

Special Project 1918



**HYDROCARBON SEEP REPORT
FLY CREEK PROJECT
SAND WASH BASIN, COLORADO**

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TABLE OF CONTENTS

<u>TITLE</u>	<u>PAGE</u>
Table of Contents	2
List of Figures	2
Introduction	3
Literature Review	3
Surveying and Sampling	4
Analyses	6
Water Chemistry	6
BETX	7
Dissolved Gases	7
Stable Isotope Results	8
Conclusions	12
References	13
Appendix- Daily Reports with GPS Coordinates	16
Topographic Map Showing Location of Existing Gas/Oil Seeps	
Water Analysis Report from ACZ Laboratories	
Isotope Report from Zymax Forensics, Report #32745 dated 8/12/03	

LIST OF FIGURES

Figure 1- Carbon 13 in Methane, Robidoux Seep, Cedar Ridge LLC

Figure 2- Carbon 13 in Carbon Dioxide, Robidoux Seep, Cedar Ridge LLC

Figure 3- Deuterium in Methane, Robidoux Seep, Cedar Ridge LLC

INTRODUCTION

Cedar Ridge LLC is developing conventional and coal bed methane (CBM) gas fields near Slater, Colorado. There are pre-existing gas and oil seeps in the area. This study was undertaken to survey the seeps and sample the largest for chemistry and stable isotopes.

The study area includes portions of Colorado and Wyoming near the towns of Slater, Colorado and Savery, Wyoming. Sections 34, 35, and 36 in Township 13 north, Range 89 west. Sections 31 and 32 in Township 13 north, Range 88 west. Sections 1, 2, 3, 10, 11, 12, 13, 14, 15, 16, 22, 23, 24 25, 26 and 27 in Township 12 north, Range 89 west. Sections 5, 6, 7, 8, 17 and 18 in Township 12 north, Range 88 west. The study area encompassed 27 square miles.

LITERATURE REVIEW

1863- The first coal mine in the Little Snake Coal Field was east of Sulphur by the Overland Stage Company (Campbell 1910). This is north of the study area. Campbell (1910) is a good history of the early coal mines. Methane gas was found in several of the mines. Water springs were discussed issuing from the Mesaverde Formation, Lewis Formation contact and the Bishop Conglomerate. Shallow dug water wells into alluvial sources were also discussed. Some were usable, but several were much worse quality than the nearby surface stream.

1871- The first geologic expedition to the area was the Fortieth Parallel Expedition in 1871 and 1872 (King et al. 1874). The expedition traversed the Little Snake Valley from east to west. They described general surficial geology identifying coal. The coal was important for nearby supply to the transcontinental railroad (1869) just north of the study area. No oil or gas seeps were recorded.

1879- The Robidoux family settled in the Little Snake Valley in 1879. They moved to their current property in 1928 which includes the Robidoux oil and gas seeps into a channel of the Little Snake River. The family knew of the seep when they first came to the valley in 1879 (Robidoux 2003). The family collected oil from the seep for lubrication, but never made use of the gas. The flow of oil was intermittent and the flow of gas was fairly constant. They also observed gas bubbles in most ponds and meander cutoffs due to decomposing vegetation. The Robidoux family traces its genealogy to the famous Mr. Antoine Robidoux who set up trading forts in Colorado and Utah during Spanish/Mexican times starting in 1828 (Reyher 2002).

1890's- Mr. Ellsworth (Elzy) Lay tries to locate a well for oil and gas somewhere in the Little Snake Valley area (Kelly 1938). Mr. Lay was a member of the Wild Bunch outlaw gang headed by Mr. George LeRoy Parker (Butch Cassidy). In later years Mr. Lay managed ranches for the Calverly family in the Little Snake Valley (Kelly 1938). The author has also heard that this well was in the Hiawatha gas field to the west of the study area. The author has also seen stock certificates of the Mutual Oil Company in the Savery Museum.

1918- Oil and gas seeps are shown in Routt County on a map of Colorado (CGS 1918). Due to the scale and size of the symbol it is difficult to determine if the seeps of the Little Snake Valley are indicated or the seeps of the Elk River Valley to the south.

1970's- A series of coal studies were made by the USDOI Geological Survey under the direction of C. S. Venable Barclay (See References). Mr. Bill Hanson was a field geologist who observed the Robidoux seeps and the gas seeps north of Savery, Wyoming near the Boyer Ranch (Hanson 2003). None of these seeps were described in the references.

1982- The area was mapped for surficial geology (Madole 1982, Tweto 1982).

2004- Cedar Ridge LLC had oil analyses conducted of a Niobrara (Mancos Shale Formation) oil well in the Sierra Madre field, a nearby Deep Creek Sandstone (Lower Mesa Verde Group) oil well, and the Robidoux oil seep (Pencor 2003). The conclusion was that all three samples were derived from a common source. The likely source was marine shale of upper Cretaceous or lower Tertiary age. The Niobrara (Mancos) sample was not degraded by bacteria. The other two samples were severely altered by bacteria.

The indicated vertical migration pathway was from the Mancos marine shale source, into the calcareous Niobrara zone within the Mancos, upward into the Deep Creek Sandstone of the lower Mesa Verde Group, and further upward into the Robidoux Seep of the upper Mesa Verde Group.

SURVEYING AND SAMPLING

Seeps were surveyed with the help of Mr. Jubal Terry of Skyline Resources, Wheatridge, Colorado. His local knowledge was valuable with the contact and observations of local residents. Likely seepage areas were surveyed by hiking, direct observation, and location by a handheld Global Positioning System (GPS) instrument. Daily reports with GPS coordinates are located in the Appendix.

The seep indicators were direct observation of bubbles or oil sheens, dead vegetation, accumulated asphalt, and black iron sulfite accumulations. Gas seepage from decomposing vegetation (biogenic) was generally in stock ponds and meander cut offs with intermittent bubbles and the absence of black iron sulfite accumulations. Gas from deeper sources that were formed from higher temperatures and pressures (thermogenic), were a steadier flow commonly accompanied by rainbow oil sheen's on the water surface. Dead vegetation was commonly associated with seeps due to the reduction of soil oxygen. However vegetation mortality can have many causes. Commonly black iron sulfite was present due to the anaeorobic conditions. Either type of seepage can have an associated hydrogen sulfide odor.

2003 June 3- Met the Robidoux's. Hiked the Robidoux and Little Robidoux seeps north of Moffat County Road. Big seep in middle of the Little Snake River. Large amount of gas flow over a wide area. Large oil sheen on the river with asphalt.

Fly Gulch was hiked from the headwaters to the confluence with the Little Snake River. An old coal mine was identified near the confluence that was leaking water and had a hydrogen sulfide odor.

Observed two stock ponds that bubbled intermittently with some black iron sulfite around edges. These two ponds were classified as biogenic.

2003 June 4- Hiked Mr. Lee Robinson's irrigated field near Savery, Wyoming. A dug pit bubbles small steady gas flow. The flood irrigation allowed identification of a much larger area that was seeping gas. A small area of vegetation was dead. One area with a rainbow sheen observed.

Observed roadside seep in pond north of Savery, Wyoming to the west of the Savery Creek Road. Only the pond bubbles even though water from irrigation covers other areas. Probable biogenic seep.

Observed roadside seep further north of Savery to the north and west of the Savery Creek Road. Multiple steady gas flow vents with strong hydrogen sulfide odor.

2003 June 5- Hiked Rye Grass Gulch from main road to confluence with Little Snake River. No seepage observed. A coal seam was observed sub cropping into the north side of the Little Snake River just downstream of the confluence. Observed sodic soil area south of Wyoming Highway 70. No seepage noted.

Observe old coal mine near mouth of Savery Creek on Thomas property.

Observe water spring with rainbow sheen east of Wyoming Highway 70. No accumulated asphalt deposits so probably iron bacteria. No gas bubbles.

Meet Mr. Espy. Observed gassy water well west of Slater Creek Road on his property. Water and gas are flowing up outside the casing into a field creating a vegetation dead area.

Observed Slater Creek with no indications.

2003 June 3- Hiked area north of Robidoux's and the Little Snake River. No indications of seepage.

Hiked Big and Little Robidoux seeps for GPS coordinates.

2003 August 7- Sampled Big Robidoux seep and CBM#1 for COGCC water quality list, BETX, and stable isotopes (seep only). Hiked Big and Little Robidoux seeps for GPS Coordinates.

All samples were taken of raw water after separation and before any treatment. Field parameters included temperature (Bimetal Thermometer), pH (Hanna Pocket), and specific conductance (Hanna Pocket). Specific conductance and pH were field calibrated using standard solutions. Field measurements are listed in the Appendix. A gas sample of the Big Robidoux Seep was taken using the inverted bottle method.

ANALYSES

The samples for the COGCC analyses list and BETX were delivered to ACZ Laboratories, Steamboat Springs, Colorado. The gas sample for stable isotope analyses was sent to Zymax Laboratories, San Luis Obispo, California.

WATER CHEMISTRY

The pH of the Big Robidoux Seep sample was 8.1 and the CBM #1 sample was 8.2. These are essentially the same and could be from the same source.

The total dissolved solids concentration of the Big Robidoux Seep sample was 2,460 mg/l and the CBM #1 sample was 2,460 mg/l. These are essentially the same and could be from the same source. This level is too high for drinking water, but could be used as stock water. The level was classified as moderately saline.

The sodium concentration of the Big Robidoux Seep sample was 999 mg/l and the CBM #1 sample was 993 mg/l. These are essentially the same and could be from the same source.

The potassium concentration of the Big Robidoux Seep sample was 6.2 mg/l and the CBM #1 sample was 5.0 mg/l. These are essentially the same and could be from the same source.

The calcium concentration of the Big Robidoux Seep sample was 3.7 mg/l and the CBM #1 sample was 4.6 mg/l. These are essentially the same and could be from the same source.

The magnesium concentration of the Big Robidoux Seep sample was 1.5 mg/l and the CBM #1 sample was 1.5 mg/l. These are essentially the same and could be from the same source.

Sodium was the predominate positive ion (cation) at a level of 99.3% for the Big Robidoux Seep sample and 99.2% for the CBM #1. These are essentially the same and could be from the same source.

The bicarbonate concentration of the Big Robidoux Seep sample was 2,270 mg/l and the CBM #1 sample was 2,310 mg/l. These are essentially the same and could be from the same source.

The chloride concentration of the Big Robidoux Seep sample was 77 mg/l and the CBM #1 sample was 56 mg/l. These are essentially the same and could be from the same source.

The sulfate concentration of the Big Robidoux Seep sample was <10 mg/l and the CBM #1 sample was <10 mg/l. These are essentially the same and could be from the same source.

The fluoride concentration of the Big Robidoux Seep sample was 7.5 mg/l and the CBM #1 sample was 7.5 mg/l. These are essentially the same and could be from the same source. This level is very high so the water is unfit for drinking water.

Bicarbonate was the predominate anion at a level of 94.5% for the Big Robidoux Seep sample and 96.0% for the CBM #1 sample. These are essentially the same and could be from the same source.

All dissolved metal concentrations are at or below the detection limits. The total iron indicates the metals are adsorbed on sample sediment.

The water samples are moderately saline and appropriate for stock watering. They are a sodium-bicarbonate water type, which is typical for water that has undergone cation exchange and sulfate reduction in a formation that was deposited in fresh water. They are from the same or very similar sources due to the almost identical water chemistry and close proximity of the Big Robidoux Seep and CBM #1 well.

BETX

BETX is an abbreviation for the analyses of benzene, ethyl-benzene, toluene, and xylene. Presence of these parameters indicates raw or refined petroleum products. Benzene was detected in a low concentration of 0.3 micrograms per liter in the CBM #1 well sample. All other parameters were below detection limits for both samples. These are typical results for most CBM water production.

The essential absence of BETX in the CBM#1 sample and lack of oil production indicates that the Mesa Verde coals were not the source of the oil observed at the Robidoux Seep. This matched the conclusions of the Pencor report (2003) discussed in the Literature Review Section.

These low BETX concentrations from the Robidoux Seep are surprising since the seep produces a rainbow sheen on the river, the Robidoux family used collected oil, and the seep has asphalt deposits. It is unknown why these visible indications of petroleum are not reflected in the BETX analyses. Perhaps the altering by bacteria on the migration pathway has affected the BETX concentrations.

DISSOLVED GASES

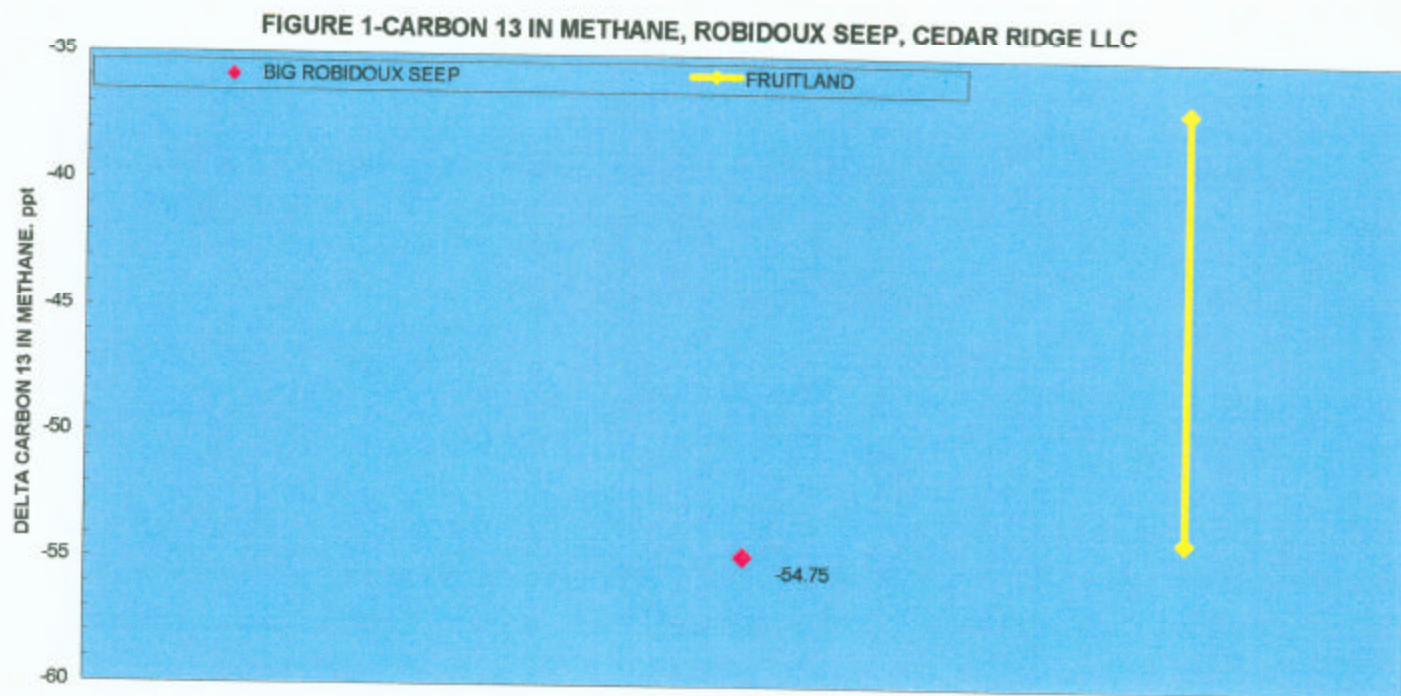
Dissolved methane ((CH₄)₁), ethane ((CH₄)₂), butane ((CH₄)₃), propane ((CH₄)₄), pentane ((CH₄)₅), and hexane ((CH₄)₆) were analyzed in each sample. The methane concentration of the Big Robidoux Seep sample was 8.8 mg/l and the CBM #1 sample was 10.6 mg/l. These are essentially the same and could be from the same source. At the altitude of the study area this is about a third of the saturation limit of 30 mg/l. The other hydrocarbon gases were not detected.

The headspace of the inverted bottle sample from the Big Robidoux sample was also analyzed for gases. Methane was found at a level of 84.1%. Carbon dioxide was found at a level of 1.51%. The atmospheric gases of nitrogen and oxygen make up the remainder at 13.1%.

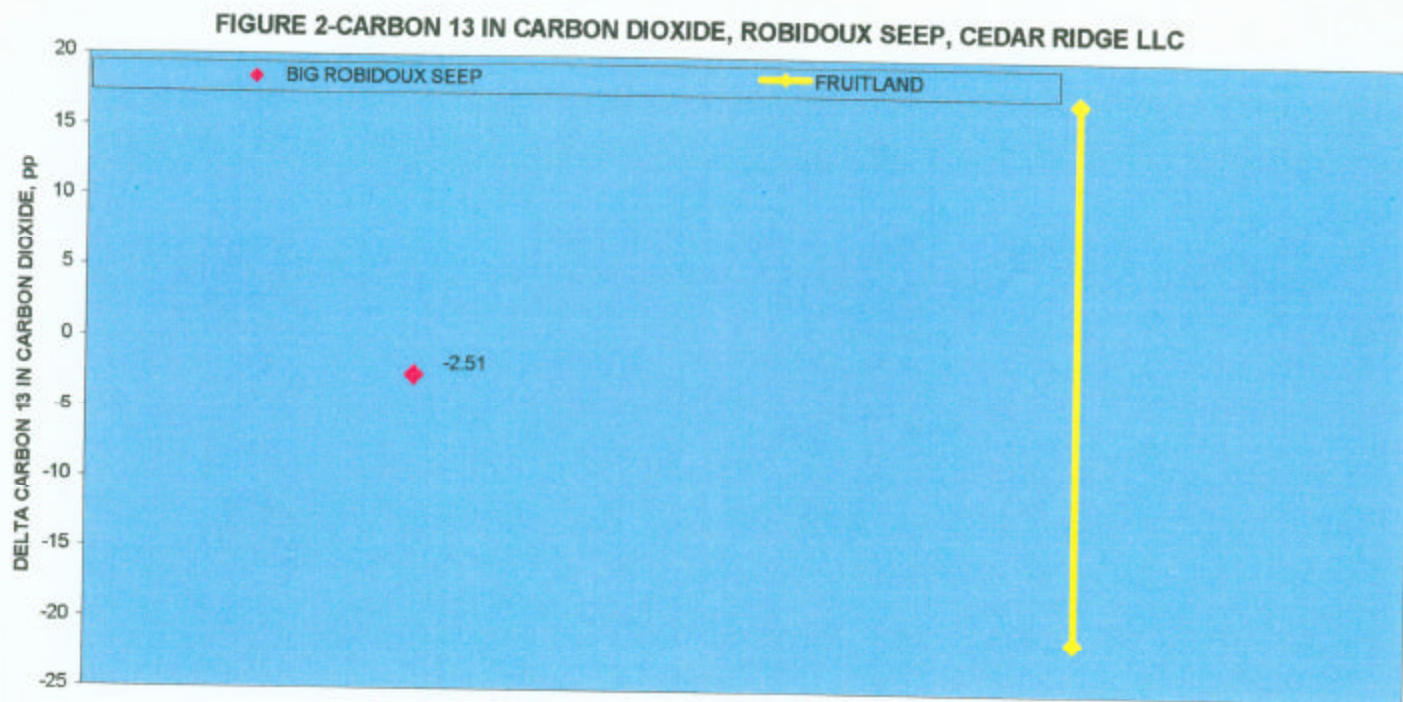
STABLE ISOTOPE RESULTS

The Big Robidoux gas sample stable isotope results are discussed in comparison with the Fruitland CBM results from the San Juan Basin (Gorody, Baldwin, and Scott 2004, Oldaker 2002). The Sand Wash Basin does not have an extensive database of results for comparison.

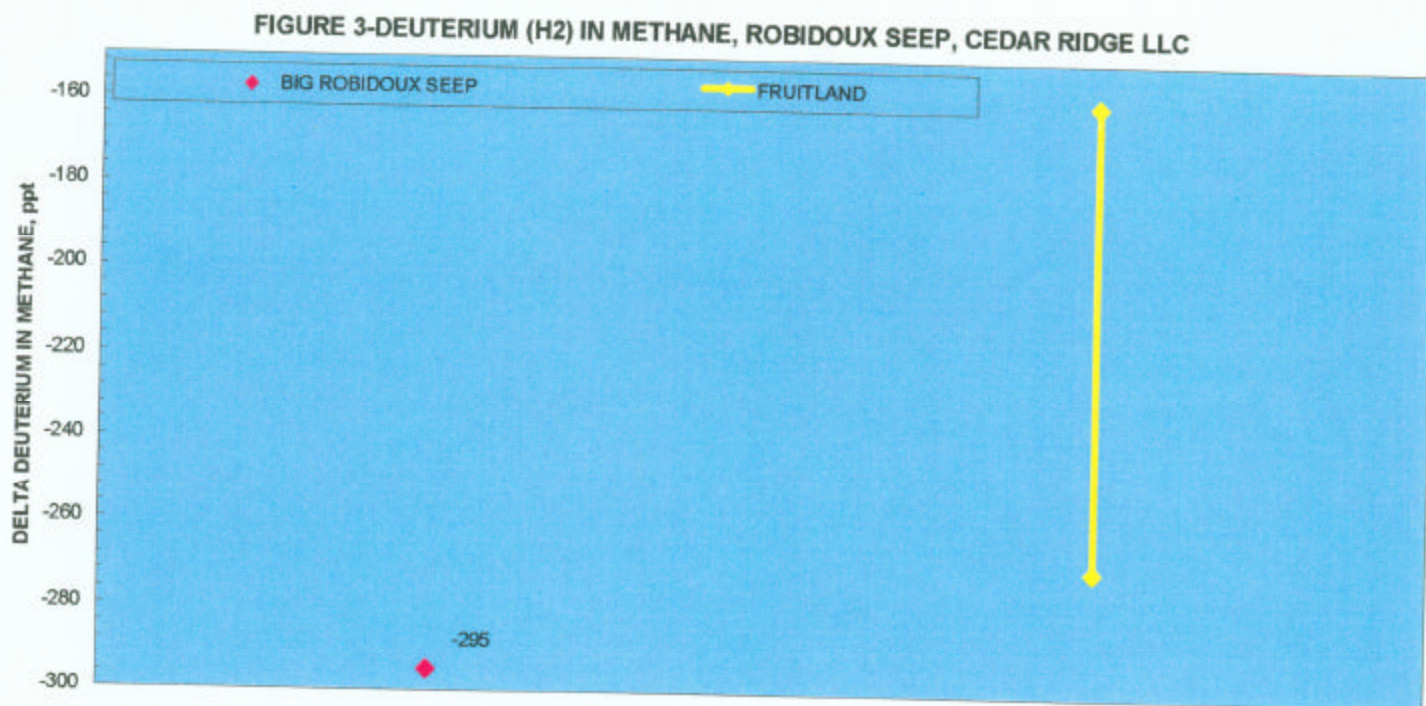
Carbon 13 is a stable isotope of carbon with one extra neutron. The concentrations of carbon 13 in methane are plotted on Figure 1. The concentration of -54.75 ppt was on the borderline of the population for the Fruitland CBM reservoir. Generally values less than -60 ppt are generated by bacteria decomposition (biogenic). The range from -60 to -55 ppt is an area of overlap between bacteria generation and high temperature/pressure generation (thermogenic). Values more than -55 ppt are generated by high temperature and pressure (thermogenic). The Fruitland CBM reservoir range of values was thermogenic. The Robidoux seep sample was classified as thermogenic. Perhaps some bacterial alteration of the carbon 13 has occurred in a similar manner to the oil migration pathway.



Carbon 13 is a stable isotope of carbon with one extra neutron. The concentrations of carbon 13 in carbon dioxide are plotted on Figure 2. The concentration of -2.51 ppt was in the middle of the population for the Fruitland CBM reservoir. Generally values near the minimum of the range (-21 ppt) indicate a shallow geo-chemical system. Values near the maximum of the range (+17 ppt) indicate a deeper geo-chemical system. The Fruitland CBM reservoir range of values was from shallow to deep. The Robidoux seep sample was classified as moderately shallow.



Deuterium is a stable isotope of hydrogen with one extra neutron. The concentrations of deuterium in methane are plotted on Figure 3. The concentration of -295 ppt was less than the population for the Fruitland CBM reservoir. Generally values less than -280 ppt are generated by bacteria decomposition (biogenic). Values more than -280 ppt are generated by high temperature and pressure (thermogenic). The Fruitland CBM reservoir range of values was thermogenic. The Robidoux seep sample was classified as biogenic. Possibly the shallow depth of the system has skewed the deuterium value. Perhaps some bacterial alteration of the deuterium has occurred in a similar manner to the oil migration pathway.



Overall the sample was classified as shallow thermogenic. It should be noted that this single sample was being compared to values from another geologic basin. The classification may change if a database was developed for the Sand Wash Basin.

CONCLUSIONS

1. The water samples are moderately saline and appropriate for stock watering. The samples are a sodium-bicarbonate water type, which is typical for water that has undergone cation exchange and sulfate reduction in a formation that was deposited in fresh water. They are from the same or very similar sources due to the almost identical water chemistry and close proximity of the Big Robidoux Seep and CBM #1 well.
2. BETX was either not detected or the concentrations were very low despite visible indications of petroleum in both the Robidoux Seep and the CBM#1 well.
3. Methane was the primary dissolved gas present without heavier hydrocarbon gases.
4. Stable isotopes of methane and carbon dioxide classify the Robidoux Seep sample as shallow thermogenic.

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APPENDIX

DAILY REPORT 3 JUNE 2003
CEDAR RIDGE LLC- FLY GULCH PROJECT

0745- Met Jubal Terry for breakfast.

1000- Onsite, met Duane Hiss. Ferry cars to Fly Gulch. Hike gulch for signs of gas seeps. Checked two fault zones. No dead vegetation, no seeps observed. One old coal mine adit that is leaking water with hydrogen sulfide smell, water has created a bog with sedge vegetation.

Map Location GS1: 40 deg, 59', 42" north, 107 deg, 18', 42" west (5 satellites).

1300- Met Duane Hiss, had lunch.

Met Albert and Evelyn Robidoux. Possible small gas seep further up Fly Gulch.

Robidoux Seep- River has broken through slough so now under water. His father was born in 1879 and knew of the seep. They moved to current location in 1928. Gas flow is not very variable. Oil flow is variable. They used it as lubricant.

Almost all the sloughs bubble some.

They are related to Antoine Robidoux who set up trading posts in the early 1800's.
Interested in Beeler genealogy.

1430- Examined multiple gas seeps with vegetation changes just to the west of the Robidoux seep in muddy bottom land. I will do GPS later to save time with Jubal.

1500- Possible oil seep with fresh water spring near highway. Some accumulation in creek,

Map Location GS2: 41 deg, 00', 48" north, 107 deg, 21', 13" west (3 satellites).

1545- Pond/spring on fault. Biogenic gas due to non-specific nature and black iron sulfite in bottom.

Map Location GS3: 41 deg, 00', 58" north, 107 deg, 21', 38" west (5 satellites).

1630- Pond/spring on fault. Biogenic gas due to non-specific nature and black iron sulfite in bottom.

Map Location GS4: 41 deg, 00', 56" north, 107 deg, 20', 25" west (4 satellites).

Return to Steamboat Springs.

2100- Prepare daily report.

DAILY REPORT 4 JUNE 2003
CEDAR RIDGE LLC- FLY CREEK PROJECT

0730- Met Jubal Terry. Travel to site.

0930- Inspect seep at Lee Robinson field. He dug water pit for stock watering. A small steady gas seep with a couple intermittent seeps. Sodic soil from seep.

41 deg, 01', 26" N, 107 deg, 26', 06" W, 5 sats.

Began mapping seep extent. Almost whole area is under irrigation water, perfect for mapping.

41 deg, 01', 28" N, 107 deg, 25', 56" W, 3 sats.

Dead Spot, 41 deg, 01', 24" N, 107 deg, 25', 52" W, 3 sats.

Intermittent Seep w/dead veg., 41 deg, 01', 21" N, 107 deg, 26', 00" W, 4 sats.

20 ft by 50 ft area w/ lateral, steady gas with lazy flow in ditch

Map Location GS5: South edge, 41 deg, 01', 24" N, 107 deg, 26', 02" W, 4 sats.

North edge, 41 deg, 01', 23" N, 107 deg, 26', 05" W, 3 sats.

Steady vigorous seep,

Map Location GS6: 41 deg, 01', 23" N, 107 deg, 26', 02" W, 5 sats.

Next ditch to east, no seeps.

Steady gas seep w/several vents, s. rainbow scum,

Map Location GS7: 41 deg, 01', 27" N, 107 deg, 26', 08" W, 3 sats.

Another as above,

Map Location GS8: 41 deg, 01', 27" N, 107 deg, 26', 07" W, 5 sats.

Foamers, 41 deg, 01', 27" N, 107', 26', 07" W, 4 sats.

Lazy gas seeps, 41 deg, 01', 27" N, 107 deg, 26', 08" W, 5 sats.

Foamers, 41 deg, 01', 27" N, 107 deg, 26', 08" W, 4 sats.

Foamer, 41 deg, 01', 27" N, 107 deg, 26', 07" W, 5 sats.

More dead spots further west with no visible seeps. Ditches do not have any seeps.

Lunch at Savery store. Met Kris Thomas.

1300- Roadside seep in pond, up Savery Ck road. Multiple vents, no black sediment, some vents vigorous, possible dug out spring, dead vegetation on hillside above pond. Why only in pond on one side of road? Lots of water on east side of road with no bubbles or indications.

41 deg, 03', 23" N, 107 deg, 24', 49" W, 3 sats.

Visit Taylor well.

1400- Black roadside bog, with sulphur smell. 2 main vents with steady vigorous flow. Other intermittent seeps. Jubal says zone in basal coals.

Map Location GS9: 41 deg, 05', 54" N, 107 deg, 22', 48" W, 6 sats.

Thunderstorms. Visited Little Snake Valley Museum. Impressive. Mutual Oil Co. Stock certificate.

DAILY REPORT 5 JUNE 2003
CEDAR RIDGE LLC- FLY CREEK PROJECT

0730- Met Jubal Terry, Traveled to site.

0930- Hiked Rye Grass Gulch to the Little Snake River. Gulch had slight water flow. No indications of gas seeps.

Hiked to 40 deg, 00', 07" N, 107 deg, 20', 55" W, 4 sats. Stopped by river cutting into valley wall. Coal seam exposed on north side of river. Possible seep site to be investigated at low water. Across from red trailer house with other 2 story gray house w/flag.

Hiked back to trucks at 40 deg, 00', 42" N, 107 deg, 19', 56" W, 6 sats.

1200- Checked sodic soil area at 40 deg, 00', 12" N, 107 deg, 21', 48" W, 6 sats.
No other indications.

Lunch- Savery store.

1330- Check Thomas area on Savery Ck., Old coal mine on property.

Check east of roadside seep, no bubbles.

Met Jim Espy.

Gassy water well on Slater Ck. road. Flowing water and gas from annulas into field creating sodic area.

Map Location GS10: 40 deg, 59', 39" N, 107 deg, 22', 45" W, 5 sats.

Checked Slater Ck. to gap with no indications.

DAILY REPORT 6 JUNE 2003
CEDAR RIDGE LLC- FLY CREEK PROJECT

0730- Met Jubal Terry. Traveled to site.

0930- Drive in to north of Robidoux. Rough roads with some cross country.

Dead tree near confluence of Little Snake and Robidoux seep slough. 41 deg, 59', 42" N, 107 deg, 20', 01" W, 3 sats. Lots of standing water through area without bubbles. Returned to trucks at 40 deg, 59', 50" N, 107 deg, 19', 52" W, 4 sats.

Lunch- Jubal heads back to Denver.

At Big Robidoux seep. River has broken into slough covering seep. Poorly visible. Mapping will have to wait for low water.

Map Location GS 11: 40 deg, 59', 37" N, 107 deg, 19' 52" W, 4 sats.

Mapped Little Robidoux seep.

Intermittent bubbler in lateral, 40 deg, 59', 34" N, 107 deg, 20', 08" W, 6 sats.

Main line of seeps is 13 vents with steady flow.

One end is Map Location GS12: 40 deg, 59', 30" N, 107 deg, 20', 08" W, 4 sats,
to other end Map Location GS13: 40 deg, 59', 34" N, 107 deg, 20', 06" W, 4 sats.

Some white salt deposits with possible asphalt.

Dead spot, 40 deg, 59', 34" N, 107 deg, 20', 05" W, 5 sats.

Four dead spots, 40 deg, 59', 34" N, 107 deg, 20', 05" W, 6 sats.

Walking irrigation ditch back to truck, no bubbles. 40 deg, 59', 36" N, 107 deg, 20', 16" W, 6 sats.

DAILY REPORT 7 AUGUST 2003
CEDAR RIDGE- FLY GULCH

0800- Call lab to set up bottles.

0830- Pick up bottles.

1100- At site. Met Mrs. Robidoux for access permission. Met John Thomas.

1245- Sampled CBM #1. T=75.4 F, pH=8.4, EC=1,700 uS/cm, H₂S<0.1 mg/l. No visible oil & grease, no sand some rubber bits, clear, vs. orange, no odor. Took COGCC, dissolved methane, and BTEX.

1330- Begin sampling Robidoux Seep, T=82.9 F, pH=8.4, EC=1,400 uS/cm, H₂S<0.1 mg/l. Visible rainbows of oil & grease, no sand, vs turbid, gray, no odor. Took COGCC, dissolved methane, BTEX, and gas sample.

1500- Began mapping big Robidoux seep.

Numerous 20-30 gas seeps with oil. 3 sats.

Map Location GS14: 40 degrees, 59', 37" N, 107 degrees, 19', 58" W

Numerous 20-30 gas seeps with oil. 5 sats.

40 degrees, 59', 37" N

107 degrees, 19', 54" W

Numerous 20-30 gas seeps with oil. 5 sats.

40 degrees, 59', 37" N

107 degrees, 19', 53" W

Numerous 20-30 gas seeps with oil. Main gas vent. Continuous gas flow that is episodic to a roar. 5 sats.

40 degrees, 59', 37" N

107 degrees, 19', 58" W

Main oil vent. 3 sats.

40 degrees, 59', 38" N

107 degrees, 19', 52" W

Downstream, 6 gas seeps with oil. 4 sats.

40 degrees, 59', 38" N

107 degrees, 19', 53" W

No more seeps downstream to the Grieve property line. 3 sats.

40 degrees, 59', 38" N

107 degrees, 19', 54" W

Upstream of main seep. Numerous 10-20 gas seeps with oil. 5 sats.

40 degrees, 59', 35" N

107 degrees, 19', 51" W

Numerous 20-30 gas seeps. 7 sats.

40 degrees, 59', 37" N

107 degrees, 19', 51" W

Numerous 15 gas seeps. 5 sats.

40 degrees, 59', 37" N

107 degrees, 19', 51" W

1 gas seep. 5 sats.

40 degrees, 59', 37" N

107 degrees, 19', 50" W

5 gas seeps. 6 sats.

40 degrees, 59', 37" N

107 degrees, 19', 50" W

2 gas seeps. 3 sats.

40 degrees, 59', 37" N

107 degrees, 19', 51" W

1 gas seep. 3 sats.

40 degrees, 59', 37" N

107 degrees, 19', 50" W

At a ford. Went and relocated truck.

5-10 intermittent gas seeps. 3 sats.

40 degrees, 59', 39" N

107 degrees, 19', 50" W

3-5 continuous gas seeps. 5 sats.

40 degrees, 59', 39" N

107 degrees, 19', 50" W

1 intermittent gas seep. 3 sats.

40 degrees, 59', 40" N

107 degrees, 19', 50" W

4 intermittent gas seeps. 4 sats.

40 degrees, 59', 40" N

107 degrees, 19', 50" W

2 oil stained areas. 3 sats.

40 degrees, 59', 40" N

107 degrees, 19', 49" W

Out of slough into main river channel. No seeps downstream to
4 sats.

40 degrees, 59', 45" N

107 degrees, 19', 50" W

Head upstream

3-5 intermittent gas seeps. 4 sats.

40 degrees, 59', 41" N

107 degrees, 19', 44" W

1 continuous gas seep, 1 intermittent gas seep. 4 sats.

40 degrees, 59', 40" N

107 degrees, 19', 44" W

No seeps upstream to

3 sats.

40 degrees, 59', 47" N

107 degrees, 19', 41" W

Return to truck.