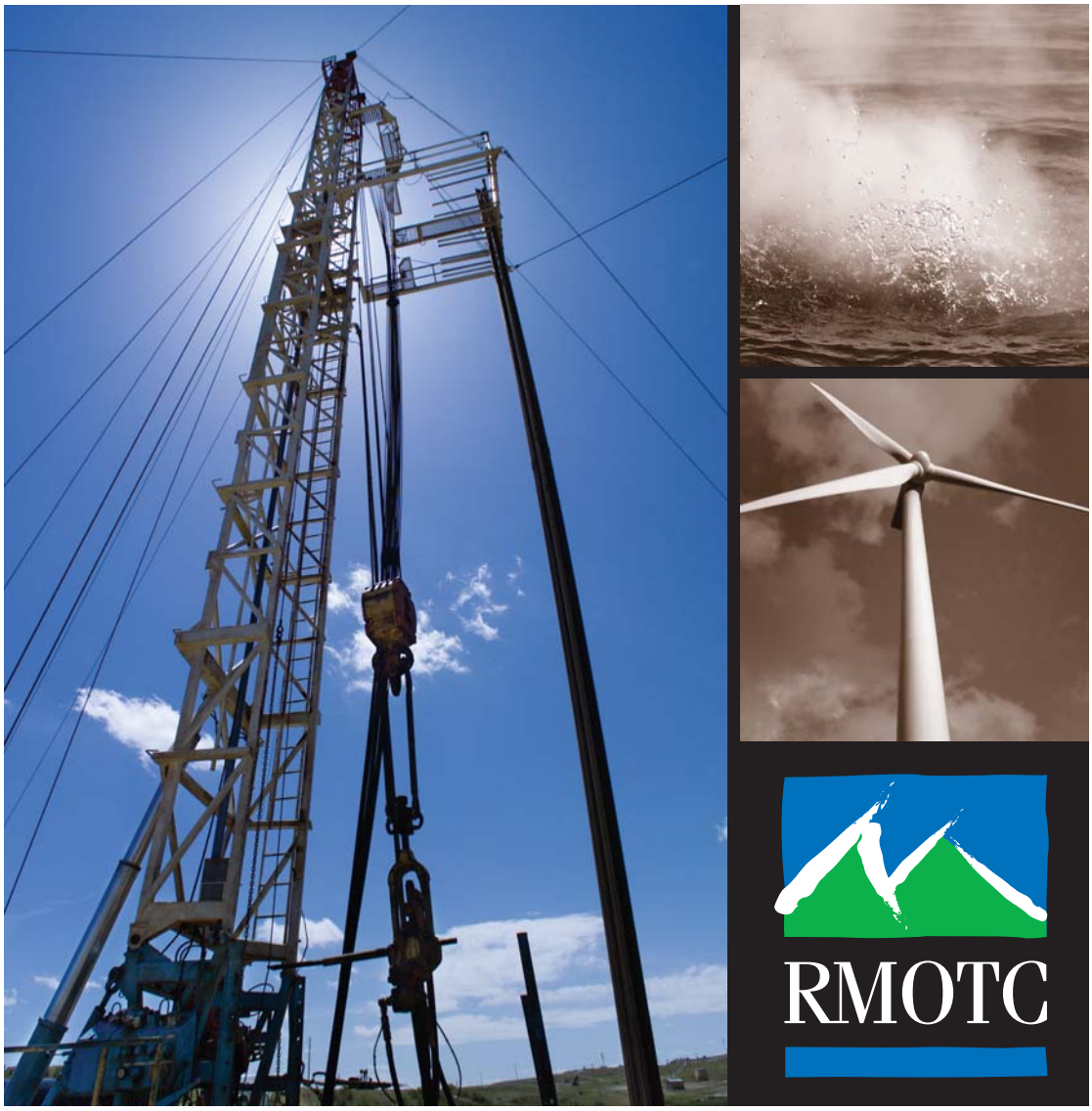

HyCap Energy, LLC: CBM Gas Separator

Naval Petroleum Reserve No. 3, Teapot Dome Field, Wyoming

Final Report for the period of April 27-28, 2010
Completed September 2010

U.S. DEPARTMENT OF ENERGY

RMOTC is operated by the United States Department of Energy, Office of Fossil Energy

RMOTC

U.S. DEPARTMENT OF ENERGY

FIA 2010-A139 (DOE-RMOTC-51131)

HyCap Energy, LLC: CBM Gas Separator

Mark Duletsky, RMOTC; Bret Wolz, HyCap

ABSTRACT

On April 27-28, 2010, HyCap Energy, LLC (formerly Wyoming Water Design & Development) conducted water gas separation testing on two wells located on the RMOTC's field test site, Naval Petroleum Reserve No. 3 (NPR-3). The test was observed by HyCap employees, members of the staff of RMOTC, and employees of Methane Electrical Services (MES), who also provided gas measurement and gas quality services.

In the early 1990s, development of coalbed methane (CBM) wells had spread to the Powder River Basin in northeastern Wyoming. Initially, operators assumed that they were capturing all the gas produced and sending it to market. CBM operations have found this assumption to be incorrect due to the problems encountered during production, including gas locking of submersible pumps and transport lines. HyCap's goal while at RMOTC was to monitor and document the effectiveness of its HyCap Separator (originally called the "Yellowstone Separator" during testing) at removing volatile gases entrained in production water.

TABLE OF CONTENTS

LIST OF FIGURES

Introduction

Since 1994, a boom in coalbed-generated methane gases (CH4) has spread to the Powder River Basin (PRB) of Wyoming and has grown over the western United States. Methane gas in this form is a highly volatile, biothermic natural gas that has a significant BTU rating. Scientific research has proven that the gases are produced by the life cycle of bacteria that live in the coal seams. The gas does not dissolve in the water, but is entrained. Since it is not mixed, diluted, or chemically altered in nature, the captured gas can be used beneficially (such as natural gas) on site, combusted directly, stored, or disposed of. The gas, like oil, rarely mixes completely with the water. In conventional CBM wells, a shroud is used at the pump end in the well to separate the entrained gas from the water using turbulent flow, pressure reduction, and the principle that gas rises when water is pumped downward. The methane rises in the annulus space of the well and is collected at the wellhead, while the production water is pumped off and disposed of.

As of 2001, approximately 12,000 wells had been drilled in the Powder River Basin with up to 39,000 additional wells anticipated over the next 10 years (NETL Powder River Basin Coalbed Methane Development and Produced Water Management Study, November 2002). The estimated CBM recoverable reserves have been estimated at up to 61 Tcf of natural gas in place in the PRB, with 39 Tcf recoverable. Improving the recovery rate of the methane represents a significant energy savings, a reduction in greenhouse gases, as well as an increased investment return.

Measurements taken indicate that the existing wells in the PRB are between 70 and 98 percent efficient in separating the gas from the water. Some wells are pumped for months before the gas comes in. In the PRB alone, with 12,000 wells conservatively averaging 150 Mcf per well, there are over 1.8 million Mcf produced every day. If the separation of the methane from the production water average 85 percent efficient, there is potentially 234,000 Mcf or more lost each day.

Burning methane in the presence of oxygen produces carbon dioxide and water. Thus, its abundance and its clean-burning properties make it an environmentally attractive and economical fuel. However, methane is a potent greenhouse gas if it is released directly into the atmosphere. According to the Environmental Protection Agency (EPA), methane as a greenhouse gas remains in the atmosphere for approximately 9 to 15 years. Eventually, it is oxidized, producing water and carbon dioxide. Methane as a greenhouse gas is also nearly 25 times more effective in trapping heat in the atmosphere than carbon dioxide (CO2).

The problems with the current extraction methods include (1) Many times in new wells, no gas is visibly released and (2) when gas flow starts from a well, sometimes significant volumes may remain entrained in the water due to operational inefficiencies.

These issues create production problems such as:

- Gas lock in water lines
- Treatment issues at water discharges
- Fugitive venting of greenhouse gas
- Loss of saleable product

All these factors result in a loss of revenue and increased costs in the production field. In the past, developers have dealt with these issues by:

- Adding air relief valves (this creates more fugitive emissions and increases installation and maintenance costs)
- Air sparging or stilling tanks (making the gas unsaleable, again adding to fugitive emissions, and again increasing installation and maintenance costs)
- Ignoring the venting
- Assuming that only very minor amounts of gas are lost, because the system is “efficient”

Field Testing of HyCap Separator

Testing of the HyCap Separator was conducted at RMOTC, located about 35 miles north of Casper, Wyoming, on the Teapot Dome Oil Field (see Figure 1) on April 27-28, 2010. Several people were in attendance and observed the testing. While there are no coals present in the stratagraphic column at NPR-3, prior visits established two candidate wells for evaluating the

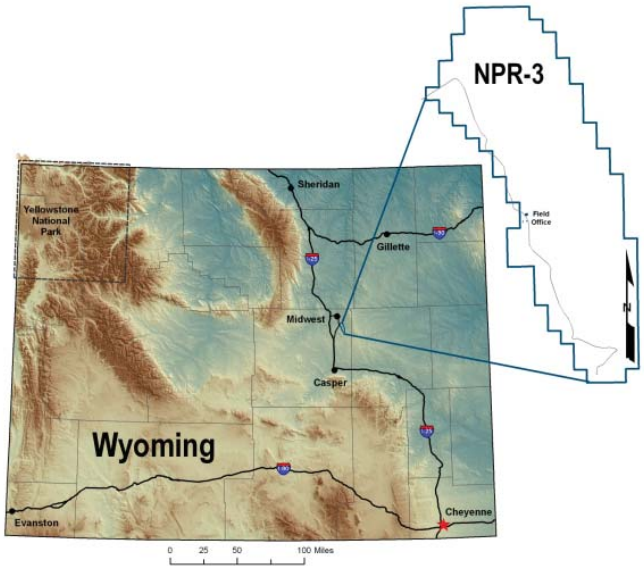

Figure 1. RMOTC's field test site, NPR-3, is located about 35 miles north of Casper, Wyoming.

system, the 45-1-21 and 45-2-X-28 wells, which had water to gas ratios similar to CBM wells currently in production. Because of the artesian conditions, its proximity to a project by another RMOTC partner, and availability of electrical power, the 45-1-21 well was selected to begin the testing. RMOTC personnel plumbed the well to the surface to make connection more convenient.

Those on site during testing were Bret H. Wolz, P.E., of HyCap; C. Kent Wolz, P.E., of HyCap; and Lance Seivertson of Methane Electrical Services (MES controls and measurement support). RMOTC's project manager on site was Mark Duletsky. A copy of the field notes are attached in Appendix A.

Joining the observation were RMOTC personnel Everett Walker and Brian Black as observers and several others at various times and phases throughout the project including John M. Kaufman, P.G., of HyCap; Ian Scott of MES; and other interested parties.

The testing equipment consisted of the HyCap Separator equipment constructed with water and gas discharges to measure quantity and quality of gas and water flow rates. Ports were supplied to take samples of the water for concentration (measured ml/l) of volatile or entrained gas measured upstream and downstream of the separator. Samples were collected and taken to

Figure 2. Rigged up at 45-1-21 at NPR-3.

Energy Labs in Gillette, Wyoming, for analysis. Copies of those results are found in Appendices B and C. For the gas produced, the volume of separated and captured gas was quantified using a V-cone meter and a Control Microsystems data logging gas-flow computer.

Initial testing started at 11 a.m. While gas could be seen separating from the stream through the clear polyethylene system piping, none was being measured at the collection point. A detailed inspection of the system revealed a leak in the gas collection column. With the help of RMOTC personnel, this problem was quickly corrected and the testing re-started at 2 p.m.

Initial flows from the well were in excess of 3,400 bpd (100 gpm) at over 60 psi. For the purposes of the test, these were choked back using the in-stream valve to achieve the apparent optimum flow of 275 bpd (8 gpm). Testing in this first round was to establish the ability of the separator to separate gas from the water column, so no water samples were taken.

At 3 p.m., MES ran a gas chromatograph sample on the produced gas. The quality of the produced gas was excellent and the chromatographs can be found in Appendix B.

At around 4 p.m., the flow from the well had dropped to 220 bpd (6.5 gpm) and the valves were opened to restore the 275 bpd (8 gpm) target. By 7 p.m., the flow from the well had degraded to the point that it was decided to fully open the valves and start accepting all produced flow to get to 240 bpd (7 gpm). By 8 p.m., the total flow of the well has dropped to 137 bpd (4 gpm).

Figure 3. The wellhead at 45-2-X-28 at NPR-3.

The separator, however, was producing nearly as much gas as initially. It was at this stage and at this flow that it was noted that the majority of the gas was no longer coming off the separation chamber, but was separating in the agitation chamber.

As the equipment was not initially designed to work in a high liquid hydrocarbon environment, test personnel felt that some of the ports in the system might be clogged, creating head loss that was affecting the water flow. Two courses to correct this were taken. First, the system was shut down and a cleaning agent (50 percent Dawn dishwashing liquid and 50 percent Simple Green) was introduced to break up any oil clogs. Second, the flow was diverted from the equipment but still through the water meter to establish the true well flow. There was no change in flow rate, as apparently the head in the well had dropped off to the point that water flows were truly less than 137 bpd (4 gpm).

At around 9:15 p.m., it was decided to shut in for the night and restart in the morning to see if the SIP of the well would rebuild to supply initial flow volumes.

The next morning, testing was restarted at 6:40 a.m. when Mark Duletsky was back on site. The initial pressure was only 45 psi, indicating that a significant loss in pressure head in the well had occurred. It was also observed that there was significant drilling mud contamination in the produced waters. During the night, the RMOTC drilling operations began on an adjacent well, 45-3-X-21, located approximately 50 yards from the 45-1-21 test well. At this time, a RMOTC staff member told the test crew that there was probably communication of fluid into the 45-1-21 well from the 45-3-X-21 drilling activities through a gas and water bearing zone that extends from 583' to 648' below ground level. This would explain the significant loss of flow vs. the flows that were measured several days prior to the testing taking place while there was no activity in the location.

Following a morning of methane recovery testing on well 45-1-21, the equipment was moved to the 45-2-X-28 well site in order to get to an area of unaffected flow, and to obtain separate sets of data from two different wells.

Methane Recovery Testing

The current accepted method of testing for methane (GPA 2261-95) is to collect a 100 ml sample in a bottle, with no head space, that is then tested in the lab as specified in the method. The problem noted with this method is that methane being entrained, rather than dissolved, begins to escape the sample rapidly upon exposure to the air. In an attempt to overcome this, HyCap Energy developed a specific sampling method involving the use of medical "vacuum vials" normally used to take blood samples. Using a medical needle and this vial, the test crew was reasonably sure that everything in the vial came from the fluid stream, and that the inaccuracies associated with delays in capping, not filling fully, or over filling the sample were removed.

All samples were taken as a series of three - A, B, and C. This created a larger sample set, and protected from sample loss. Three samples were lost due to "popping" the cork when temperatures rose while transporting the samples back to the lab, and later when oil recovery numbers were estimated.

Inlet flow samples (odd numbered samples) were taken approximately 5-6 minutes ahead of the outlet flow samples (even numbered samples). The purpose in this was to attempt to sample nearly the same "slug" of water as it entered into, and passed out of the separator. Samples with single digits (1-6) were taken from the first

Figure 4. To prevent methane from escaping after exposure to air, medical "vacuum vials" normally used to take blood samples were used to take samples from the well.

well (45-1-21) and samples numbered 21-28 were taken from the second well site (48-2-X-28).

Field observation during the testing noted a significant difference in the volume of water vs. head space in the inlet samples vs. the corresponding outlet samples. This indicates a significant volume of gases entrained in the influent samples as well as significant removal of the entrained gasses captured in the effluent samples. The inlet samples from 48-2-X-28 were under a minimum of 50 psi pressure while the outlet pressure was near 2 psi. The lab results had to be adjusted for the volume difference to give a true recovery number. The analytical results can be found in Appendix B.

Oil Recovery Testing

Significant removal of hydrocarbons from the fluid stream was noted during testing at 48-2-X-28. Following a request from Curt Johnson of Custom Water Solutions to Bret Wolz of HyCap Energy, the remaining water samples were combined at Energy Labs, and analyzed for hydrocarbon capture through the separator. Although this was not planned into the design, there is an apparent 70 percent recovery of liquid hydrocarbons (200mg/l to 60 mg/l, see Appendix C). Had a collection system been installed on the unit for oil separation, it would apparently be capable of reducing even small concentrations significantly. Additional testing is being conducted to determine the full effectiveness of the HyCap Separator in removal of heavy hydrocarbons.

Conclusion

The laboratory test results indicate that the HyCap Separator safely separated and captured between 97 and 98 percent of the natural gas that was entrained in the flow of groundwater from the two test wells at the RMOTC facility. Gas quality monitoring during the tests showed the methane concentration was about 95 percent by gas volume. In addition, 70 percent of the liquid hydrocarbons were also separated from the water stream. The HyCap Separator system was extremely efficient at methane separation and capture and unexpectedly removed a large portion of the liquid hydrocarbons (crude oil).

For methane separation, the HyCap Separator unit requires no external power or chemical input and is virtually maintenance free, allowing the user to concentrate on resource production. The unit is fully scalable for water flows ranging from 34 bpd (1 gpm) to 141,450 bpd (5,000 gpm) and natural gas flows ranging from 1 Mcf/day to over 1 MMcf/day. Research is ongoing to allow larger flows with economical designs.

Appendix A: Field Notes

Field notes compiled by HyCap

April 27-28, 2010
Field Demonstration Project for HyCap Separator
Rocky Mountain Oilfield Testing Center
Natrona County WY

Non-RMOTC staff on site:
Bret Wolz, HyCap
C. Kent Wolz, HyCap
Lance Sivertson, Methane Electrical Services

April 27, 2010

- Arrived on site at 8 a.m.: Met Mark Duletsky with RMOTC at 8:30 a.m.
- 8:30 to 10:30 a.m.: Rigged up on 45-1-21, elevation 4,995 feet.
- 11 a.m.: Start-up testing, found a leak in the gas collection column. Duletsky found a tube of JB Weld with which we repaired the defect and waited for a good cure.
- 2 p.m.: Restart flow. Initial water pressure 70 psi, choked back flow to 8-10 gpm. Began producing gas.
- See the MES reports for flow.
- 3 p.m.: Sivertson ran a GC on gas produced. Quality is excellent.
- 4 p.m.: Flow to 6.5 gpm, bump to 8, Seivertson left with computer, reading the head only. Data is logged for download.
- 7 p.m.: Stopped diverting portions, start accepting all flow to get 7 gpm. Everett Walker starts on shift for RMOTC.
- 8 p.m.: Total flow of the well has dropped to 4 gpm. Still lots of gas in production.
- 8:15 p.m.: Shut down to see if injection ports need cleaning. Add cleaning agent (Dawn dishwashing liquid).
- 8:50 p.m.: Back in service, only climbed .5 gpm to 5; change over and cleaning did not help.
- 9:15 p.m.: 2.5 gpm; began discussions on leaving for night or shutting off. Decided to shut in for night, restart in the morning so that there will be flow when everyone gets here.
- 9:30 p.m.: Shut off well.

April 28, 2010

- Restart the test at 6:40 a.m., when Mark Duletsky was back on site. Initial pressure only 45 psi. During the night, operations at the adjacent well site were started. They have not begun drilling but are circulating mud in the hole. We have begun to see significant amounts of mud in our discharge.
- Initially thought that is was oil, but a sample has no oil, only drilling mud. At this time, Everett Walker with RMOTC told us there was leakage of water into the other well. This explains the significant loss of flow vs. the reports we received previously on flow on the well. Pulling partial on flow, 8 gpm
- 6:45 a.m.: Took first inflow vs. outflow water samples. 1 A,B,C, inflow, 2 A,B,C outflow 8 gpm approxpressures 30 psi; Sivertson back on site 7 a.m.
- 7:30 a.m.: Flow has reduced to 6 gpm, and we are accepting all the flow from the well. Took second sample; set 3 A,B,C inflow and 4 A,B,C out flow
- 8 a.m.: Flow has reduced to 3 gpm, pressure unknown. Third sample set 5 A,B,C inflow and 6 A,B,C out flow
- 9 a.m.: Flow down to 2.5 gpm average
- 10 a.m.: Flow down to 1.7 gpm average, test stopped as flow below 20% of design target.
- 10 a.m. to noon: Move to second well site (48-2-X-28), elevation 5101.4 feet.
- 12:15 p.m.: Start testing, set up with 10 gpm, approx 50 psi inflow. Well choked down to this rate. Well flow did not vary by more than 0.2 gpm through out testing of second well. John Kaufman PG of HyCap joins in observation til 2:45 p.m.

- 12:30 p.m.: Begin second round of testing set 21 A,B,C inflow and 22 A,B,C out flow
- 1:20 p.m.: Begin testing set 23 A,B,C inflow and 24 A,B,C out flow
- 1:45 p.m.: Begin testing set 25 A,B,C inflow and 26 A,B,C out flow
- 2:50 p.m.: DOE personnel arrive and begin exit interview. Clarke Turner, RMOTC Director, and Mandy Cepeda, Technical Writer/Editor for Navarro Research & Engineering
- 3 p.m: Begin testing set 27A,B,C inflow and 28 A,B,C out flow
- 3:45 p.m.: Stopped testing of second well and rigged down to leave site.
- 4:45 p.m.: Checked out of site and left.

Appendix B: Methane Electrical Services Report

(Note: Report provided by HyCap and printed as received. During testing at RMOTC, HyCap was doing business as Wyoming Water Design & Development and the technology's name was "Yellowstone Separator.")

Yellowstone Seperator

Gas Flow and Gas Analysis

Wyoming Water Design & Development LLC

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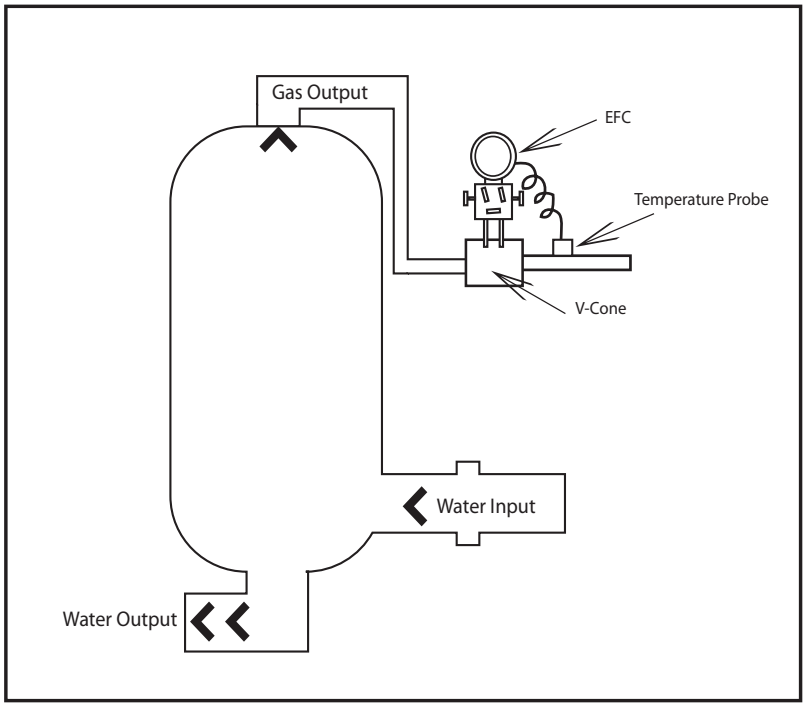
Phone:307-682-1369
Fax: 307-682-137
iscott@methaneelectrical.com

Yellowstone Separator
Gas Flow and Gas Analysis

Methane Electrical Services (MES) was contacted by Bret Wolz of Wyoming Water Design & Development LLC and was asked to prove gas flow for their Yellowstone Separator project. Methane Electrical Services offers gas measurement, electronic flow computer (EFC) checks and calibration and gas sampling to CBM producers in the Powder River Basin of Wyoming. With a combined 16 years of experience in the CBM industry Methane Electrical has proven itself with an established track record of providing accurate and professional gas flow and gas analysis services to these companies.

The Yellowstone Separator project is a separation unit, which releases entrained gases from underground water supplies by running water through a large vessel, with several mechanical processes to agitate the water and facilitate the release and separate of the entrained gases trapped within the water supply.



When Methane Electrical was called in Mr. Wolz had already run several tests with the Yellowstone Separator. Initial tests of the process showed that there was indeed a separation of gas and water. This was evident by a visual inspection of the clear water intake hose, which showed large gas pockets traveling through the lines, and then comparing it with the water output lines, which showed little to no pockets of gas exiting the separator. A secondary proof was provided at the gas output. When the gas was allowed to run through a meter tube then stopped up it would build pressure, which could be felt by placing your hand over the exit port and then quickly releasing it.

methane electrical

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After consultation with Mr. Wolz it was determined that the best way to prove flow was to run an Electronic Flow Computer on the meter line. An EFC from Control Micro Systems was purchased and installed on the unit. Calibration checks were performed and showed the unit performing to industry specs.

Mr. Wolz then arranged with US Department of Energy to test the unit at the Rocky Mountain Oilfield Testing Center near Midwest Wyoming. The test was run on two well sites and on both sites gas flow was registered on the EFC with the following results:

Data Report

End Time	Flow Time	Flow Rate (MCF a Day)	Temperature (°F)	Pressure (PSI)	Diff. Pressure (in H2O at 60°F)	Relative Density	Volume (MCF)	Mass (lbm)	Energy (MBTU)
4/27/2010 1:09:19PM	4	0.0000	64.2	12.851059	0.013	0.554784	0	0	0.032
4/27/2010 1:28:10 PM	0	0.0000	65.31	12.844828	0	0.554641	0	0	0
4/27/2010 2:59:59PM	24.97	0.0000	67.2	12.83224	0.017	0.554784	0	0.01	0.227
4/27/2010 3:15:19 PM	0	0.0000	69.37	12.847143	0	0.554784	0	0	0
4/27/2010 3:59:59PM	15	0.0000	73.33	12.807349	0.02	0.554784	0	0.01	0.145
4/27/2010 4:15:33 PM	0	0.0000	74.69	12.798483	0	0.554784	0	0	0
4/27/2010 4:16:36PM	0	0.0000	75.13	12.798431	0	0.554713	0	0	0
4/27/2010 4:59:59 PM	1990.03	1.2960	71.76	12.875811	0.163	0.554784	0.027	1.16	27.578
4/27/2010 5:26:54PM	367.97	0.3360	73.25	13.280335	0.284	0.554784	0.007	0.3	7.239
4/27/2010 5:59:59 PM	196.03	0.0480	76.58	12.773549	0.019	0.55478	0.002	0.08	1.854
4/27/2010 6:59:59PM	1126.9	0.7440	70.35	12.765141	0.196	0.554784	0.031	1.3	31.07
4/27/2010 7:59:59 PM	414.03	0.0960	69.05	12.752072	0.019	0.554784	0.004	0.16	3.915
4/27/2010 8:59:59PM	938.72	0.2400	70.23	12.737383	0.026	0.554784	0.01	0.42	10.15
4/27/2010 9:59:59 PM	188.39	0.0480	66.35	12.726843	0.016	0.554784	0.002	0.07	1.625
4/27/2010 10:59:59PM	383.02	0.0960	56.01	12.717793	0.03	0.554784	0.004	0.19	4.473
4/27/2010 11:28:11 PM	29	0.0000	54.94	12.717876	0.024	0.554784	0	0.01	0.307
4/28/2010 8:59:59AM	718.06	0.3840	55.48	12.904034	0.515	0.554784	0.016	0.68	16.423
4/28/2010 9:59:59 AM	2521.77	0.7440	59.35	12.645702	0.035	0.554784	0.031	1.31	31.256
4/28/2010 10:59:59AM	1005.01	0.3600	59.56	12.663811	0.137	0.554784	0.015	0.64	15.354
4/28/2010 11:59:59 AM	698.99	0.2640	54.48	12.668271	0.104	0.554784	0.011	0.46	11.063
4/28/2010 12:11:10PM	25.99	0.0000	58.48	12.647701	0.023	0.554784	0	0.01	0.267
4/28/2010 2:00:17 PM	4	0.0000	44.03	12.606219	0.313	0.554354	0	0.01	0.159
4/28/2010 2:59:59PM	3110.75	6.2160	52.96	12.874949	1.664	0.554784	0.259	11	263.083
4/28/2010 3:59:59 PM	3591.98	3.8880	57.62	12.714149	0.568	0.554784	0.162	6.87	164.117
4/28/2010 4:59:59PM	3600	2.6400	63.95	12.64422	0.21	0.554784	0.11	4.68	111.695
4/28/2010 5:08:27 PM	461.89	0.0140	64.75	12.637436	0.202	0.554784	0.014	0.59	14.09

Proving the Yellowstone Separator unit does indeed separate gas from water with measurable results.

methane electrical

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Cumulative Data Report

Export Time 5/4/2010 11:42:31 AM

Process Measurements Live Forced Units
Temperature 65.737 F
Static Pressure 12.957232 psia
Differential Pressure -0.019355 in H2O at 60F
Pulses 0 pulses/s

Calculated AGA-8 Detailed Compressibility
Supercompressibility 0.999848
Relative Density 0.554784
Mass Density (Base) 0.042457 lbm/ft. 3
Mass Density (Flowing),0.036923 lbm/ft. 3
Heating Value 1014.333923 BTU/ft. 3
Compressibility Calculation Error 0
Time of last update 5/4/2010 1:37:18TH

Calculation Status
Calculation State Running,
Last Flow Configuration 4/28/2010 3:42:20 PM
Last Density Configuration 4/16/2010 4:10:39 PM

Calculated Flow at Base Conditions
Flow Volume Rate 0 MCF/day
Flow Mass Rate 0 lbm/day
Flow Energy Rate 0 MBTU/day

Today's Accumulated Flow at Base Conditions
Today / Yesterday
Flow Volume 0 / 0.618641 MCF
Flow Mass 0 / 26.250515 lbm
Flow Energy 0 / 627.507751 MBTU
Number of Calculations 0 / 15743
Flow Time 0:00:00 / 4:22:18

This Month,Last Month
Today / Yesterday
Flow Volume 0 / 0.77962 MCF
Flow Time 0:00:00:00 / 0:08:22:03

Total Accumulated Flow Volume
0.77962 MCF

Accumulated Uncorrected Flow
Today / Yesterday
Flow Volume 0 / 0 MCF

This Month,Last Month
Flow Volume,0,0,MCF

methane electrical

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The next step was to analyze the gas being pulled out of the water. To do this we pulled off several gas samples and ran them through our ABB Natural Gas Chromatograph two samples were printed off and the results of this test is as follows:

```
Print Date Time:    04/27/2010 15:17

Analyzed By:       Lance Sivertson (307) 620-5230  Methane Electrical Services (307) 682-1369
Meter ID:          brets test 2
                   Methane Electrical 307-682-1369
Analysis Time:     04/27/2010 16:11         Sample Type:       Spot
Flowing Temp.:     63.9 Deg. F               Flowing Pressure:  2 psig


Comp                  UnNorm    Normal     Liquids       Ideal      Rel. Density
                        %         %       (USgal/MCF)    (Btu/SCF)
-------------------------------------------------------------------------------
Propane               0.0148    0.0159      0.0044       0.3993      0.0000
Hydrogen Sulfide      0.0000    0.0000      0.0000       0.0000      0.0000
IsoButane             0.0046    0.0049      0.0016       0.1607      0.0000
Butane                0.0061    0.0066      0.0021       0.2143      0.0000
NeoPentane            0.0000    0.0000      0.0000       0.0000      0.0000
IsoPentane            0.0045    0.0047      0.0018       0.1919      0.0000
Pentane               0.0000    0.0000      0.0000       0.0000      0.0000
Hexane+               0.0000    0.0000      0.0000       0.0000      0.0000
Nitrogen              5.1198    5.4927      0.6053       0.0000      0.0000
Methane              87.5917   93.9703     15.9566     949.1002      0.0000
CarbonDioxide         0.0974    0.1045      0.0179       0.0000      0.0000
Ethane                0.3732    0.4004      0.1072       7.0854      0.0000
Hexane                0.0000    0.0000      0.0000       0.0000      0.0000
Heptane+              0.0000    0.0000      0.0000       0.0000      0.0000
Heptane               0.0000    0.0000      0.0000       0.0000      0.0000
Octane                0.0000    0.0000      0.0000       0.0000      0.0000
Nonane+               0.0000    0.0000      0.0000       0.0000      0.0000
Nonane                0.0000    0.0000      0.0000       0.0000      0.0000
Decane                0.0000    0.0000      0.0000       0.0000      0.0000
Undecane              0.0000    0.0000      0.0000       0.0000      0.0000
Dodecane              0.0000    0.0000      0.0000       0.0000      0.0000
Ethane-               0.0000    0.0000      0.0000       0.0000      0.0000
Propane +             0.0000    0.0000      0.0000       0.0000      0.0000
Oxygen                0.0000    0.0000      0.0000       0.0000      0.0000
Water                 0.0000    0.0000      0.0000       0.0000      0.0000
-------------------------------------------------------------------------------
Total                93.2121   100.0000      16.6968   957.1518      0.5808

Inferior Wobbe     1238.4427 (Btu/SCF)      Superior Wobbe   1261.1541 (Btu/SCF)
Compressibility    0.9981                   Density          0.0444    (lbm/ft3)
Real Rel. Density  0.5808                   Ideal CV         957.1518  (Btu/SCF)
Wet CV             944.4708  (Btu/SCF)      Dry CV           961.1647  (Btu/SCF)
Contract Temp.     60.0000   (deg F)        Contract Press.  14.7300   (psia)
Number of Cycles    1                       Connected Stream 1
Atmospheric Pressure 12.7
```

methane electrical

2360 Wolff Rd
Gillette, WY 82718
Phone:307-682-1369
Fax: 307-682-137
iscott@methaneelectrical.com

Print Date Time: 04/27/2010 15:09

Analyzed By: Lance Sivertson (307) 620-5230 Methane Electrical Services (307) 682-1369
Meter ID: Bret's test
Methane Electrical 307-682-1369
Analysis Time: 04/27/2010 15:02 Sample Type: Spot
Flowing Temp.: 63.9 Deg. F Flowing Pressure: 2 psig

Comp	UnNorm %	Normal %	Liquids (USgal/MCF)	Ideal (Btu/SCF)	Rel. Density
Propane	0.0150	0.0155	0.0043	0.3903	0.0000
Hydrogen Sulfide	0.0000	0.0000	0.0000	0.0000	0.0000
IsoButane	0.0048	0.0050	0.0016	0.1627	0.0000
Butane	0.0057	0.0059	0.0019	0.1925	0.0000
NeoPentane	0.0000	0.0000	0.0000	0.0000	0.0000
IsoPentane	0.0049	0.0050	0.0018	0.2015	0.0000
Pentane	0.0000	0.0000	0.0000	0.0000	0.0000
Hexane+	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	5.1887	5.3671	0.5914	0.0000	0.0000
Methane	90.8904	94.0149	15.9642	949.5497	0.0000
CarbonDioxide	0.1897	0.1962	0.0335	0.0000	0.0000
Ethane	0.3774	0.3904	0.1046	6.9091	0.0000
Hexane	0.0000	0.0000	0.0000	0.0000	0.0000
Heptane+	0.0000	0.0000	0.0000	0.0000	0.0000
Heptane	0.0000	0.0000	0.0000	0.0000	0.0000
Octane	0.0000	0.0000	0.0000	0.0000	0.0000
Nonane+	0.0000	0.0000	0.0000	0.0000	0.0000
Nonane	0.0000	0.0000	0.0000	0.0000	0.0000
Decane	0.0000	0.0000	0.0000	0.0000	0.0000
Undecane	0.0000	0.0000	0.0000	0.0000	0.0000
Dodecane	0.0000	0.0000	0.0000	0.0000	0.0000
Ethane-	0.0000	0.0000	0.0000	0.0000	0.0000
Propane +	0.0000	0.0000	0.0000	0.0000	0.0000
Oxygen	0.0000	0.0000	0.0000	0.0000	0.0000
Water	0.0000	0.0000	0.0000	0.0000	0.0000
Total	96.6766	100.0000	16.7034	957.4058	0.5812

Inferior Wobbe	1238.4479 (Btu/SCF)	Superior Wobbe	1261.1530 (Btu/SCF)
Compressibility	0.9981	Density	0.0445 (lbm/ft3)
Real Rel. Density	0.5812	Ideal CV	957.4058 (Btu/SCF)
Wet CV	944.7253 (Btu/SCF)	Dry CV	961.4237 (Btu/SCF)
Contract Temp.	60.0000 (deg F)	Contract Press.	14.7300 (psia)
Number of Cycles	1	Connected Stream	1
Atmospheric Pressure	12.7		

CV Calorific Value ... ie Heating Value
Ideal CV Displays the Ideal Calorific Value. Ideal CV is not adjusted for Compressibility, Pressure Base or Temperature Base.
Superior (Dry) CV Displays the Superior Calorific Value. Superior CV is the Ideal gross heating value of dry gas on a volumetric basis, modified by the user configurable pressure base constant and calculated compressibility factor to yield Ideal dry BTU/Real cubic ft.

It is the conclusion of Methane Electrical Services, that the Yellowstone separator unit does separate entrained gasses from underground water supplies. Based on the data we have looked at we also conclude that the gas pulled off of the water is of a make up similar in nature to the CBM gas produced in the Powder River Basin.

methane electrical
2360 Wolff Rd
Gillette, WY 82718
Phone:307-682-1369
Fax: 307-682-137
iscott@methaneelectrical.com

Appendix C: Energy Lab Reports

(Note: Report provided by HyCap and printed as received. During testing at RMOTC, HyCap was doing business as Wyoming Water Design & Development and the technology's name was "Yellowstone Separator.")

ENERGY LABORATORIES, INC. * 400 W Boxelder Rd * Gillette, WY 82718-5315
Toll Free 866.686.7175 * 307.686.7175 * FAX 307.682.4625 * gillette@energylab.com

ANALYTICAL SUMMARY REPORT

May 12, 2010

Wyoming Water Design and Development LLC
445 Sinclair
Gillette, WY 82716

Workorder No.: G10050002

Project Name: Yellowstone Sep

Energy Laboratories Inc. received the following 14 samples for Wyoming Water Design and Development LLC on 04/30/2010 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
G10050002-001	1A I	04/28/10 6:45	04/30/10	Gas	Natural Gas Analysis
G10050002-002	2A O	04/28/10 6:50	04/30/10	Gas	Same As Above
G10050002-003	3A I	04/28/10 7:30	04/30/10	Gas	Same As Above
G10050002-004	4A O	04/28/10 7:35	04/30/10	Gas	Same As Above
G10050002-005	5A I	04/28/10 8:00	04/30/10	Gas	Same As Above
G10050002-006	6B O	04/28/10 8:05	04/30/10	Gas	Same As Above
G10050002-007	21B I	04/28/10 12:30	04/30/10	Gas	Same As Above
G10050002-008	22A O	04/28/10 12:35	04/30/10	Gas	Same As Above
G10050002-009	23C I	04/28/10 13:20	04/30/10	Gas	Same As Above
G10050002-010	24B O	04/28/10 13:25	04/30/10	Gas	Same As Above
G10050002-011	25C I	04/28/10 13:45	04/30/10	Gas	Same As Above
G10050002-012	26A O	04/28/10 13:50	04/30/10	Gas	Same As Above
G10050002-013	27A I	04/28/10 15:00	04/30/10	Gas	Same As Above
G10050002-014	28B O	04/28/10 15:05	04/30/10	Gas	Same As Above

As appropriate, any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

If you have any questions regarding these tests results, please call.

Report Approved By: Laboratory Manager

Digitally signed by
Terry Friedlan
Date: 2010.05.12 07:44:55 -06:00

ENERGY LABORATORIES, INC. * 400 W Boxelder Rd * Gillette, WY 82718-5315
Toll Free 866.686.7175 * 307.686.7175 * FAX 307.682.4625 * gillette@energylab.com

CLIENT: Wyoming Water Design and Development
Project: Yellowstone Sep
Sample Delivery Group: G10050002

Report Date: 05/12/10

CASE NARRATIVE

Tests Associated with Analyst identified as ELI-B were subcontracted to Energy Laboratories Billings Branch, EPA Number MT00005.

ENERGY LABORATORIES, INC. * 400 W Boxelder Rd * Gillette, WY 82718-5315
Toll Free 866.686.7175 * 307.686.7175 * FAX 307.682.4625 * gillette@energylab.com

LABORATORY ANALYTICAL REPORT

Client: Wyoming Water Design and Development LLC
Site Name: Yellowstone Sep **Report Date:** 05/12/10

Lab ID: G10050002-001 **Collection Date:** 04/28/10 06:45
Client Sample ID 1A I **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	9.46	Mol %				GPA 2261-95	05/10/10 08:51 / eli-b

Lab ID: G10050002-002 **Collection Date:** 04/28/10 06:50
Client Sample ID 2A O **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	14.8	Mol %				GPA 2261-95	05/10/10 09:09 / eli-b

Lab ID: G10050002-003 **Collection Date:** 04/28/10 07:30
Client Sample ID 3A I **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	72.7	Mol %				GPA 2261-95	05/10/10 09:15 / eli-b

Lab ID: G10050002-004 **Collection Date:** 04/28/10 07:35
Client Sample ID 4A O **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	9.40	Mol %				GPA 2261-95	05/10/10 09:29 / eli-b

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

ENERGY LABORATORIES, INC. * 400 W Boxelder Rd * Gillette, WY 82718-5315
Toll Free 866.686.7175 * 307.686.7175 * FAX 307.682.4625 * gillette@energylab.com

LABORATORY ANALYTICAL REPORT

Client: Wyoming Water Design and Development LLC
Site Name: Yellowstone Sep **Report Date:** 05/12/10

Lab ID: G10050002-005 **Collection Date:** 04/28/10 08:00
Client Sample ID 5A I **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	65.3	Mol %				GPA 2261-95	05/10/10 09:23 / eli-b

Lab ID: G10050002-006 **Collection Date:** 04/28/10 08:05
Client Sample ID 6B O **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	9.17	Mol %				GPA 2261-95	05/10/10 09:39 / eli-b

Lab ID: G10050002-007 **Collection Date:** 04/28/10 12:30
Client Sample ID 21B I **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	74.5	Mol %				GPA 2261-95	05/10/10 09:44 / eli-b

Lab ID: G10050002-008 **Collection Date:** 04/28/10 12:35
Client Sample ID 22A O **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	9.45	Mol %				GPA 2261-95	05/10/10 09:49 / eli-b

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

ENERGY LABORATORIES, INC. * 400 W Boxelder Rd * Gillette, WY 82718-5315
Toll Free 866.686.7175 * 307.686.7175 * FAX 307.682.4625 * gillette@energylab.com

LABORATORY ANALYTICAL REPORT

Client: Wyoming Water Design and Development LLC
Site Name: Yellowstone Sep **Report Date:** 05/12/10

Lab ID: G10050002-009 **Collection Date:** 04/28/10 13:20
Client Sample ID 23C I **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	81.1	Mol %				GPA 2261-95	05/10/10 09:58 / eli-b

Lab ID: G10050002-010 **Collection Date:** 04/28/10 13:25
Client Sample ID 24B O **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	6.74	Mol %				GPA 2261-95	05/10/10 10:08 / eli-b

Lab ID: G10050002-011 **Collection Date:** 04/28/10 13:45
Client Sample ID 25C I **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	60.5	Mol %				GPA 2261-95	05/10/10 10:20 / eli-b

Lab ID: G10050002-012 **Collection Date:** 04/28/10 13:50
Client Sample ID 26A O **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	7.61	Mol %				GPA 2261-95	05/10/10 10:32 / eli-b

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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Toll Free 866.686.7175 * 307.686.7175 * FAX 307.682.4625 * gillette@energylab.com

LABORATORY ANALYTICAL REPORT

Client: Wyoming Water Design and Development LLC
Site Name: Yellowstone Sep **Report Date:** 05/12/10

Lab ID: G10050002-013 **Collection Date:** 04/28/10 15:00
Client Sample ID 27A I **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	63.8	Mol %				GPA 2261-95	05/11/10 08:46 / eli-b

Lab ID: G10050002-014 **Collection Date:** 04/28/10 15:05
Client Sample ID 28B O **DateReceived:** 04/30/10
Matrix: Gas

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHIC ANALYSIS REPORT							
Methane	6.51	Mol %				GPA 2261-95	05/11/10 08:51 / eli-b

Report Definitions: RL - Analyte reporting limit. MCL - Maximum contaminant level.
QCL - Quality control limit. ND - Not detected at the reporting limit.

ENERGY LABORATORIES, INC. * 400 W Boxelder Rd * Gillette, WY 82718-5315
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Workorder Receipt Checklist

G10050002

Wyoming Water Design and Development LLC

Login completed by: Misty Voegele
Date Received: 4/30/2010

Reviewed by: Kasey Ruff
Received by: mav

Reviewed Date: 5/3/2010
Carrier name: Hand Del

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature:	°C NA		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Not Applicable ☑

Contact and Corrective Action Comments:

None

ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

Page 1 of 2

PLEASE PRINT (Provide as much information as possible.)

Company Name: Wyo Water Design & Development	Project Name, PWS, Permit, Etc. Yellowstone Sep.	Sample Origin State: Wy	EPA/State Compliance: Yes ☐ No ☑
Report Mail Address:	Contact Name: Bret Wolz	Phone/Fax: 680-8275 cell 695-2039	Email: WWDO@vcn.com
			Sampler: (Please Print) Bret Wolz
Invoice Address: 445 Sinclair St. Gill.	Invoice Contact & Phone: Same.	Purchase Order:	Quote/Bottle Order:

Special Report/Formats:

☐ DW ☐ POTW/WWTP ☐ State: _____ ☐ Other: _____

☐ EDD/EDT (Electronic Data) Format: _____ ☐ LEVEL IV ☐ NELAC

Number of Containers
Sample Type: A Air, W Water, S Soils/Solids, V Vegetation, B Bioassay, O Other, D DW - Drinking Water

ANALYSIS REQUESTED

NG-NGA (SEE Methane)

SEE ATTACHED

Standard Turnaround (TAT)

RUSH

Contact ELI prior to **RUSH** sample submittal for charges and scheduling – See Instruction Page

Comments:

Shipped by: Hand

Cooler ID(s):

Receipt Temp: 1.1 °C

On Ice: (Y) N

Custody Seal: On Bottle Y N; On Cooler Y N

Intact: N

Signature Match: Y N

LABORATORY USE ONLY: 1005002

	SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX
1	1A I	4/28	6:45a	GW
2	2A O		6:50a	GW
3	3A I		7:30a	GW
4	4A O		7:35	GW
5	5A E		8:00a	GW
6	6B O		8:05	GW
7				
8				
9				
10				

Custody Record MUST be Signed

Relinquished by (print): BRET Wolz Date/Time: 4/30 11:16 Signature:

Relinquished by (print): Date/Time: Signature:

Sample Disposal: Return to Client: _____ Lab Disposal: _____

Received by (print): Date/Time: Signature:

Received by (print): Date/Time: Signature:

Received by Laboratory: MO 4/30/10 11:16

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.
This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.
Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

Page 2 of 2

PLEASE PRINT (Provide as much information as possible.)

Company Name: WWDD	Project Name, PWS, Permit, Etc. Yellowstone Sep.	Sample Origin State: Wy	EPA/State Compliance: Yes ☐ No ☒
Report Mail Address: 445 Sinclair	Contact Name: Bret Wolz Phone/Fax: 655-2039	Email: 655 2040	Sampler: (Please Print) Bret Wolz
Invoice Address:	Invoice Contact & Phone:	Purchase Order:	Quote/Bottle Order:

Special Report/Formats:

☐ DW ☐ POTW/WWTP ☐ State: _____ ☐ Other: _____

☐ EDD/EDT (Electronic Data) Format: _____ ☐ LEVEL IV ☐ NELAC

Number of Containers
Sample Type: A W S V B O DW
Air Water Soils/Solids Vegetation Bioassay Other DW - Drinking Water

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)		Collection Date	Collection Time	MATRIX	NG-NGA (Methane) (SEL)	SEE ATTACHED	R U S H
1	21 B	I	4/28	12:30	CH4	X		✓
2	22 A	O		12:35		X		✓
3	23 C	I		13:20		X		✓
4	24 B	O		13:25		X		✓
5	25 C	I		13:45		X		✓
6	26 A	O		13:50		X		✓
7	27 A	I		15:00		X		✓
8	28 B	O		15:05		X		✓
9								
10								

Standard Turnaround (TAT)

Contact ELI prior to **RUSH** sample submittal for charges and scheduling – See Instruction Page

Comments:

Shipped by: hand
Cooler ID(s):
Receipt Temp: 1.4 °C
On Ice: Y N
Custody Seal: On Bottle Y N; On Cooler Y N
Intact: Y N
Signature Match: Y N

LABORATORY USE ONLY: 1005000 2

Custody Record MUST be Signed

Relinquished by (print): Bret Wolz	Date/Time: 4/30 11:15	Signature:	Received by (print):
Relinquished by (print):	Date/Time:	Signature:	Received by (print):
Sample Disposal: Return to Client: _____ Lab Disposal: _____			Received by Laboratory: 4/30/10 1115

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.
This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.
Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

ENERGY LABORATORIES, INC. * 400 W Boxelder Rd * Gillette, WY 82718-5315
Toll Free 866.686.7175 * 307.686.7175 * FAX 307.682.4625 * gillette@energylab.com

ANALYTICAL SUMMARY REPORT

May 07, 2010

Wyoming Water Design and Development LLC
445 Sinclair
Gillette, WY 82716

Workorder No.: G10050123

Project Name: Oil Content Seperator

Energy Laboratories Inc. received the following 2 samples for Wyoming Water Design and Development LLC on 05/04/2010 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
G10050123-001	Inlet (Odd)	04/28/10 12:30	05/04/10	Aqueous	Oil & Grease, Gravimetric
G10050123-002	Outlet (Even)	04/28/10 15:00	05/04/10	Aqueous	Same As Above

As appropriate, any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

If you have any questions regarding these tests results, please call.

Report Approved By: Laboratory Manager

Digitally signed by
Terry Friedlan
Date: 2010.05.07 19:17:08 -06:00

ENERGY LABORATORIES, INC. * 400 W Boxelder Rd * Gillette, WY 82718-5315
Toll Free 866.686.7175 * 307.686.7175 * FAX 307.682.4625 * gillette@energylab.com

LABORATORY ANALYTICAL REPORT

Client:	Wyoming Water Design and Development LLC		
Project:	Oil Content Seperator	**Report Date:**	05/07/10
Client Sample ID	Inlet (Odd)	**Collection Date:**	04/28/10 12:30
Location:		**Date Received:**	05/04/10
Samp FRQ/Type:		**Matrix:**	Aqueous
Lab ID:	G10050123-001	**Sampled By:**	Bret Wolz

Analyses	Result	Units	RL	Qualifier	Result	Units	Method	Analysis Date / By
NON-METALS								
Oil & Grease (HEM)	200	mg/L	50	D			E1664A	05/06/10 12:42 / djk

- The pH of the sample at the time of analysis was >2. Additional preservative was added prior to analysis.

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

ENERGY LABORATORIES, INC. * 400 W Boxelder Rd * Gillette, WY 82718-5315
Toll Free 866.686.7175 * 307.686.7175 * FAX 307.682.4625 * gillette@energylab.com

LABORATORY ANALYTICAL REPORT

Client:	Wyoming Water Design and Development LLC		
Project:	Oil Content Seperator	**Report Date:**	05/07/10
Client Sample ID	Outlet (Even)	**Collection Date:**	04/28/10 15:00
Location:		**Date Received:**	05/04/10
Samp FRQ/Type:		**Matrix:**	Aqueous
Lab ID:	G10050123-002	**Sampled By:**	Bret Wolz

Analyses	Result	Units	RL	Qualifier	Result	Units	Method	Analysis Date / By
NON-METALS								
Oil & Grease (HEM)	60	mg/L	20	D			E1664A	05/06/10 12:46 / djk

- The pH of the sample at the time of analysis was >2. Additional preservative was added prior to analysis.

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

ENERGY LABORATORIES, INC. * 400 W Boxelder Rd * Gillette, WY 82718-5315
Toll Free 866.686.7175 * 307.686.7175 * FAX 307.682.4625 * gillette@energylab.com

QA/QC Summary Report

Client: Wyoming Water Design and Development LLC
Project: Oil Content Seperator

Report Date: 05/07/10
Work Order: G10050123

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E1664A										Batch: OG100506A
Sample ID: MBLK1005060000		Method Blank				Run: BAL-ACCU-124_100506A				05/06/10 11:42
Oil & Grease (HEM)		ND	mg/L	0.9						
Sample ID: LCS1005060000		Laboratory Control Sample				Run: BAL-ACCU-124_100506A				05/06/10 11:43
Oil & Grease (HEM)		36	mg/L	1.0	89	78	114			
Sample ID: LCSD1005060000		Laboratory Control Sample Duplicate				Run: BAL-ACCU-124_100506A				05/06/10 11:44
Oil & Grease (HEM)		37	mg/L	1.0	93	78	114	3.8	18	
Sample ID: G10040916-006IMS		Sample Matrix Spike				Run: BAL-ACCU-124_100506A				05/06/10 11:46
Oil & Grease (HEM)		40	mg/L	1.0	95	78	114			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

ENERGY LABORATORIES, INC. * 400 W Boxelder Rd * Gillette, WY 82718-5315
Toll Free 866.686.7175 * 307.686.7175 * FAX 307.682.4625 * gillette@energylab.com

Workorder Receipt Checklist

G10050123

Wyoming Water Design and Development LLC

Login completed by: Misty Voegele
Date Received: 5/4/2010

Reviewed by: Kasey Ruff
Received by: mav

Reviewed Date: 5/5/2010
Carrier name: Hand Del

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☐	No ☑	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature:	°C NA		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☑	Not Applicable ☐

Contact and Corrective Action Comments:

Samples are in unpreserved vials. 5/5/2010mav

ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

Page 1 of 1

PLEASE PRINT (Provide as much information as possible.)

Company Name: Wyoming Water Design & Dev.	Project Name, PWS, Permit, Etc.: Oil Content Seperator	Sample Origin State: Wy.	EPA/State Compliance: Yes ☐ No ☐
Report Mail Address: 445 Sinclair	Contact Name: Bret Wolz Phone/Fax: 685-2039	Email: wwdo@vcn.com	Sampler: (Please Print) B Wolz
Invoice Address: Same	Invoice Contact & Phone: Same	Purchase Order:	Quote/Bottle Order:

Special Report/Formats:

☐ DW ☐ POTW/WWTP ☐ State: _____ ☐ Other: _____ ☐ EDD/EDT (Electronic Data) Format: _____ ☐ LEVEL IV ☐ NELAC

Number of Containers
Sample Type: A W S V B O DW
Air Water Soils/Solids Vegetation Bioassay Other DW - Drinking Water

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Oil+Grease	SEE ATTACHED
1	Inlet (odd)	4/28	12:30 pm	6-W	X	
2	Outlet (even)	"	3:20 pm	8-W	X	
3						
4	Crude Oil content					
5						
6						
7						
8						
9						
10						

Standard Turnaround (TAT) — RUSH

➡ Contact ELI prior to **RUSH** sample submittal for charges and scheduling – See Instruction Page

Comments:

Shipped by: hand
Cooler ID(s):
Receipt Temp: 1 / Ac
On Ice: Y N
Custody Seal On Bottle Y N / On Cooler Y N
Intact Y N
Signature Match Y N
1005023

LABORATORY USE ONLY

RUSH

Custody Record MUST be Signed

Relinquished by (print):	Date/Time: 5/4/10 13:15	Signature:	Received by (print):	Date/Time: / Signature:
Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time: / Signature:
Sample Disposal: Return to Client: _____ Lab Disposal: _____			Received by Laboratory: VO	Date/Time: 5/4/10 1315 / Signature:

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.
This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.
Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

RMOTC

U.S. DEPARTMENT OF ENERGY

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