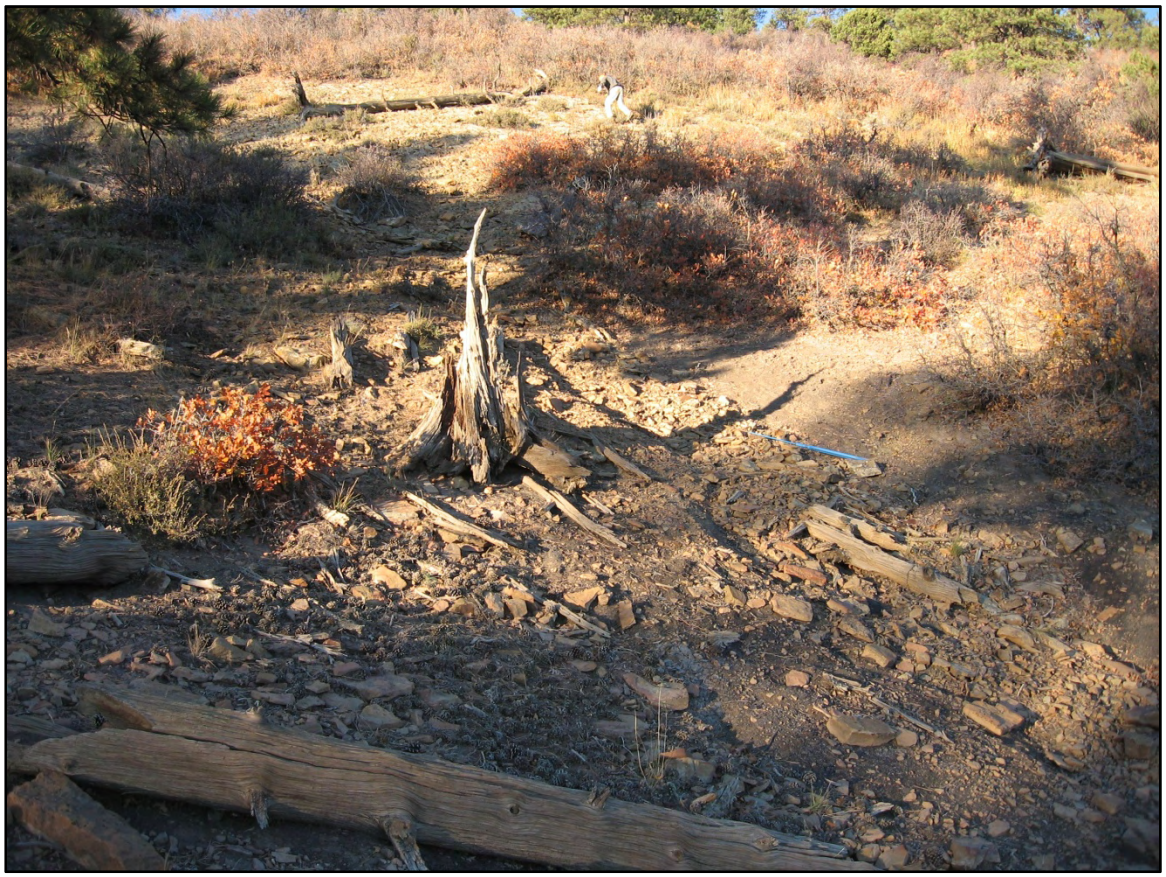

**Photo 4 - Suspect Area 18, October 22, 2008.**

**Photo 5 - Suspect Area 19, October 22, 2008.**

**Photo 6 - Suspect Area 20, October 22, 2008.**

**Photo 7 - Suspect Area 23, October 22, 2008.**

**Photo 8 - Suspect Area 24, October 22, 2008.**

**Photo 9 - Suspect Area 25, October 21, 2008.**

**Photo 10 - Suspect Area 26, October 21, 2008.**

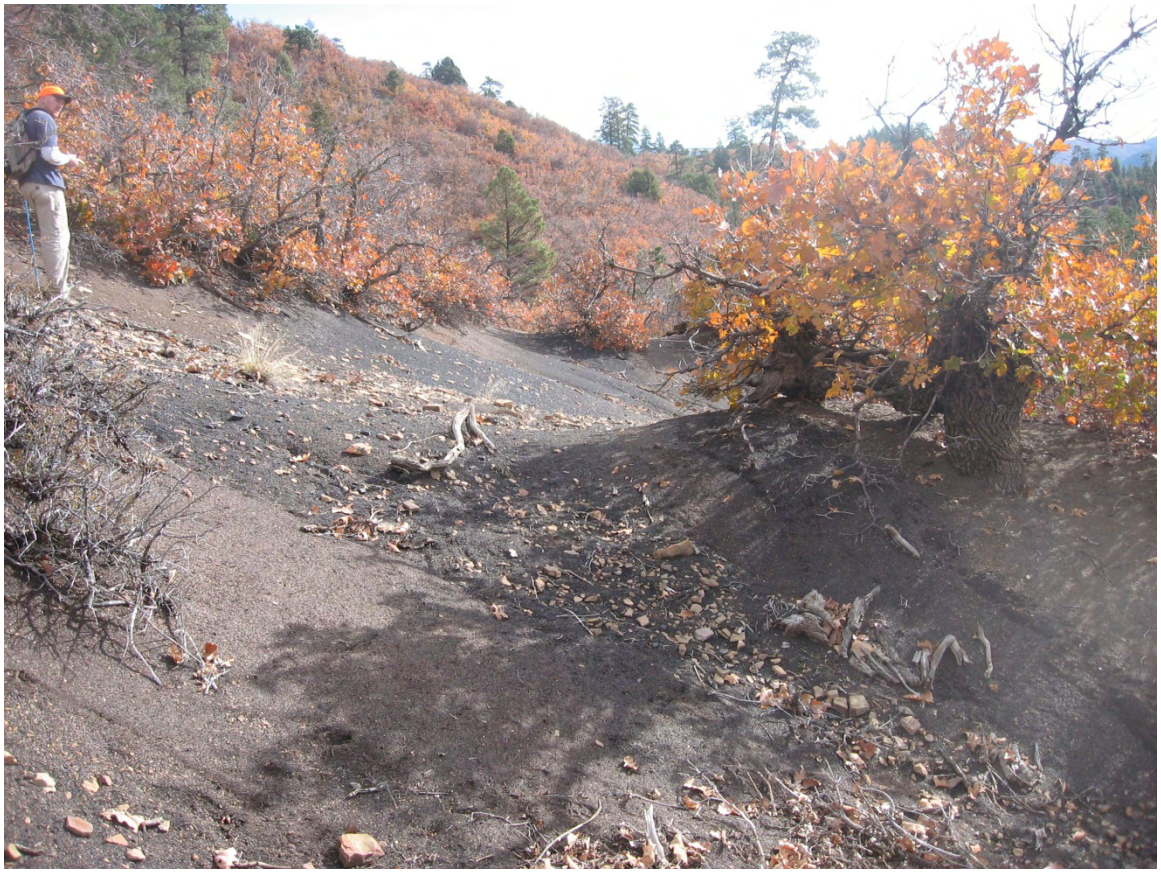

**Photo 11 - Suspect Area 27, October 21, 2008.**

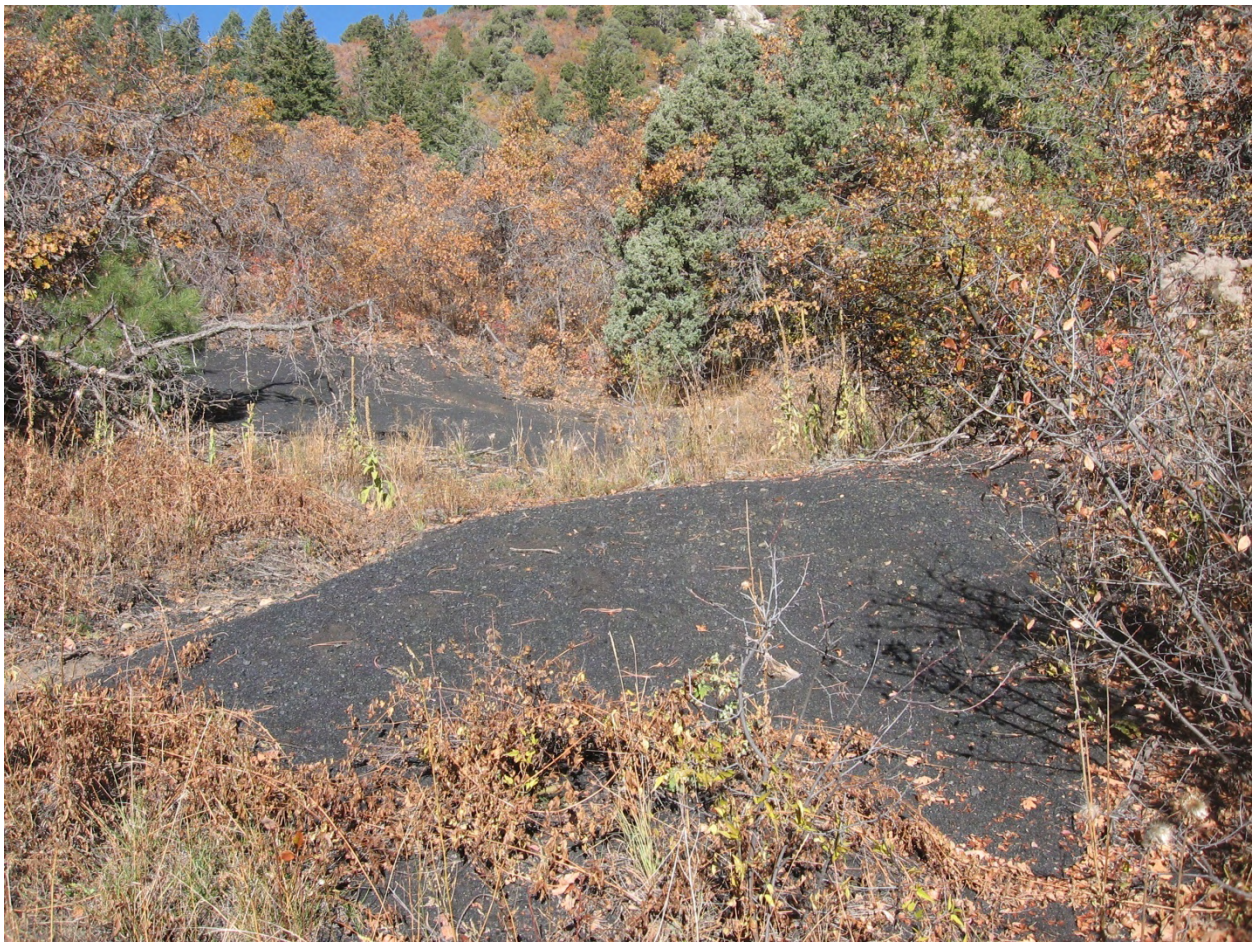

**Photo 12 - Suspect Area 27, October 21, 2008.**

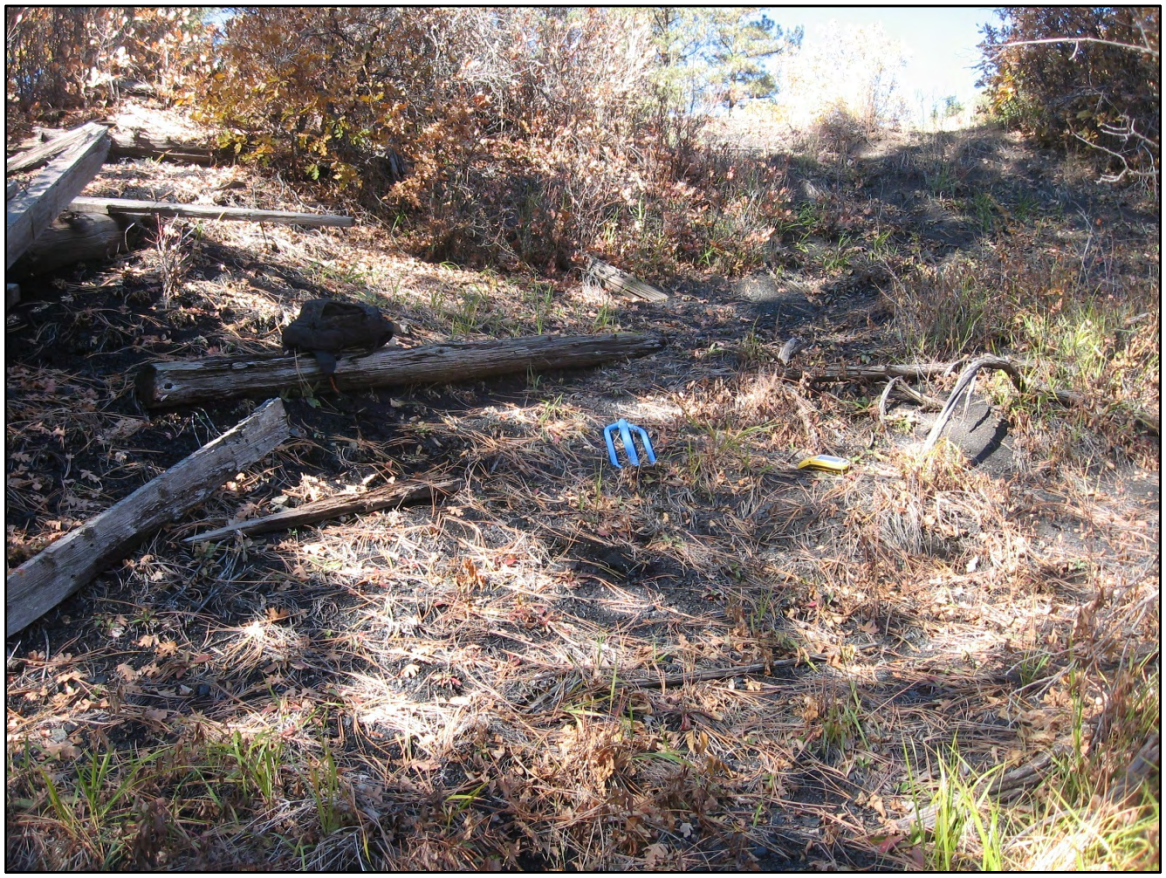

**Photo 13 - Suspect Area 30, October 17, 2008.**

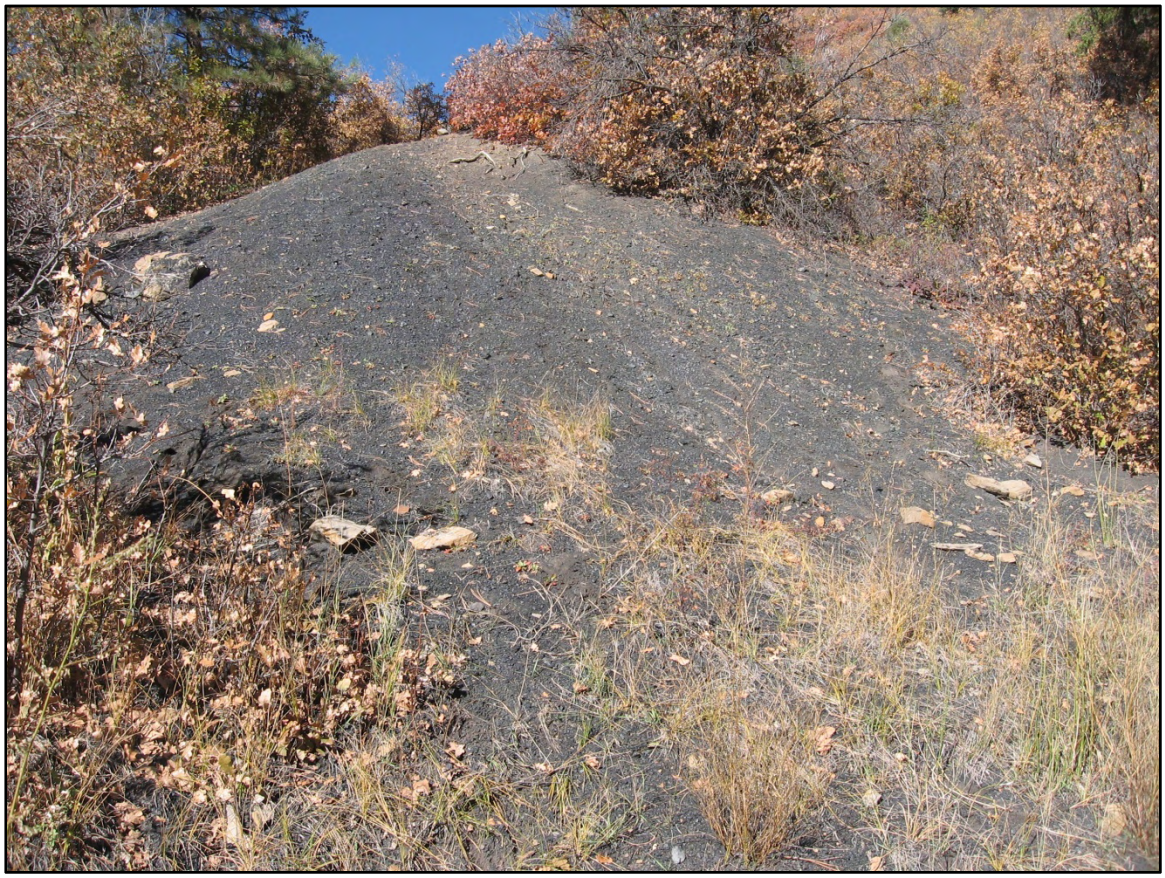

**Photo 14 - Suspect Area 30, October 17, 2008.**

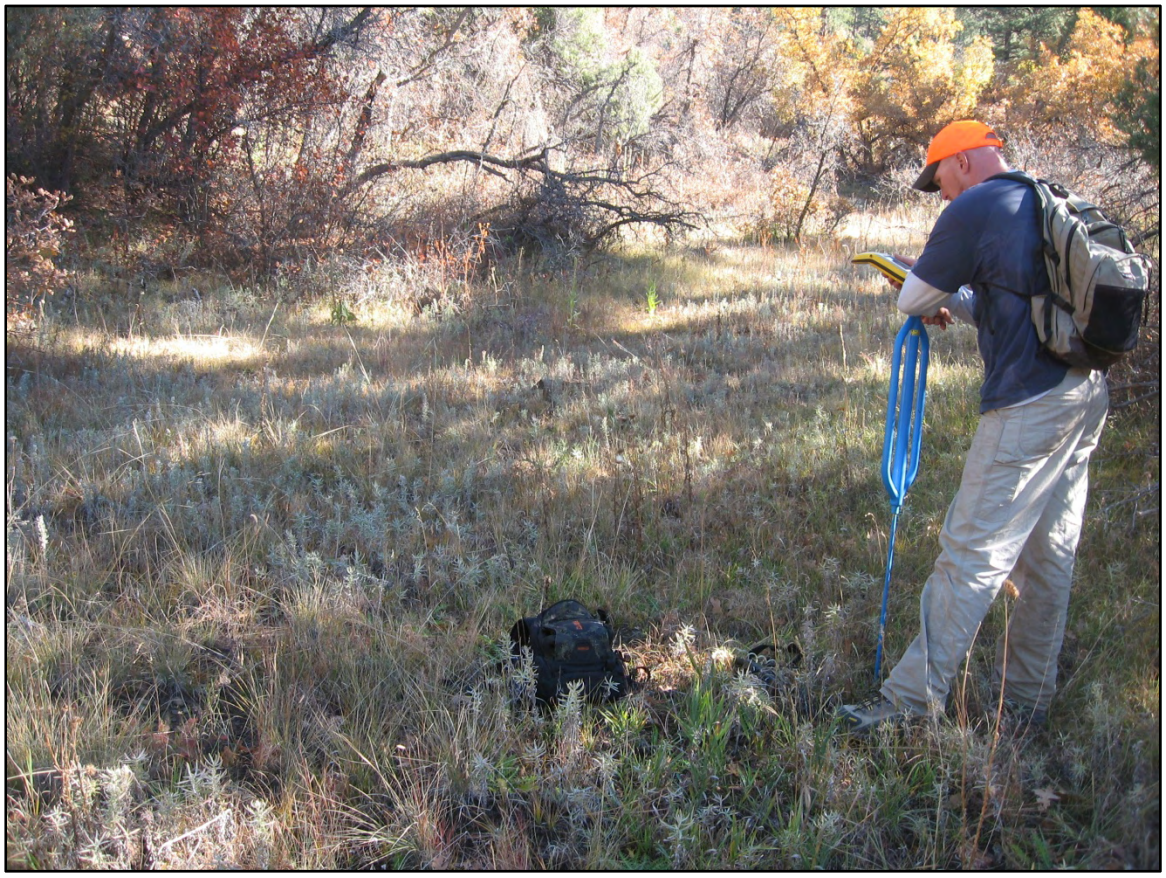

**Photo 15 - Suspect Area 31, October 19, 2008.**

# APPENDIX E

# SUBSURFACE SOIL GAS DATA

**TABLE E-1**
**SUBSURFACE SOIL GAS MEASUREMENTS**
**2008 FRUITLAND OUTCROP MONITORING**
**LA PLATA COUNTY, COLORADO**

| Point ID | Methane | Oxygen | Carbon Monoxide | Hydrogen Sulfide | Date | Time | Elevation | Northing | Easting |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 19.8 | 0 | 0 | 10/17/2008 | 11:05:15am | 7,401.203 | 1,238,173.471 | 2,417,050.793 |
| 2 | 0 | 20.2 | 0 | 0 | 10/17/2008 | 11:07:32am | 7,420.163 | 1,238,200.643 | 2,417,000.417 |
| 3 | 0 | 20.2 | 0 | 0 | 10/17/2008 | 11:12:00am | 7,412.344 | 1,238,111.463 | 2,416,986.733 |
| 4 | 0 | 19.8 | 0 | 0 | 10/17/2008 | 11:14:03am | 7,394.285 | 1,238,080.726 | 2,417,053.847 |
| 5 | 0 | 19.8 | 0 | 0 | 10/17/2008 | 11:15:46am | 7,399.053 | 1,238,123.690 | 2,417,035.250 |
| 6 | 0 | 20.5 | 0 | 0 | 10/19/2008 | 10:01:47am | 7,554.346 | 1,238,370.760 | 2,415,445.563 |
| 7 | 0 | 20.6 | 0 | 0 | 10/19/2008 | 10:05:11am | 7,569.229 | 1,238,393.149 | 2,415,417.326 |
| 8 | 0 | 20.4 | 0 | 0 | 10/19/2008 | 10:06:12am | 7,570.251 | 1,238,419.476 | 2,415,416.086 |
| 9 | 0 | 20.4 | 0 | 0 | 10/19/2008 | 10:07:18am | 7,572.825 | 1,238,411.222 | 2,415,384.162 |
| 10 | 0 | 20.6 | 0 | 0 | 10/19/2008 | 10:08:28am | 7,582.003 | 1,238,430.182 | 2,415,369.115 |
| 11 | 0 | 20.7 | 0 | 0 | 10/19/2008 | 10:29:24am | 7,478.920 | 1,238,064.454 | 2,417,814.707 |
| 12 | 0 | 20.7 | 0 | 0 | 10/19/2008 | 10:31:01am | 7,475.070 | 1,238,096.447 | 2,417,806.797 |
| 13 | 0 | 20.4 | 0 | 0 | 10/19/2008 | 10:32:04am | 7,488.858 | 1,238,101.410 | 2,417,763.820 |
| 14 | 0 | 20.6 | 0 | 0 | 10/19/2008 | 10:33:15am | 7,467.368 | 1,238,054.004 | 2,417,772.322 |
| 15 | 0 | 20.7 | 0 | 0 | 10/19/2008 | 10:34:10am | 7,472.397 | 1,238,079.079 | 2,417,791.017 |
| 16 | 0 | 20.4 | 0 | 0 | 10/19/2008 | 12:17:26pm | 7,582.643 | 1,243,626.138 | 2,367,560.877 |
| 17 | 0 | 20.1 | 0 | 0 | 10/19/2008 | 12:22:59pm | 7,575.853 | 1,243,689.853 | 2,367,762.335 |
| 18 | 0 | 20.3 | 0 | 0 | 10/19/2008 | 12:24:37pm | 7,567.123 | 1,243,493.147 | 2,367,735.348 |
| 19 | 0 | 20.1 | 0 | 0 | 10/20/2008 | 10:32:43am | 8,601.678 | 1,246,665.504 | 2,356,514.111 |
| 20 | 0 | 19.4 | 2 | 0 | 10/20/2008 | 10:34:30am | 8,593.006 | 1,246,627.833 | 2,356,531.854 |
| 21 | 0 | 21.0 | 1 | 0 | 10/20/2008 | 10:36:06am | 8,577.484 | 1,246,596.328 | 2,356,515.937 |
| 22 | 0 | 19.4 | 1 | 0 | 10/20/2008 | 10:37:48am | 8,578.334 | 1,246,631.272 | 2,356,486.594 |
| 23 | 0 | 19.4 | 1 | 0 | 10/20/2008 | 10:39:25am | 8,591.242 | 1,246,641.251 | 2,356,515.135 |
| 24 | 0 | 19.9 | 0 | 0 | 10/20/2008 | 12:50:25pm | 8,000.470 | 1,242,772.899 | 2,346,498.206 |
| 25 | 0 | 19.9 | 0 | 0 | 10/20/2008 | 12:52:44pm | 8,033.717 | 1,242,814.052 | 2,346,554.595 |
| 26 | 0 | 20.0 | 0 | 0 | 10/20/2008 | 12:54:42pm | 8,069.549 | 1,242,874.896 | 2,346,580.582 |
| 27 | 0 | 20.0 | 0 | 0 | 10/20/2008 | 12:56:26pm | 8,090.786 | 1,242,932.347 | 2,346,585.558 |
| 28 | 0 | 20.0 | 0 | 0 | 10/20/2008 | 12:57:52pm | 8,080.292 | 1,242,897.491 | 2,346,627.696 |
| 29 | 0 | 20.0 | 0 | 0 | 10/20/2008 | 01:05:44pm | 8,058.163 | 1,242,830.296 | 2,346,254.718 |
| 30 | 0 | 20.1 | 0 | 0 | 10/20/2008 | 01:07:08pm | 8,114.367 | 1,242,872.504 | 2,346,144.027 |
| 31 | 0 | 20.0 | 0 | 0 | 10/20/2008 | 01:08:44pm | 8,133.701 | 1,242,967.949 | 2,346,103.568 |
| 32 | 0 | 20.0 | 0 | 0 | 10/20/2008 | 01:09:57pm | 8,165.713 | 1,243,006.149 | 2,346,073.314 |
| 33 | 0 | 20.1 | 0 | 0 | 10/20/2008 | 01:11:06pm | 8,192.438 | 1,243,040.688 | 2,346,017.408 |
| 34 | 0 | 20.1 | 0 | 0 | 10/20/2008 | 01:42:25pm | 8,362.908 | 1,243,762.007 | 2,347,849.957 |
| 35 | 0 | 20.1 | 0 | 0 | 10/20/2008 | 01:47:28pm | 8,319.830 | 1,243,652.795 | 2,347,942.560 |
| 36 | 0 | 19.9 | 0 | 0 | 10/20/2008 | 01:48:48pm | 8,310.935 | 1,243,596.535 | 2,347,972.198 |
| 37 | 0 | 20.0 | 0 | 0 | 10/20/2008 | 01:50:07pm | 8,312.696 | 1,243,584.749 | 2,347,899.173 |
| 38 | 0 | 19.9 | 0 | 0 | 10/20/2008 | 01:51:47pm | 8,314.155 | 1,243,624.254 | 2,347,981.814 |
| 39 | 0 | 20.1 | 0 | 0 | 10/21/2008 | 10:20:41am | 7,754.071 | 1,238,467.405 | 2,409,108.634 |
| 40 | 0 | 20.1 | 1 | 0 | 10/21/2008 | 10:22:39am | 7,752.545 | 1,238,487.520 | 2,409,162.824 |
| 41 | 0 | 20.3 | 0 | 0 | 10/21/2008 | 10:23:36am | 7,736.707 | 1,238,451.578 | 2,409,169.864 |
| 42 | 0 | 20.3 | 0 | 0 | 10/21/2008 | 10:24:55am | 7,747.204 | 1,238,437.049 | 2,409,108.533 |
| 43 | 0 | 20.2 | 0 | 0 | 10/21/2008 | 10:26:04am | 7,758.386 | 1,238,466.263 | 2,409,129.411 |
| 44 | 0 | 19.8 | 0 | 0 | 10/21/2008 | 11:22:03am | 7,900.255 | 1,238,578.255 | 2,406,960.781 |
| 45 | 0 | 19.8 | 0 | 0 | 10/21/2008 | 11:24:07am | 7,909.362 | 1,238,607.369 | 2,406,951.815 |
| 46 | 0 | 19.8 | 0 | 0 | 10/21/2008 | 11:25:27am | 7,912.603 | 1,238,599.590 | 2,406,911.430 |
| 47 | 0 | 19.8 | 0 | 0 | 10/22/2008 | 09:12:27am | 7,816.164 | 1,238,375.966 | 2,398,244.629 |
| 48 | 0 | 19.8 | 0 | 0 | 10/22/2008 | 09:13:41am | 7,802.327 | 1,238,301.711 | 2,398,172.645 |
| 49 | 0 | 19.8 | 0 | 0 | 10/22/2008 | 09:14:59am | 7,809.627 | 1,238,322.023 | 2,398,263.418 |
| 50 | 0 | 19.7 | 0 | 0 | 10/22/2008 | 09:16:52am | 7,831.973 | 1,238,281.723 | 2,398,355.007 |
| 51 | 0 | 19.7 | 0 | 0 | 10/22/2008 | 09:18:24am | 7,820.630 | 1,238,356.428 | 2,398,427.856 |
| 52 | 0 | 20.0 | 0 | 0 | 10/22/2008 | 10:02:59am | 7,695.714 | 1,238,097.235 | 2,402,796.356 |

**TABLE E-1**
**SUBSURFACE SOIL GAS MEASUREMENTS**
**2008 FRUITLAND OUTCROP MONITORING**
**LA PLATA COUNTY, COLORADO**

| Point ID | Methane | Oxygen | Carbon Monoxide | Hydrogen Sulfide | Date | Time | Elevation | Northing | Easting |
|---|---|---|---|---|---|---|---|---|---|
| 53 | 0 | 20.0 | 0 | 0 | 10/22/2008 | 10:05:49am | 7,695.507 | 1,238,137.029 | 2,402,846.411 |
| 54 | 0 | 19.8 | 0 | 0 | 10/22/2008 | 10:07:19am | 7,697.353 | 1,238,125.082 | 2,402,815.809 |
| 55 | 0 | 19.5 | 0 | 0 | 10/22/2008 | 05:42:10pm | 7,909.928 | 1,242,424.759 | 2,379,167.636 |
| 56 | 0 | 19.6 | 0 | 0 | 10/22/2008 | 05:43:21pm | 7,918.276 | 1,242,431.121 | 2,379,246.500 |
| 57 | 0 | 19.5 | 0 | 0 | 10/22/2008 | 05:44:03pm | 7,942.482 | 1,242,492.445 | 2,379,214.904 |
| 58 | 0 | 19.5 | 0 | 0 | 10/22/2008 | 05:45:20pm | 7,967.463 | 1,242,528.081 | 2,379,258.018 |
| 59 | 0 | 19.5 | 0 | 0 | 10/22/2008 | 05:46:18pm | 7,984.375 | 1,242,567.599 | 2,379,206.641 |
| 60 | 20 | 21.0 | 0 | 0 | 10/22/2008 | 06:16:07pm | 7,724.633 | 1,241,183.301 | 2,380,749.339 |
| 61 | 0 | 19.5 | 0 | 0 | 10/22/2008 | 06:17:33pm | 7,721.624 | 1,241,217.909 | 2,380,662.044 |
| 62 | 0 | 19.6 | 0 | 0 | 10/22/2008 | 06:18:16pm | 7,711.165 | 1,241,180.768 | 2,380,648.267 |
| 63 | 0 | 19.5 | 0 | 0 | 10/22/2008 | 06:19:21pm | 7,700.320 | 1,241,174.762 | 2,380,593.165 |
| 64 | 0 | 19.5 | 0 | 0 | 10/22/2008 | 06:20:28pm | 7,704.610 | 1,241,213.538 | 2,380,608.460 |
| 65 | 0 | 19.4 | 0 | 0 | 10/22/2008 | 06:23:07pm | 7,743.300 | 1,241,295.296 | 2,380,667.260 |
| 66 | 0 | 19.4 | 7 | 0 | 10/22/2008 | 06:23:59pm | 7,739.968 | 1,241,348.122 | 2,380,652.025 |
| 67 | 0 | 19.1 | 1 | 0 | 10/22/2008 | 06:24:57pm | 7,747.517 | 1,241,330.435 | 2,380,729.417 |
| 68 | 0 | 19.4 | 4 | 0 | 10/22/2008 | 06:25:53pm | 7,729.868 | 1,241,277.705 | 2,380,726.939 |
| 69 | 0 | 19.3 | 0 | 0 | 10/22/2008 | 06:26:38pm | 7,714.286 | 1,241,250.029 | 2,380,756.707 |

**APPENDIX F**

**NATURAL SPRINGS PHOTOS**

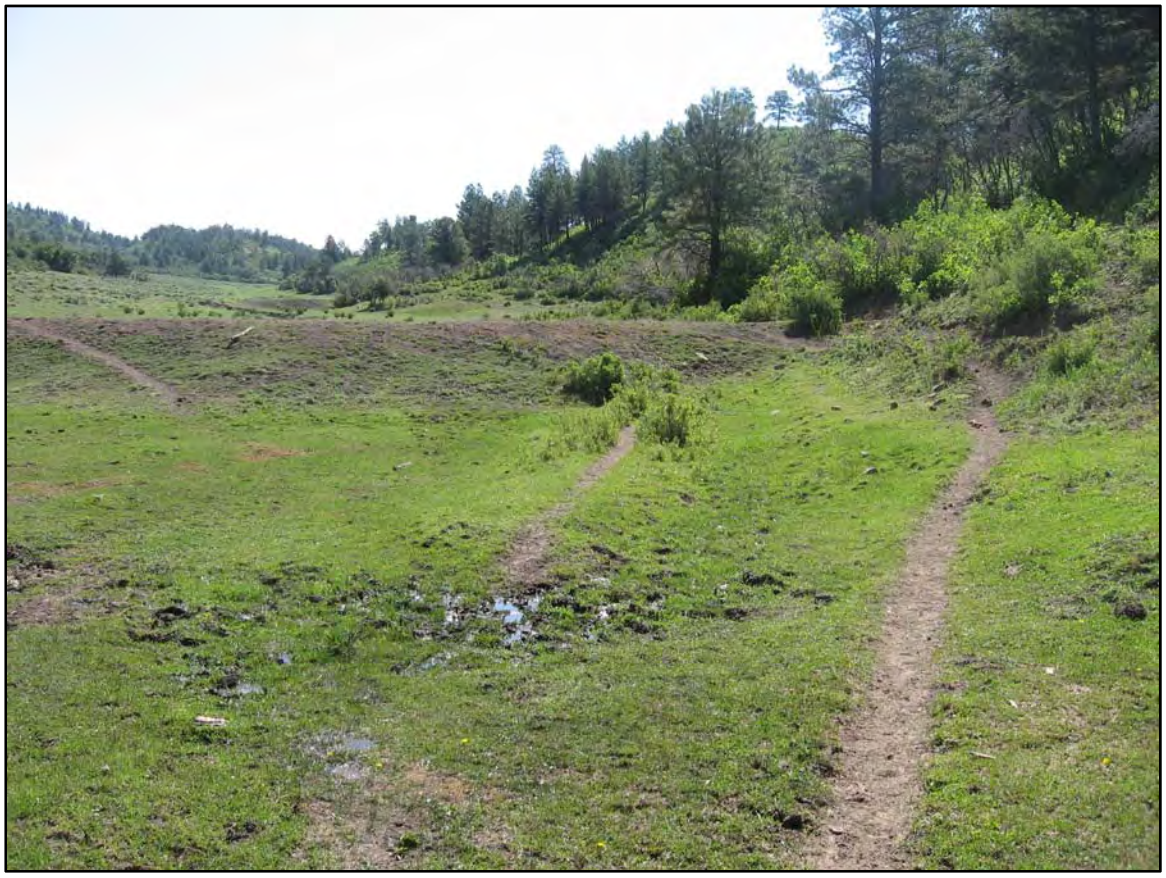

**Photo 1 - Rancho Durango East Spring, June 23, 2008.**

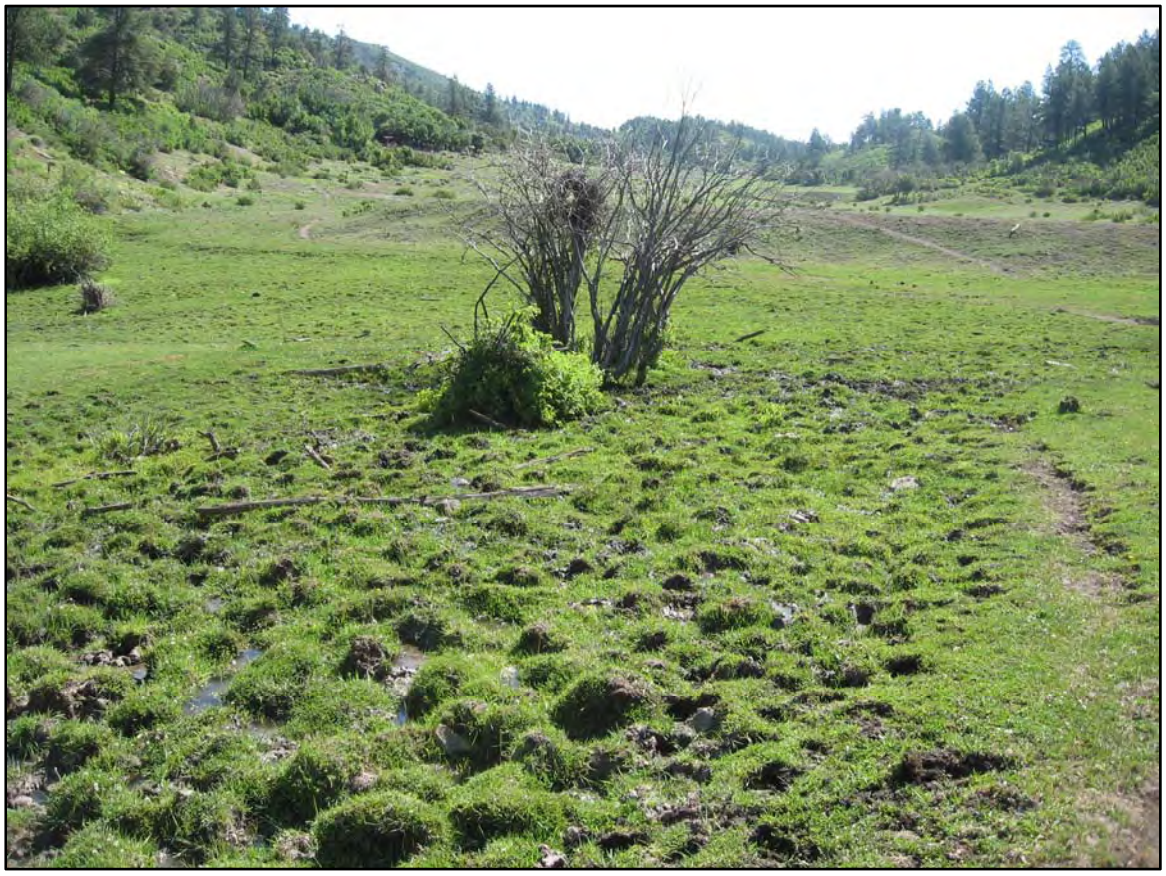

**Photo 2 - Rancho Durango East Spring, June 23, 2008.**

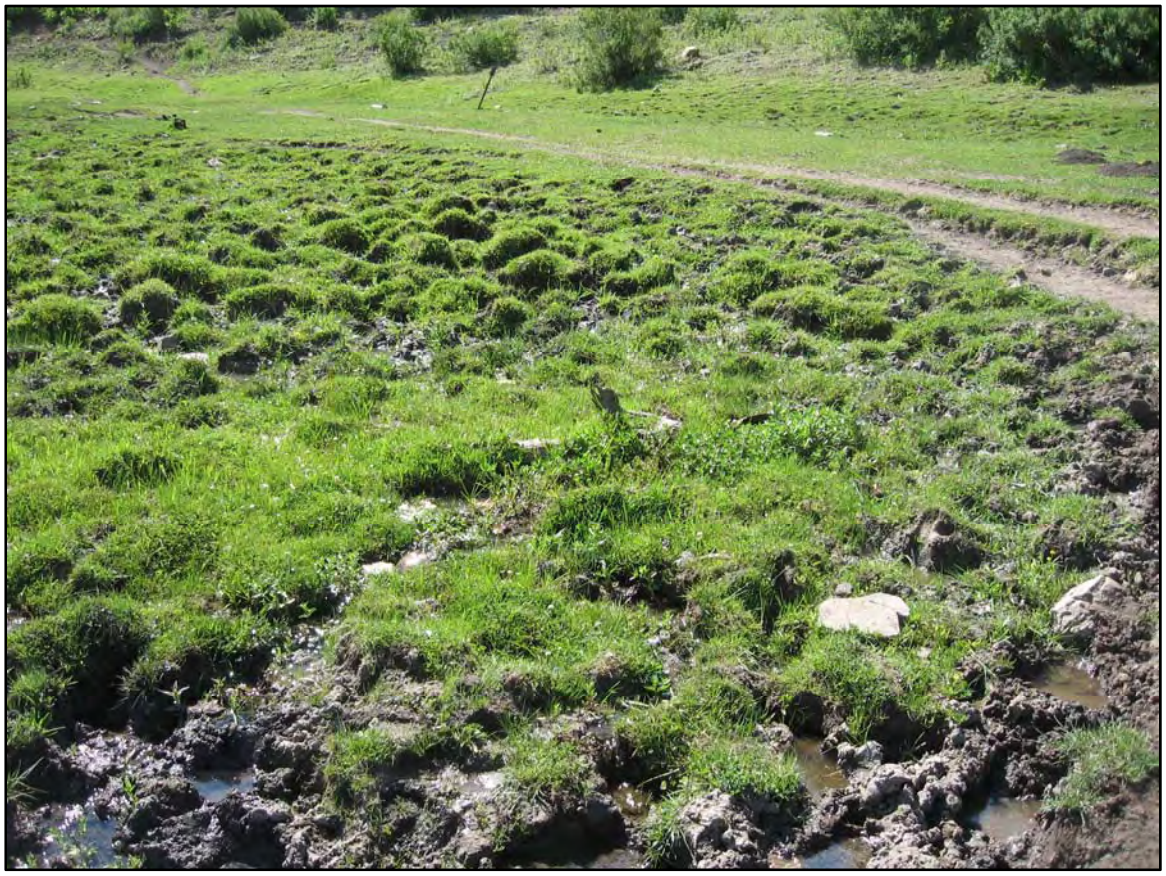

**Photo 3 - Rancho Durango East Spring, June 23, 2008.**

**Photo 4 - Rancho Durango North Spring, June 23, 2008.**

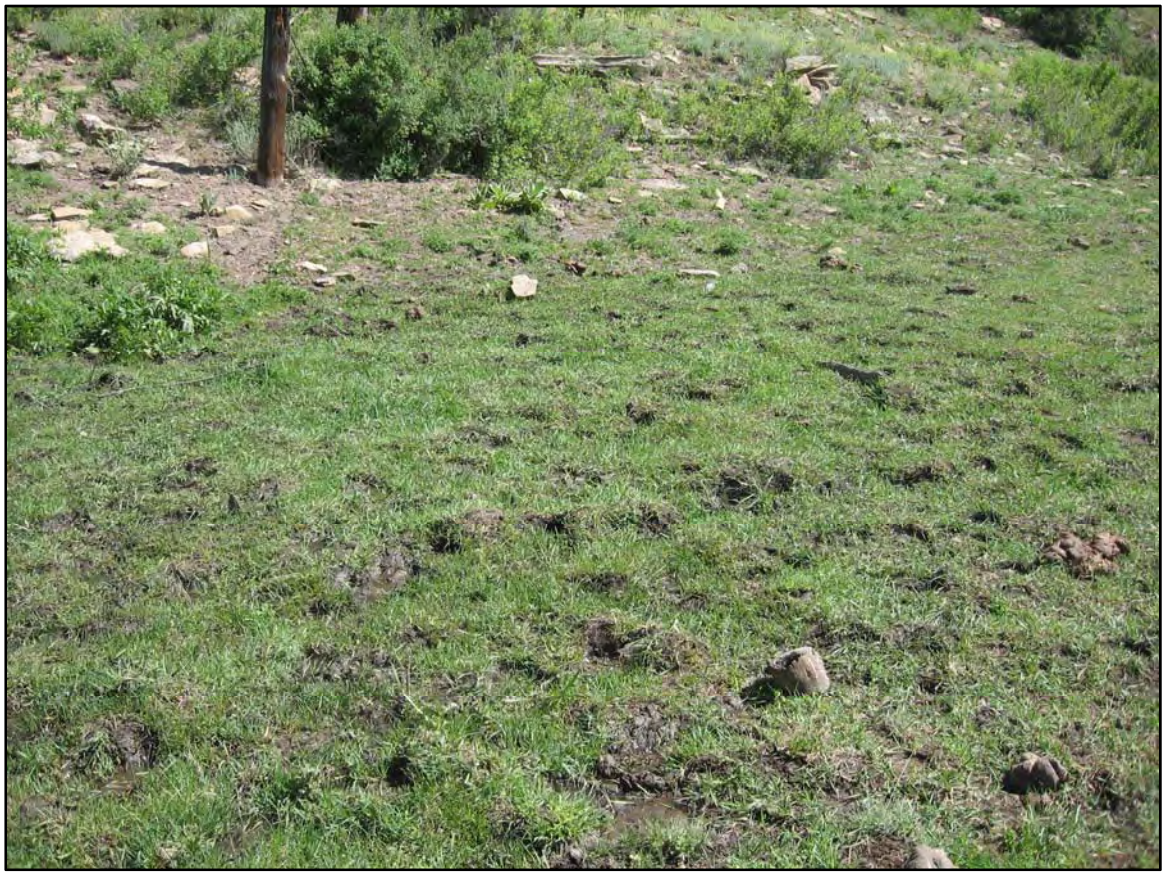

**Photo 5 - Rancho Durango North Spring, June 23, 2008.**

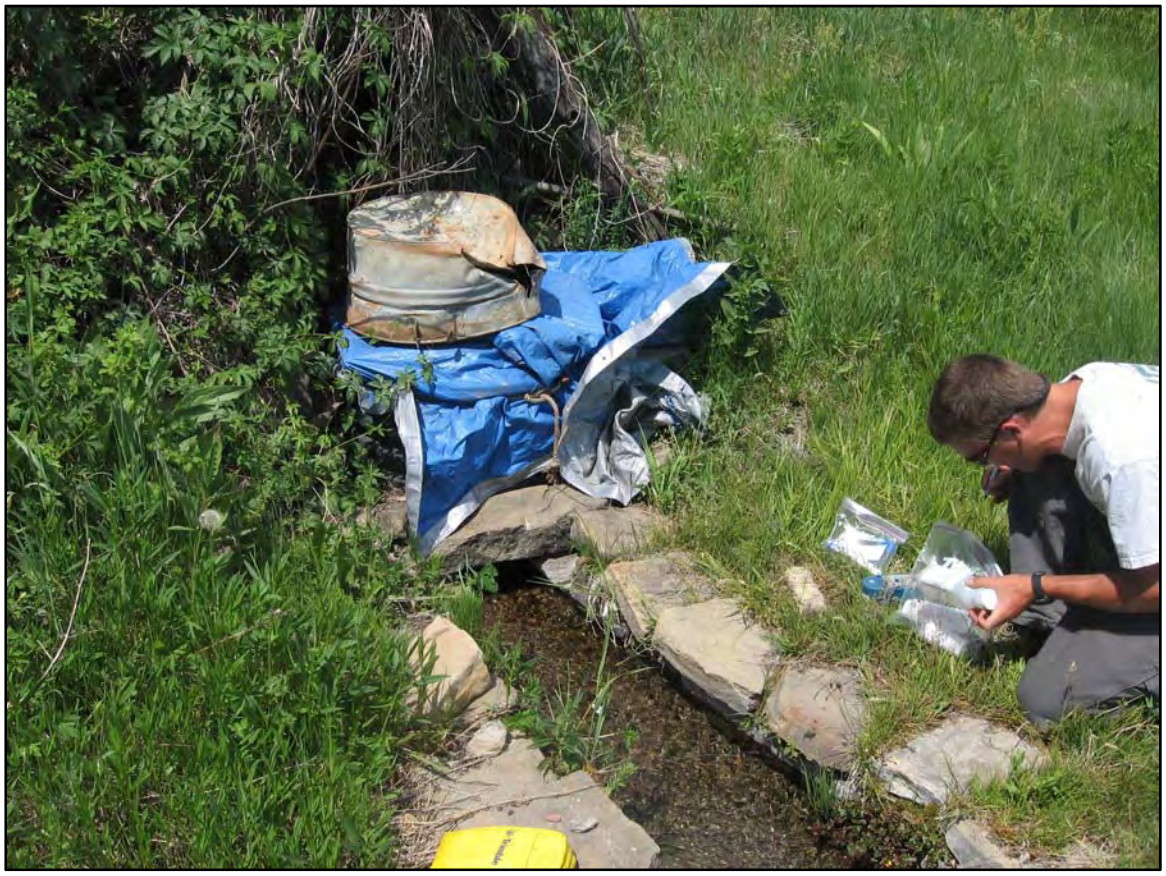

**Photo 6 - Darwin Rather Spring #1, June 23, 2008.**

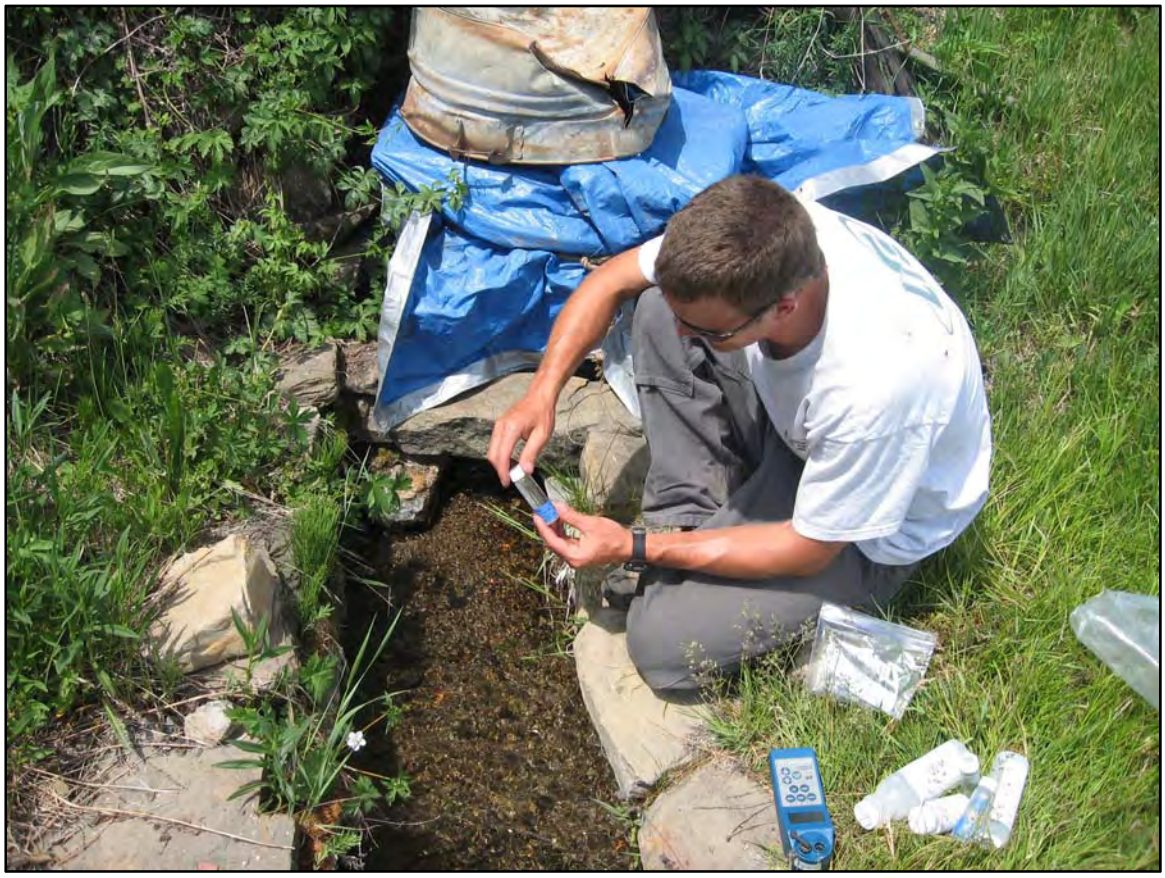

**Photo 7 - Darwin Rather Spring #1, June 23, 2008.**

**Photo 8 - Darwin Rather Spring #2, June 23, 2008.**

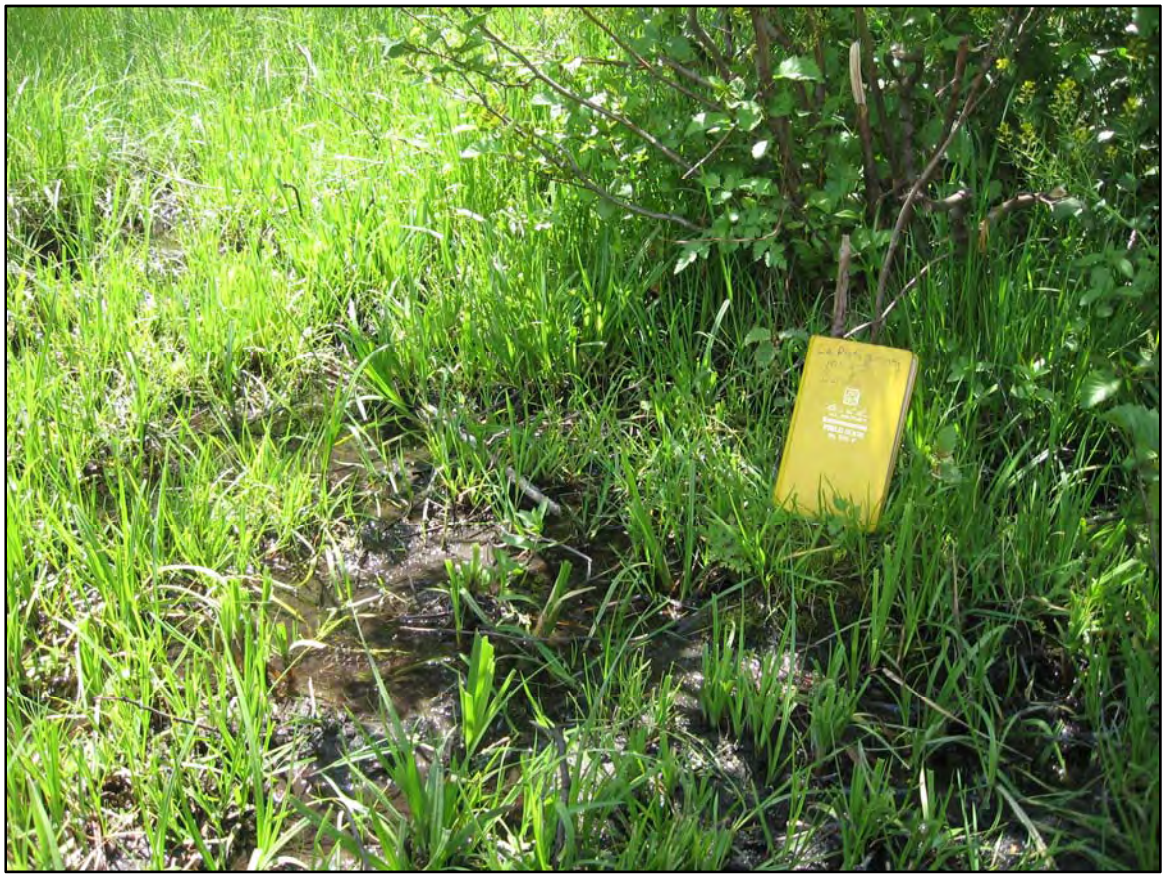

**Photo 9 - Darwin Rather Spring #2, June 23, 2008.**

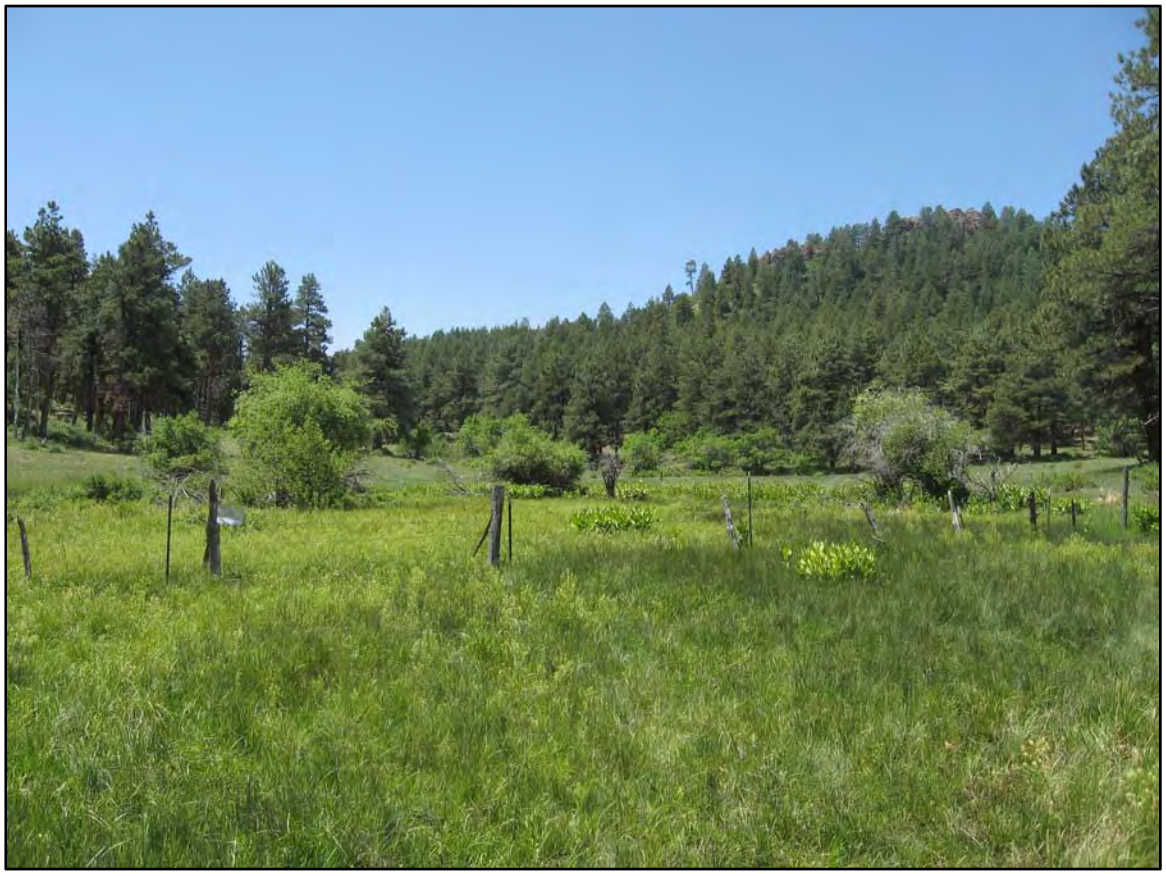

**Photo 10 - Southwesterly view from Darwin Rather Spring #2, June 23, 2008.**

**Photo 11 - Northeasterly view from Darwin Rather Spring #2, June 23, 2008.**

**Photo 12 - Hoier Spring, June 23, 2008.**

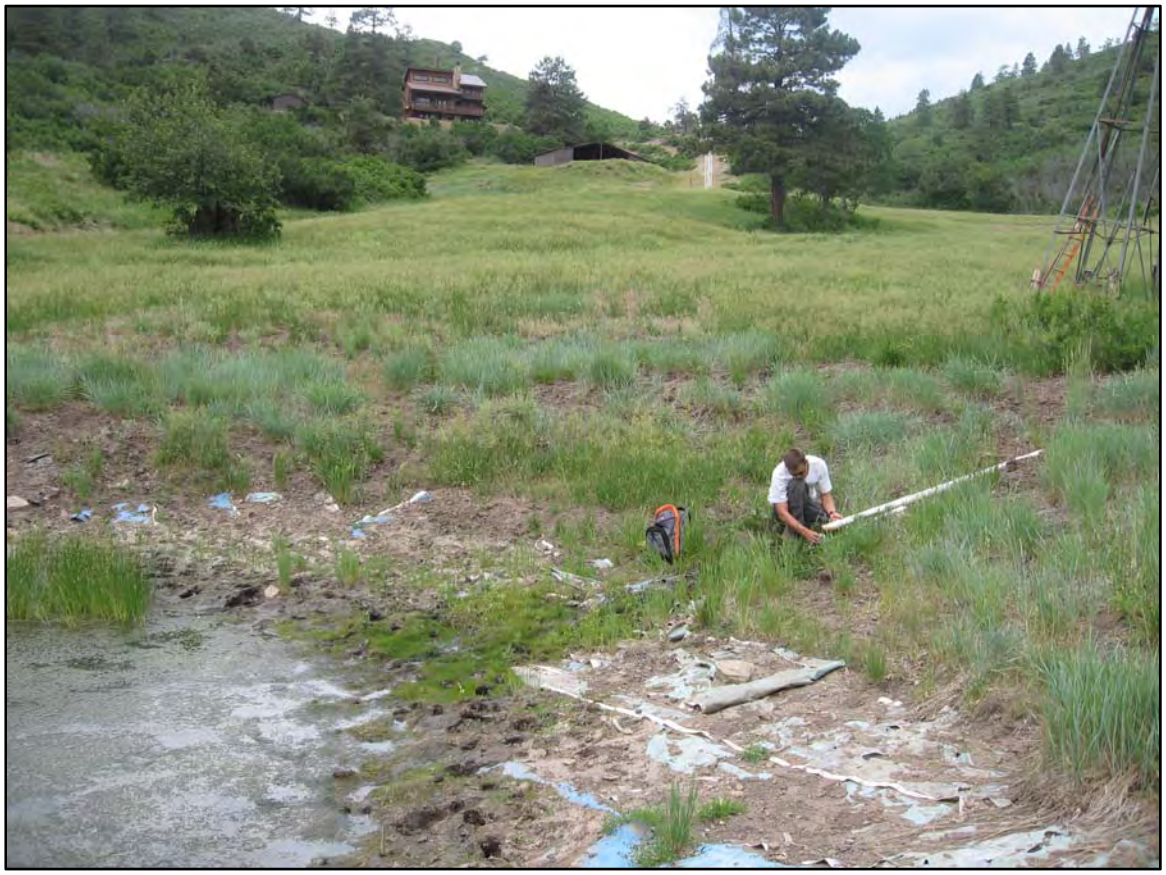

**Photo 13 - Hoier Spring, June 23, 2008.**

**Photo 14 - Rancho Durango LTD Spring, October 15, 2008.**

**Photo 15 - Rancho Durango LTD Spring, October 15, 2008.**

**APPENDIX G**

**NATURAL SPRINGS ANALYTICAL RESULTS**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***L T Environmental,Inc.*** | | | | | ***Lynn M. Fechter -Four Corners Geoscience,Inc.*** | | | |
| ***17 West Mill Street*** | | | | *Conducted Methane analysis per protocol and method established* | | | | |
| ***Bayfield,CO 81122*** | | | | *by BLM San Juan Resource Area 1993 and USGS method.* | | | | |
| ***Kyle Siesser*** | | | | *Samples were collected by Kyle Seisser, LTE Geologist.* | | | | |
| ***970-764-7356*** | | | | *Samples were delivered to Four Corners Geoscience and analyses* | | | | |
| | | | | *were conducted on SRI FID within 24 hours of collection.* | | | | |
| ***Methane Analysis Report*** | | ***Project Number*** | ***MSO813*** | *Laboratory calibration conducted same as sample run.* | | | | |
| | | ***Report Date*** | ***June 27,2008*** | *Blanks and duplicated runs conducted for each sample set* | | | | |
| **Lab #** | **Sample Date** | **Sample** | **Site ID-Location** | | | | | |
| ***FCGeo*** | | ***Time(Hrs)*** | | ***Lab Blank*** | ***CH4*** | ***C2*** | ***Method*** | ***Detection*** |
| | | | | ***(mg/L)*** | ***(mg/L)*** | ***(mg/L)*** | | ***Limit(mg/L)*** |
| 062308-1 | 6/23/2008 | 1130 | Darwin Rathers Spring # 1 | 0.02 | <0.02 | ND | USGS/BLM | 0.02 |
| 062308-2 | 6/23/2008 | 1205 | Darwin Rathers Spring # 2 | 0.02 | <0.02 | ND | USGS/BLM | 0.02 |
| 062308-3 | 6/23/2008 | 1010 | Ranch Durango LTD Spring | 0.02 | <0.02 | ND | USGS/BLM | 0.02 |
| 062308-4 | 6/23/2008 | 1025 | Ranch Durango North Spring | 0.02 | <0.02 | ND | USGS/BLM | 0.02 |
| 062308-5 | 6/23/2008 | 1425 | Hoier Spring | 0.02 | <0.02 | ND | USGS/BLM | 0.02 |
| | | | | | | | | |
| | | | | | | | | |
| December 5, 2008 | | | | | | | | |
| Emailed to Kyle Siesser | | | | | | | | |
| | | | | | | | | |
| No field blanks received at FCGeo Lab | | | | | | | | |
| | | | | | | | | |
| Calibration conducted previous to gas chromatograph run 6/23/2008 | | | | | | | | |

# Four Corners Geoscience

28 Trilobite Trail, Oxford, CO
54 Wassinger Drive, Bayfield, CO 81122
Mailing Address: P.O. Box 4224 • Durango, CO 81302
(970) 247-5046

Lab Number: 062308-1,2,3,4,5
Report Due Date:

Client: LTE
Address: 4600 W. 60th Ave.
City, State & Zip: Arvada, CO 80003
Contact: Kyle Siesser
Phone: 970.764.7356
Fax: 303 433 1432
email P.O. Number: KSiesser@ltenv.com
Collector's Name: Kyle Siesser
Project Name: La Plata Fruitland
Project Number: MS0813

Fax Results Y N
Page of

**PUBLIC WATER SUPPLY INFORMATION**
System Name
PWS No.
Report to State/EPA Y N
POE No.
DWR No.
Collection Point
City County

**SAMPLE TYPE CODES**

DW = drinking water
WW = waste water
MW = monitoring well
HW = hazardous waste
TB = travel blank
SD = solid
SO = soil
SL = sludge

**Compliance Monitoring** Y N

**TURNAROUND TIME REQUESTED**

Standard
RUSH
Special

Lab Manager Approval

| CLIENT'S SAMPLE ID/LOCATION | Date | Time | Sample Type | Containers | Analyses Requested: Dissolved Methane | Spl. No. |
|---|---|---|---|---|---|---|
| Darwin Rathers Spring #1 | 6/23/08 | 1130 | S | 3 | X | 1 |
| Darwin Rathers Spring #2 | 6/23/08 | 1205 | S | 3 | X | 2 |
| Rancho Durango LTD Spring | 6/23/08 | 1010 | S | 3 | X | 3 |
| Rancho Durango North Spring | 6/23/08 | 1025 | S | 3 | X | 4 |
| Hoier Spring | 6/23/08 | 1425 | S | 3 | X | 5 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Instructions/Comments/Special Requirements: send invoice to manderson@ltenv.com

S = Spring

| SAMPLE RECEIPT | | | Date | Time | Samples Relinquished By | Samples Received By |
|---|---|---|---|---|---|---|
| Received Cold | (Y) | N | 6-23-08 | 1603 | | |
| Custody Seals | Y | N | | | | |
| Seals Intact | Y | N | | | | |
| No. of Containers | | | | | | |

Standard Terms and Conditions apply unless written agreements specify otherwise. Payment terms are Net 30.

**GAL ID No.:** **806-136,01-05**

July 8, 2008

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Kyle Siesser

Project Name: La Plata Fruitland
Project Number:
Date Received: 06/23/08

This is to transmit the attached analytical report. The analytical data and information contained therein was generated using specified or selected methods contained in references, such as Standard Methods for the Examination of Water and Wastewater, 18th & 19th editions, and Methods for Determination of Organic Compounds in Drinking Water, EPA-600/4-79-020.

Samples were received by Green Analytical Laboratories, Inc. in good condition on 06/23/08.

If you should have any questions or comments regarding this report, please do not hesitate to call.

Sincerely,

Nick Fullerton
Laboratory Director

Enclosure

75 Suttle Street, Durango, Colorado 81303
Telephone (970) 247-4220 Fax (970) 247-4227

**Green Analytical Laboratories**
**75 Suttle Street**
**Durango, CO 81303**

**GAL I.D.:** 806-136-01
Date Received: 06/23/08
Date Reported: 07/08/08
QC Batches:

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Kyle Siesser

**PROJECT NAME:** La Plata Fruitland
**PROJECT NUMBER:** MS 0813
**SAMPLE I.D.:** Darwin Ratlers Spring #1

Sample Date: 06/23/08
Sample Matrix: Water

# Laboratory Report

**RESULTS**

| PARAMETER | METHOD | REPORT LIMIT | RESULT | DIL | UNITS |
|---|---|---|---|---|---|
| Alkalinity, Total | 2320B | 10 | 212 | 1 | mg/L |
| Alkalinity, Bicarbonate | 2320B | 10 | 212 | 1 | mg/L |
| Alkalinity, Carbonate | 2320B | 10 | <10 | 1 | mg/L |
| Alkalinity, Hydroxide | 2320B | 10 | <10 | 1 | mg/L |
| Calcium | 200.7 | 0.5 | 65.0 | 1 | mg/L |
| Chloride | 4500CL | 10 | <10 | 1 | mg/L |
| Conductivity | 2510B | 1.0 | 478 | 1 | uS/cm |
| Fluoride | 4500F C | 0.2 | <0.2 | 1 | mg/L |
| Iron | 200.7 | 0.05 | <0.05 | 1 | mg/L |
| Magnesium | 200.7 | 0.5 | 21.4 | 1 | mg/L |
| Manganese | 200.8 | 0.0005 | <0.0005 | 1 | mg/L |
| Nitrate/Nitrite as N | 353.3 | 0.02 | 1.72 | 1 | mg/L |
| pH | 150.1 | NA | 7.10 | NA | SU |
| Potassium | 200.7 | 0.5 | 1.3 | 1 | mg/L |
| Selenium | 200.8 | 0.001 | <0.001 | 1 | mg/L |
| Sodium | 200.7 | 0.5 | 9.0 | 1 | mg/L |
| Sulfate | 4500SO4 | 10 | 39 | 1 | mg/L |
| TDS | 2540C | 10 | 230 | 1 | mg/L |
| Hardness | Calc | 10 | 250 | 1 | mg/L |

*Nick Fullerton, Laboratory Director*

**Green Analytical Laboratories**
**75 Suttle Street**
**Durango, CO 81303**

**GAL I.D.:** 806-136-02
Date Received: 06/23/08
Date Reported: 07/09/08
QC Batches:

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Kyle Siesser

**PROJECT NAME:** La Plata Fruitland
**PROJECT NUMBER:** MS 0813
**SAMPLE I.D.:** Darwin Ratlers Spring #2

Sample Date: 06/23/08
Sample Matrix: Water

# Laboratory Report

**RESULTS**

| PARAMETER | METHOD | REPORT LIMIT | RESULT | DIL | UNITS |
|---|---|---|---|---|---|
| Alkalinity, Total | 2320B | 10 | 138 | 1 | mg/L |
| Alkalinity, Bicarbonate | 2320B | 10 | 138 | 1 | mg/L |
| Alkalinity, Carbonate | 2320B | 10 | <10 | 1 | mg/L |
| Alkalinity, Hydroxide | 2320B | 10 | <10 | 1 | mg/L |
| Calcium | 200.7 | 0.5 | 39.3 | 1 | mg/L |
| Chloride | 4500CL | 10 | <10 | 1 | mg/L |
| Conductivity | 2510B | 1.0 | 276 | 1 | uS/cm |
| Fluoride | 4500F C | 0.2 | 0.3 | 1 | mg/L |
| Iron | 200.7 | 0.05 | 0.10 | 1 | mg/L |
| Magnesium | 200.7 | 0.5 | 6.1 | 1 | mg/L |
| Manganese | 200.8 | 0.0005 | 0.0213 | 1 | mg/L |
| Nitrate/Nitrite as N | 353.3 | 0.02 | 0.58 | 1 | mg/L |
| pH | 150.1 | NA | 7.64 | NA | SU |
| Potassium | 200.7 | 0.5 | <0.5 | 1 | mg/L |
| Selenium | 200.8 | 0.001 | <0.001 | 1 | mg/L |
| Sodium | 200.7 | 0.5 | 13.6 | 1 | mg/L |
| Sulfate | 4500SO4 | 10 | 19 | 1 | mg/L |
| TDS | 2540C | 10 | 130 | 1 | mg/L |
| Hardness | Calc | 10 | 123 | 1 | mg/L |

*Nick Fullerton, Laboratory Director*

**Green Analytical Laboratories**
**75 Suttle Street**
**Durango, CO 81303**

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Kyle Siesser

**GAL I.D.:** 806-136-03
Date Received: 06/23/08
Date Reported: 07/08/08
QC Batches:

**PROJECT NAME:** La Plata Fruitland
**PROJECT NUMBER:** MS 0813
**SAMPLE I.D.:** Rancho Durango LTD

Sample Date: 06/23/08
Sample Matrix: Water

# Laboratory Report

**RESULTS**

| PARAMETER | METHOD | REPORT LIMIT | RESULT | DIL | UNITS |
|---|---|---|---|---|---|
| Alkalinity, Total | 2320B | 10 | 252 | 1 | mg/L |
| Alkalinity, Bicarbonate | 2320B | 10 | 252 | 1 | mg/L |
| Alkalinity, Carbonate | 2320B | 10 | <10 | 1 | mg/L |
| Alkalinity, Hydroxide | 2320B | 10 | <10 | 1 | mg/L |
| Calcium | 200.7 | 0.5 | 79.5 | 1 | mg/L |
| Chloride | 4500CL | 10 | <10 | 1 | mg/L |
| Conductivity | 2510B | 1.0 | 550 | 1 | uS/cm |
| Fluoride | 4500F C | 0.2 | 0.3 | 1 | mg/L |
| Iron | 200.7 | 0.05 | <0.05 | 1 | mg/L |
| Magnesium | 200.7 | 0.5 | 20.1 | 1 | mg/L |
| Manganese | 200.8 | 0.0005 | 0.0117 | 1 | mg/L |
| Nitrate/Nitrite as N | 353.3 | 0.02 | 0.23 | 1 | mg/L |
| pH | 150.1 | NA | 7.21 | NA | SU |
| Potassium | 200.7 | 0.5 | 0.9 | 1 | mg/L |
| Selenium | 200.8 | 0.001 | 0.001 | 1 | mg/L |
| Sodium | 200.7 | 0.5 | 16.7 | 1 | mg/L |
| Sulfate | 4500SO4 | 10 | 69 | 1 | mg/L |
| TDS | 2540C | 10 | 305 | 1 | mg/L |
| Hardness | Calc | 10 | 281 | 1 | mg/L |

*Nick Fullerton, Laboratory Director*

**Green Analytical Laboratories**
**75 Suttle Street**
**Durango, CO 81303**

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Kyle Siesser

**GAL I.D.:** 806-136-04
Date Received: 06/23/08
Date Reported: 07/08/08
QC Batches:

**PROJECT NAME:** La Plata Fruitland
**PROJECT NUMBER:** MS 0813
**SAMPLE I.D.:** Rancho Durango North

Sample Date: 06/23/08
Sample Matrix: Water

# Laboratory Report

**RESULTS**

| PARAMETER | METHOD | REPORT LIMIT | RESULT | DIL | UNITS |
|---|---|---|---|---|---|
| Alkalinity, Total | 2320B | 10 | 332 | 1 | mg/L |
| Alkalinity, Bicarbonate | 2320B | 10 | 332 | 1 | mg/L |
| Alkalinity, Carbonate | 2320B | 10 | <10 | 1 | mg/L |
| Alkalinity, Hydroxide | 2320B | 10 | <10 | 1 | mg/L |
| Calcium | 200.7 | 0.5 | 108 | 1 | mg/L |
| Chloride | 4500CL | 10 | <10 | 1 | mg/L |
| Conductivity | 2510B | 1.0 | 740 | 1 | uS/cm |
| Fluoride | 4500F C | 0.2 | 0.3 | 1 | mg/L |
| Iron | 200.7 | 0.05 | 0.06 | 1 | mg/L |
| Magnesium | 200.7 | 0.5 | 31.9 | 1 | mg/L |
| Manganese | 200.8 | 0.0005 | 0.0559 | 1 | mg/L |
| Nitrate/Nitrite as N | 353.3 | 0.02 | 0.03 | 1 | mg/L |
| pH | 150.1 | NA | 7.60 | NA | SU |
| Potassium | 200.7 | 0.5 | 2.0 | 1 | mg/L |
| Selenium | 200.8 | 0.001 | 0.002 | 1 | mg/L |
| Sodium | 200.7 | 0.5 | 14.5 | 1 | mg/L |
| Sulfate | 4500SO4 | 10 | 122 | 1 | mg/L |
| TDS | 2540C | 10 | 460 | 1 | mg/L |
| Hardness | Calc | 10 | 401 | 1 | mg/L |

*Nick Fullerton, Laboratory Director*

**Green Analytical Laboratories**
**75 Suttle Street**
**Durango, CO 81303**

**GAL I.D.:** 806-136-05
Date Received: 06/23/08
Date Reported: 07/08/08
QC Batches:

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Kyle Siesser

**PROJECT NAME:** La Plata Fruitland
**PROJECT NUMBER:** MS 0813
**SAMPLE I.D.:** Hoier Spring

Sample Date: 06/23/08
Sample Matrix: Water

# Laboratory Report

**RESULTS**

| PARAMETER | METHOD | REPORT LIMIT | RESULT | DIL | UNITS |
|---|---|---|---|---|---|
| Alkalinity, Total | 2320B | 10 | 146 | 1 | mg/L |
| Alkalinity, Bicarbonate | 2320B | 10 | 144 | 1 | mg/L |
| Alkalinity, Carbonate | 2320B | 10 | <10 | 1 | mg/L |
| Alkalinity, Hydroxide | 2320B | 10 | <10 | 1 | mg/L |
| Calcium | 200.7 | 0.5 | 25.8 | 1 | mg/L |
| Chloride | 4500CL | 10 | <10 | 1 | mg/L |
| Conductivity | 2510B | 1.0 | 258 | 1 | uS/cm |
| Fluoride | 4500F C | 0.2 | <0.2 | 1 | mg/L |
| Iron | 200.7 | 0.05 | 0.71 | 1 | mg/L |
| Magnesium | 200.7 | 0.5 | 12.4 | 1 | mg/L |
| Manganese | 200.8 | 0.0005 | 0.0068 | 1 | mg/L |
| Nitrate/Nitrite as N | 353.3 | 0.02 | 0.09 | 1 | mg/L |
| pH | 150.1 | NA | 8.16 | NA | SU |
| Potassium | 200.7 | 0.5 | 1.3 | 1 | mg/L |
| Selenium | 200.8 | 0.001 | <0.001 | 1 | mg/L |
| Sodium | 200.7 | 0.5 | 13.9 | 1 | mg/L |
| Sulfate | 4500SO4 | 10 | <10 | 1 | mg/L |
| TDS | 2540C | 10 | 105 | 1 | mg/L |
| Hardness | Calc | 10 | 115 | 1 | mg/L |

*Nick Fullerton, Laboratory Director*

# CHAIN OF CUSTODY RECORD

Page____ of ____

Client: LTE

Contact: Kyle Siesser

Address: 15 W. Mill St. PO Box 874
Bayfield, CO 81122

Phone Number: 970. 764. 7356

FAX Number: 303. 433. 1432

NOTES:

1) Ensure proper container packaging.

2) Ship samples promptly following collection.

3) Designate Sample Reject Disposition.

PO# MS 0813

Project Name: La Plata Fruitland

Table 1. – Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other (Specify) _____

FOR GAL USE ONLY
GAL JOB #
806-136

Samplers Signature:

Lab Name: Green Analytical Laboratories, Inc. (970) 247-4220 FAX (970) 247-4227

Address: 75 Suttle Street, Durango, CO 81303

| Sample ID | Collection | | Miscellaneous | | | | Preservative(s) | | | | | | Analyses Required | | | | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Date | Time | Collected by: (Init.) | Matrix Type From Table 1 | No. of Containers | Sample Filtered ? Y/N | Unpreserved (Ice Only) | HNO3 | HCL | H2SO4 | NAOH | Other (Specify) | Attached | | | | | | | | | |
| 1. Darwin Rafters Spring #1 | 6/23/08 | 1130 | TL | 1 | 3 | N | ✓ | | | ✓ | | | X | | | | | | | | | |
| 2. Darwin Rafters Spring #2 | 6/23/08 | 1205 | TL | 1 | 3 | N | ✓ | | | ✓ | | | X | | | | | | | | | |
| 3. Rancho Durango LTD | 6/23/08 | 1010 | TL | 1 | 3 | N | ✓ | | | ✓ | | | X | | | | | | | | | |
| 4. Rancho Durango North | 6/23/08 | 1025 | TL | 1 | 3 | N | ✓ | | | ✓ | | | X | | | | | | | | | |
| 5. Hoier Spring | 6/23/08 | 1425 | TL | 1 | 3 | N | ✓ | | | ✓ | | | X | | | | | | | | | |
| 6. | | | | | | | | | | | | | | | | | | | | | | |
| 7. | | | | | | | | | | | | | | | | | | | | | | |
| 8. | | | | | | | | | | | | | | | | | | | | | | |
| 9. | | | | | | | | | | | | | | | | | | | | | | |
| 10. | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Relinquished by: | Date: 6/23/08 | Time: 1643 | Received by: Debbie Zufelt | Date: 6-23-08 | Time: 1643 |
| Relinquished by: | Date: | Time: | Received by: | Date: | Time: |

* Sample Reject: [ ] Return [ ] Dispose [ ] Store (30 Days)

03-1000-2008-300

## Methane Analysis Report

Four Corners Geoscience,Inc.
P.O. Box 4224
Durango, CO 81302

Client
L T Environmental,Inc.
15 West Mill Street
Bayfield,CO 81122
Mark Yalom
970-884-5215

**Project Name:** La Plata Spring Sampling
**Project Numb** MSO813
**Report Date:** 10/22/2008
**Sampled By:** Lindsay Voss

**Analysis:** Brant Landers

| FCGeo # | Sample Date | Sample Time (Hrs) | Site ID-Location | Results: CH4 (mg/L) | Limit (mg/L) | C2 |
|---|---|---|---|---|---|---|
| 101508-LB1 | 10/15/2008 | 11:15 | Ranch Durango East | <0.02 | 0.02 | ND |
| 101508-LB2 | 10/15/2008 | 11:30 | Ranch Durango North | <0.02 | 0.02 | ND |
| 101508-LB3 | 10/15/2008 | 12:10 | Ranch Durango LTD | <0.02 | 0.02 | ND |
| 101508-LB4 | 10/15/2008 | 14:15 | Darwin Rather #1 | <0.02 | 0.02 | ND |
| 101508-LB5 | 10/15/2008 | 15:00 | Darwin Rather #2 | <0.02 | 0.02 | ND |
| 101508-LB6 | 10/15/2008 | 17:00 | Hoier Spring | <0.02 | 0.02 | ND |

**Notes:**
*Samples delivered to FCGeo 12:00 p.m. 10/17/08*
*Analyses were conducted on SRI gas chromatograph w/ FID within 24 hours of delivery.*
***Conducted Methane analysis per protocol and method established by BLM San Juan Resource Area 1993 and USGS method.***
*Laboratory calibration quality control conducted the same day as sample runs.*
*Blanks and duplicated runs conducted for each sample set.*
*No field blanks received at FCGeo Lab*
*ND- Non Detected*

Lynn M. Fechter, B.S. Geology

# Four Corners Geoscience

28 Trilobite Trail, Oxford, CO
54 Wassinger Drive, Bayfield, CO 81122
Mailing Address: P.O. Box 4224 • Durango, CO 81302
(970) 247-5046

Lab Number: 10-1608-LB 1,2,3,4,5,6
Report Due Date:

Client: LT Environmental | Fax Results Y N | Page 1 of 1
Address: 15 W. Mill St | PUBLIC WATER SUPPLY INFORMATION
City, State & Zip: Bayfield, CO 81122 | System Name
Contact: Mark Valum (myalum@LTENV.com) | PWS No. | Report to State/EPA Y N
Phone: 970 884-5215 | Collector's Name: Lindsay Voss | POE No. | DWR No.
Fax: " | Project Name: La Plata Springs Sampling | Collection Point
P.O. Number: MS0813/~~[illegible]~~ | Project Number: MS0813 | City | County

**SAMPLE TYPE CODES**

DW = drinking water; TB = travel blank
WW = waste water; SD = solid
MW = monitoring well; SO = soil
HW = hazardous waste; SL = sludge

Compliance Monitoring: Y N

**TURNAROUND TIME REQUESTED**

Standard
RUSH
Special

Lab Manager Approval

| CLIENT'S SAMPLE ID/LOCATION | Date | Time | Sample Type | Containers | Analyses Requested: Methane | Spl. No. |
|---|---|---|---|---|---|---|
| Ranch Durango East | 10-15 | 1115 | SW | 3 | X | 1 |
| Ranch Durango North | | 1130 | | | X | 2 |
| Ranch Durango LTD | | 1210 | | | X | 3 |
| Darwin Rather #1 | | 1415 | | | X | 4 |
| Darwin Rather #2 | | 1500 | | | X | 5 |
| Hoier Spring | ↓ | 1700 | ↓ | ↓ | X | 6 |

Instructions/Comments/Special Requirements: Note VOAs Not Inverted & Rec'd >24 hrs from Sampling

| SAMPLE RECEIPT | | | Date | Time | Samples Relinquished By | Samples ~~Received~~ Received By |
|---|---|---|---|---|---|---|
| Received Cold | (Y) | N | 10/17/08 | 1200 | [signature] | [signature] 10/17/08 |
| Custody Seals | Y | N | | | | Residual Lab |
| Seals Intact | Y | N | | | | |
| No. of Containers | | | | | | |

Standard Terms and Conditions apply unless written agreements specify otherwise. Payment terms are Net 30.

03-1000-2008-300

**GAL ID No.:** **810-079,01-06**

November 3, 2008

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Marc Yalom

Project Name: La Plata Spring Sampling
Project Number:
Date Received: 10/16/08

This is to transmit the attached analytical report. The analytical data and information contained therein was generated using specified or selected methods contained in references, such as Standard Methods for the Examination of Water and Wastewater, 18th & 19th editions, and Methods for Determination of Organic Compounds in Drinking Water, EPA-600/4-79-020.

Samples were received by Green Analytical Laboratories in good condition on 10/16/08.

If you should have any questions or comments regarding this report, please do not hesitate to call.

Sincerely,

Debbie Zufelt

Debbie Zufelt
Laboratory Manager

Enclosure

75 Suttle Street, Durango, Colorado 81303
Telephone (970) 247-4220 Fax (970) 247-4227

**Green Analytical Laboratories**
**75 Suttle Street**
**Durango, CO 81303**

**GAL I.D.:** 810-079-01
Date Received: 10/16/08
Date Reported: 11/03/08
QC Batches:

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Marc Yalom

**PROJECT NAME:** La Plata Spring Sampling
**PROJECT NUMBER:**
**SAMPLE I.D.:** Ranch Durango East

Sample Date: 10/15/08
Sample Matrix: Water

# Laboratory Report

**RESULTS**

| PARAMETER | METHOD | REPORT LIMIT | RESULT | DIL | UNITS | Maximum Contamination Level |
|---|---|---|---|---|---|---|
| Alkalinity, Total | 2320B | 10 | 210 | 1 | mg/L | |
| Alkalinity, Bicarbonate | 2320B | 10 | 206 | 1 | mg/L | |
| Alkalinity, Carbonate | 2320B | 10 | <10 | 1 | mg/L | |
| Alkalinity, Hydroxide | 2320B | 10 | <10 | 1 | mg/L | |
| Bromide | 4500 Br | 0.10 | <0.10 | 1 | mg/L | |
| Calcium | 200.7 | 0.5 | 60.5 | 1 | mg/L | |
| Chloride | 4500CL | 10 | <10 | 1 | mg/L | |
| Conductivity | 2510B | 1.0 | 495 | 1 | uS/cm | |
| Fluoride | 4500F C | 0.2 | 0.3 | 1 | mg/L | 4.0 |
| H2 S | Calc. | 0.05 | <0.05 | 1 | mg/L | |
| Iron | 200.7 | 0.05 | <0.05 | 1 | mg/L | |
| Magnesium | 200.7 | 0.5 | 12.9 | 1 | mg/L | |
| Manganese | 200.8 | 0.0005 | 0.0245 | 1 | mg/L | |
| Nitrate/Nitrite as N | 353.3 | 0.02 | <0.02 | 1 | mg/L | |
| pH | 150.1 | NA | 7.68 | NA | SU | |
| Potassium | 200.7 | 0.5 | 0.7 | 1 | mg/L | |
| Selenium | 200.8 | 0.001 | <0.001 | 1 | mg/L | 0.05 |
| Sodium | 200.7 | 0.5 | 14.8 | 1 | mg/L | |
| Sulfate | 4500SO4 | 10 | 42 | 1 | mg/L | |
| Sulfide | 4500S_ | 0.05 | <0.05 | 1 | mg/L | |
| TDS | 2540C | 10 | 250 | 1 | mg/L | |
| Hardness | Calc | 10 | 204 | 1 | mg/L | |
| CAB | Calc | | 3.43 | | % | |

*Debbie Zufelt, Laboratory Manager*

**Green Analytical Laboratories**
**75 Suttle Street**
**Durango, CO 81303**

**GAL I.D.:** 810-079-02
Date Received: 10/16/08
Date Reported: 11/03/08
QC Batches:

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Marc Yalom

**PROJECT NAME:** La Plata Spring Sampling
**PROJECT NUMBER:**
**SAMPLE I.D.:** Ranch Durango North

Sample Date: 10/15/08
Sample Matrix: Water

# Laboratory Report

**RESULTS**

| PARAMETER | METHOD | REPORT LIMIT | RESULT | DIL | UNITS | Maximum Contamination Level |
|---|---|---|---|---|---|---|
| Alkalinity, Total | 2320B | 10 | 276 | 1 | mg/L | |
| Alkalinity, Bicarbonate | 2320B | 10 | 276 | 1 | mg/L | |
| Alkalinity, Carbonate | 2320B | 10 | <10 | 1 | mg/L | |
| Alkalinity, Hydroxide | 2320B | 10 | <10 | 1 | mg/L | |
| Bromide | 4500 Br | 0.10 | <0.10 | 1 | mg/L | |
| Calcium | 200.7 | 0.5 | 77.1 | 1 | mg/L | |
| Chloride | 4500CL | 10 | <10 | 1 | mg/L | |
| Conductivity | 2510B | 1.0 | 670 | 1 | uS/cm | |
| Fluoride | 4500F C | 0.2 | 0.3 | 1 | mg/L | 4.0 |
| H2 S | Calc. | 0.05 | <0.05 | 1 | mg/L | |
| Iron | 200.7 | 0.05 | <0.05 | 1 | mg/L | |
| Magnesium | 200.7 | 0.5 | 22.0 | 1 | mg/L | |
| Manganese | 200.8 | 0.0005 | 0.0017 | 1 | mg/L | |
| Nitrate/Nitrite as N | 353.3 | 0.02 | <0.02 | 1 | mg/L | |
| pH | 150.1 | NA | 7.22 | NA | SU | |
| Potassium | 200.7 | 0.5 | 1.1 | 1 | mg/L | |
| Selenium | 200.8 | 0.001 | <0.001 | 1 | mg/L | 0.05 |
| Sodium | 200.7 | 0.5 | 13.7 | 1 | mg/L | |
| Sulfate | 4500SO4 | 10 | 79 | 1 | mg/L | |
| Sulfide | 4500S_ | 0.05 | <0.05 | 1 | mg/L | |
| TDS | 2540C | 10 | 355 | 1 | mg/L | |
| Hardness | Calc | 10 | 283 | 1 | mg/L | |
| CAB | Calc | | 0.10 | | % | |

*Debbie Zufelt, Laboratory Manager*

**Green Analytical Laboratories**
**75 Suttle Street**
**Durango, CO 81303**

**GAL I.D.:** 810-079-03
Date Received: 10/16/08
Date Reported: 11/03/08
QC Batches:

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Marc Yalom

**PROJECT NAME:** La Plata Spring Sampling
**PROJECT NUMBER:**
**SAMPLE I.D.:** Ranch Durango LTD

Sample Date: 10/15/08
Sample Matrix: Water

# Laboratory Report

**RESULTS**

| PARAMETER | METHOD | REPORT LIMIT | RESULT | DIL | UNITS | Maximum Contamination Level |
|---|---|---|---|---|---|---|
| Alkalinity, Total | 2320B | 10 | 252 | 1 | mg/L | |
| Alkalinity, Bicarbonate | 2320B | 10 | 252 | 1 | mg/L | |
| Alkalinity, Carbonate | 2320B | 10 | <10 | 1 | mg/L | |
| Alkalinity, Hydroxide | 2320B | 10 | <10 | 1 | mg/L | |
| Bromide | 4500 Br | 0.10 | <0.10 | 1 | mg/L | |
| Calcium | 200.7 | 0.5 | 69.7 | 1 | mg/L | |
| Chloride | 4500CL | 10 | <10 | 1 | mg/L | |
| Conductivity | 2510B | 1.0 | 605 | 1 | uS/cm | |
| Fluoride | 4500F C | 0.2 | 0.3 | 1 | mg/L | 4.0 |
| H2 S | Calc. | 0.05 | <0.05 | 1 | mg/L | |
| Iron | 200.7 | 0.05 | <0.05 | 1 | mg/L | |
| Magnesium | 200.7 | 0.5 | 17.5 | 1 | mg/L | |
| Manganese | 200.8 | 0.0005 | 0.0226 | 1 | mg/L | |
| Nitrate/Nitrite as N | 353.3 | 0.02 | 0.20 | 1 | mg/L | |
| pH | 150.1 | NA | 7.63 | NA | SU | |
| Potassium | 200.7 | 0.5 | 1.0 | 1 | mg/L | |
| Selenium | 200.8 | 0.001 | 0.001 | 1 | mg/L | 0.05 |
| Sodium | 200.7 | 0.5 | 14.9 | 1 | mg/L | |
| Sulfate | 4500SO4 | 10 | 71 | 1 | mg/L | |
| Sulfide | 4500S_ | 0.05 | <0.05 | 1 | mg/L | |
| TDS | 2540C | 10 | 300 | 1 | mg/L | |
| Hardness | Calc | 10 | 246 | 1 | mg/L | |
| CAB | Calc | | 1.06 | | % | |

*Debbie Zufelt, Laboratory Manager*

**Green Analytical Laboratories**
**75 Suttle Street**
**Durango, CO 81303**

**GAL I.D.:** 810-079-04
Date Received: 10/16/08
Date Reported: 11/03/08
QC Batches:

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Marc Yalom

**PROJECT NAME:** La Plata Spring Sampling
**PROJECT NUMBER:**
**SAMPLE I.D.:** Darwin Rather #1

Sample Date: 10/15/08
Sample Matrix: Water

# Laboratory Report

**RESULTS**

| PARAMETER | METHOD | REPORT LIMIT | RESULT | DIL | UNITS | Maximum Contamination Level |
|---|---|---|---|---|---|---|
| Alkalinity, Total | 2320B | 10 | 208 | 1 | mg/L | |
| Alkalinity, Bicarbonate | 2320B | 10 | 208 | 1 | mg/L | |
| Alkalinity, Carbonate | 2320B | 10 | <10 | 1 | mg/L | |
| Alkalinity, Hydroxide | 2320B | 10 | <10 | 1 | mg/L | |
| Bromide | 4500 Br | 0.10 | <0.10 | 1 | mg/L | |
| Calcium | 200.7 | 0.5 | 56.7 | 1 | mg/L | |
| Chloride | 4500CL | 10 | 11 | 1 | mg/L | |
| Conductivity | 2510B | 1.0 | 512 | 1 | uS/cm | |
| Fluoride | 4500F C | 0.2 | <0.2 | 1 | mg/L | 4.0 |
| H2 S | Calc. | 0.05 | <0.05 | 1 | mg/L | |
| Iron | 200.7 | 0.05 | <0.05 | 1 | mg/L | |
| Magnesium | 200.7 | 0.5 | 18.6 | 1 | mg/L | |
| Manganese | 200.8 | 0.0005 | 0.0006 | 1 | mg/L | |
| Nitrate/Nitrite as N | 353.3 | 0.02 | 1.87 | 1 | mg/L | |
| pH | 150.1 | NA | 7.06 | NA | SU | |
| Potassium | 200.7 | 0.5 | 0.9 | 1 | mg/L | |
| Selenium | 200.8 | 0.001 | <0.001 | 1 | mg/L | 0.05 |
| Sodium | 200.7 | 0.5 | 7.5 | 1 | mg/L | |
| Sulfate | 4500SO4 | 10 | 34 | 1 | mg/L | |
| Sulfide | 4500S_ | 0.05 | <0.05 | 1 | mg/L | |
| TDS | 2540C | 10 | 230 | 1 | mg/L | |
| Hardness | Calc | 10 | 218 | 1 | mg/L | |
| CAB | Calc | | 2.75 | | % | |

*Debbie Zufelt, Laboratory Manager*

**Green Analytical Laboratories**
**75 Suttle Street**
**Durango, CO 81303**

**GAL I.D.:** 810-079-05
Date Received: 10/16/08
Date Reported: 11/03/08
QC Batches:

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Marc Yalom

**PROJECT NAME:** La Plata Spring Sampling
**PROJECT NUMBER:**
**SAMPLE I.D.:** Darwin Rather #2

Sample Date: 10/15/08
Sample Matrix: Water

# Laboratory Report

**RESULTS**

| PARAMETER | METHOD | REPORT LIMIT | RESULT | DIL | UNITS | Maximum Contamination Level |
|---|---|---|---|---|---|---|
| Alkalinity, Total | 2320B | 10 | 133 | 1 | mg/L | |
| Alkalinity, Bicarbonate | 2320B | 10 | 133 | 1 | mg/L | |
| Alkalinity, Carbonate | 2320B | 10 | <10 | 1 | mg/L | |
| Alkalinity, Hydroxide | 2320B | 10 | <10 | 1 | mg/L | |
| Bromide | 4500 Br | 0.10 | <0.10 | 1 | mg/L | |
| Calcium | 200.7 | 0.5 | 33.7 | 1 | mg/L | |
| Chloride | 4500CL | 10 | <10 | 1 | mg/L | |
| Conductivity | 2510B | 1.0 | 314 | 1 | uS/cm | |
| Fluoride | 4500F C | 0.2 | <0.2 | 1 | mg/L | 4.0 |
| H2 S | Calc. | 0.05 | <0.05 | 1 | mg/L | |
| Iron | 200.7 | 0.05 | 0.65 | 1 | mg/L | |
| Magnesium | 200.7 | 0.5 | 6.6 | 1 | mg/L | |
| Manganese | 200.8 | 0.0005 | 0.197 | 1 | mg/L | |
| Nitrate/Nitrite as N | 353.3 | 0.02 | <0.02 | 1 | mg/L | |
| pH | 150.1 | NA | 7.20 | NA | SU | |
| Potassium | 200.7 | 0.5 | 0.5 | 1 | mg/L | |
| Selenium | 200.8 | 0.001 | <0.001 | 1 | mg/L | 0.05 |
| Sodium | 200.7 | 0.5 | 10.9 | 1 | mg/L | |
| Sulfate | 4500SO4 | 10 | 16 | 1 | mg/L | |
| Sulfide | 4500S_ | 0.05 | <0.05 | 1 | mg/L | |
| TDS | 2540C | 10 | 170 | 1 | mg/L | |
| Hardness | Calc | 10 | 111 | 1 | mg/L | |
| CAB | Calc | | 2.58 | | % | |

*Debbie Zufelt, Laboratory Manager*

**Green Analytical Laboratories**
**75 Suttle Street**
**Durango, CO 81303**

**GAL I.D.:** 810-079-06
Date Received: 10/16/08
Date Reported: 11/03/08
QC Batches:

LT Environmental
PO Box 874
Bayfield, CO 81122
Attention: Marc Yalom

**PROJECT NAME:** La Plata Spring Sampling
**PROJECT NUMBER:**
**SAMPLE I.D.:** Hoier Spring

Sample Date: 10/15/08
Sample Matrix: Water

# Laboratory Report

**RESULTS**

| PARAMETER | METHOD | REPORT LIMIT | RESULT | DIL | UNITS | Maximum Contamination Level |
|---|---|---|---|---|---|---|
| Alkalinity, Total | 2320B | 10 | 142 | 1 | mg/L | |
| Alkalinity, Bicarbonate | 2320B | 10 | 138 | 1 | mg/L | |
| Alkalinity, Carbonate | 2320B | 10 | <10 | 1 | mg/L | |
| Alkalinity, Hydroxide | 2320B | 10 | <10 | 1 | mg/L | |
| Bromide | 4500 Br | 0.10 | <0.10 | 1 | mg/L | |
| Calcium | 200.7 | 0.5 | 23.7 | 1 | mg/L | |
| Chloride | 4500CL | 10 | <10 | 1 | mg/L | |
| Conductivity | 2510B | 1.0 | 278 | 1 | uS/cm | |
| Fluoride | 4500F C | 0.2 | <0.2 | 1 | mg/L | 4.0 |
| H2 S | Calc. | 0.05 | <0.05 | 1 | mg/L | |
| Iron | 200.7 | 0.05 | 0.11 | 1 | mg/L | |
| Magnesium | 200.7 | 0.5 | 11.8 | 1 | mg/L | |
| Manganese | 200.8 | 0.0005 | 0.0178 | 1 | mg/L | |
| Nitrate/Nitrite as N | 353.3 | 0.02 | 0.03 | 1 | mg/L | |
| pH | 150.1 | NA | 8.30 | NA | SU | |
| Potassium | 200.7 | 0.5 | 1.4 | 1 | mg/L | |
| Selenium | 200.8 | 0.001 | <0.001 | 1 | mg/L | 0.05 |
| Sodium | 200.7 | 0.5 | 13.7 | 1 | mg/L | |
| Sulfate | 4500SO4 | 10 | <10 | 1 | mg/L | |
| Sulfide | 4500S_ | 0.05 | <0.05 | 1 | mg/L | |
| TDS | 2540C | 10 | 135 | 1 | mg/L | |
| Hardness | Calc | 10 | 108 | 1 | mg/L | |
| CAB | Calc | | 5.87 | | % | |

*Debbie Zufelt, Laboratory Manager*

# CHAIN OF CUSTODY RECORD

Page 1 of 1

Client: LT Environmental
Contact: John Peterson
Address: 4600 W 60th Ave
Arvada, CO 80003
Phone Number: 303-433-9788
FAX Number: 303-433-1432

NOTES:
1) Ensure proper container packaging.
2) Ship samples promptly following collection.
3) Designate Sample Reject Disposition.

PO#
Project Name: La Plata Spring Samplng

Table 1. – Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other (Specify) _____

FOR GAL USE ONLY
GAL JOB # 810-079.01-.06

Samplers Signature:

Lab Name: Green Analytical Laboratories, Inc. (970) 247-4220 FAX (970) 247-4227
Address: 75 Suttle Street, Durango, CO 81303

| Sample ID | Collection: Date | Collection: Time | Misc: Collected by: (Init.) | Misc: Matrix Type From Table 1 | Misc: No. of Containers | Misc: Sample Filtered ? Y/N | Preservative(s): Unpreserved (Ice Only) | Preservative(s): HNO3 | Preservative(s): HCL | Preservative(s): H2SO4 | Preservative(s): NAOH | Preservative(s): Other (Specify) | Analyses Required: Gas mw | Analyses Required: + Bromide | Analyses Required: + Sulfide | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Ranch Durango East | 10/15/08 | 1115 | LEV | 1 | 5 | N | 3 | | | 1 | 1 | | X | X | X | per |
| 2. Ranch Durango North | " | 1130 | LEV | 1 | " | " | " | | | " | " | | " | " | " | |
| 3. Ranch Durango LTD | " | 1210 | LEV | 1 | " | " | " | | | " | " | | " | " | " | |
| 4. Darwin Rather #1 | " | 1415 | LEV | 1 | " | " | " | | | " | " | | " | " | " | |
| 5. Darwin Rather #2 | " | 1500 | LEV | 1 | " | " | " | | | " | " | | " | " | " | |
| 6. Hoier Spring | " | 1700 | LEV | 1 | " | " | " | | | " | " | | " | " | " | |
| 7. | | | | | | | | | | | | | | | | |
| 8. | | | | | | | | | | | | | | | | |
| 9. | | | | | | | | | | | | | | | | |
| 10. | | | | | | | | | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Relinquished by: [signature] | Date: 10-16-08 | Time: 0733 | Received by: Debbie Zufelt | Date: 10-16-08 | Time: 0733 |
| Relinquished by: | Date: | Time: | Received by: | Date: | Time: |

* Sample Reject: [ ] Return [ ] Dispose [ ] Store (30 Days)