Laramie Energy II, LLC
Tier II Gas Wells
Quarterly Production Monitoring Report
Furr 16-22D and Furr 16-22B
Rulison Field, Garfield County, Colorado
December 2009

Prepared for:

Laramie Energy II, LLC
1512 Larimer Street, Suite 1000
Denver, Colorado 80202

Prepared by:

Olsson Associates
4690 Table Mountain Drive, Suite 200
Golden, Colorado 80403

June 2010

Project #008-2362

Table of Contents

TABLES

FIGURES

APPENDICES

1.0 Introduction

Laramie Energy II, LLC (Laramie Energy II) has developed natural gas resources in the vicinity of Jack's Pocket on the north flank of Battlement Mesa in Garfield County, Colorado. These gas wells were originally drilled by Petrohunter Operating Co. and GSL Energy Corp. and were purchased and completed by Laramie Energy II in 2008. Laramie Energy II retained Olsson Associates Inc. (Olsson) to collect natural gas and produced water samples from the Furr Wells to comply with the requirements of the Colorado Oil and Gas Conservation Commission (COGCC) Rulison Sampling and Analysis Plan (RSAP) requirement developed by URS Corporation (URS) for all natural gas wells within a three-mile radius of the former Project Rulison site.

The Laramie II natural gas wells discussed in this report are all located within a 3-mile radius of the Project Rulison underground nuclear test site conducted in September 1969 by the Atomic Energy Commission, a predecessor agency to the Department of Energy (DOE), and Austral Oil, a private oil company. Project Rulison was a subsurface natural gas stimulation nuclear test designed to produce natural gas from tight gas sands in the Cretaceous age Williams Fork Formation.

In general, the RSAP requires all companies drilling or producing natural gas wells within specified zones and sectors surrounding the former Rulison site to review certain drilling data (gamma ray logs) and to sample certain production media (natural gas and produced water) to document the presence or absence of potential impacts associated with Project Rulison.

All known natural gas wells within the three mile radius of Project Rulison (including Laramie Energy II wells) are shown on Figure 1. Laramie Energy II's Furr Gas wells are shown more specifically on Figure 2. This report presents the third quarter, 2009 production monitoring results for the samples of Laramie Energy II Furr 16-22B and 16-22D wells collected on December 16, 2009.

The drilling and baseline monitoring activities for the Furr wells were conducted in November and December 2008 with the results presented in a report titled Laramie Energy II, LLC Tier II Gas Well Baseline Monitoring and Production Report, Rulison Field, Garfield County, Colorado November - December 2008 (May 2009). The results of this drilling and baseline/quarterly monitoring indicate that no Project Rulison related radionuclides were detected in any of the gas or produced water samples. An addendum to this report (July 2009) was provided for data verification and validation performed by Diane Short and Associates.

Copies of the reports, including the December 17, 2008 baseline/production data, data validation addendum, the first quarter (April 2009), second quarter (June 2009), and third quarter (October 2009) data reports for the Furr 16-22B and Furr 16-22D wells, were provided to Laramie Energy II, the COGCC, the Colorado Department of Public Health and Environment (CDPHE) Hazardous Materials and Waste Management Division (HMWMD) - Radiation Management Unit, S.M. Stoller/DOE, the Garfield County Oil and Gas Liaison, and URS Corporation.

For purposes of classifying the Laramie Energy II wells within the context of the current RSAP, both the Furr 16-22D and Furr 16-22B are considered Tier II wells located respectively in Sectors 10 and 11. The Furr 16-22B is currently considered to be the closest natural gas well to the former Project Rulison site in Sector 11. The Furr 16-22D has a surface location in sector 11 and a bottom hole location in sector 10, but the bottom hole location is near the sector dividing line.

As shown by the baseline sampling conducted in November and December of 2008, the analytical results collected in early April 2009, June 2009, and the October 2009 laboratory analytical results for gas and produced water samples collected do not indicate the presence of any Project Rulison related radioactivity. No Project Rulison related radioactivity was detected in the natural gas or produced water samples collected on December 16, 2009. A summary table of Laramie Energy II well locations and sampling activities is presents as Table 1.

1.1 Tier II Zone Monitoring Requirements

URS Corporation (URS) is working for Noble Energy, EnCana Oil & Gas (USA), Inc., and Williams Production RMT who are also conducting natural gas well drilling operations in the vicinity of Project Rulison. URS has developed a Rulison Sampling and Analysis Plan (RSAP), Revision 2 issued in March 2008. The URS RSAP is currently in revision, and Revision 3 should be issued in the spring of 2010, but any changes will need to be approved by the Colorado Oil and Gas Conservation Commission.

The URS RSAP defines Tier II wells as those gas wells located outside the 1-mile radius, but within the 3-mile radius of Project Rulison; whereas Tier I wells are defined as those gas wells located within the 1-mile radius of Project Rulison. This RSAP has been adopted by the COGCC, and outlines the required sampling and analysis for all operators within a three-mile radius or Project Rulison.

According to the March 2008 Revision 2 of the URS RSAP the Tier II well monitoring includes:

- Drilling Monitoring;
- Production Monitoring; and
- Baseline produced water and natural gas monitoring.

According to the URS RSAP Table 2 - Tier I and II Sampling and Analysis Scheme for Gas Wells within a Three Mile Radius of Project Rulison well production sampling provisions require that Tier II wells, such as the Furr 16-22 B and 16-22D, be sampled and analyzed as follows:

- A one-time sampling and analysis of produced water for the radiological and non-radiological analytes listed in Table 3 and Table 4 of the RSAP. The Tier II wells are to be sampled as soon as possible after frac-ing but no later than 30 days after the first gas delivery from a new gas well;
- If a Tier II gas well is the closest well in a sector (i.e. no Tier I well), produced water and natural gas will be sampled and analyzed for the radiological analytes listed in Table 3 quarterly during the first year, semi-annually (twice a year) during the second and third year, and annually thereafter; and
- Further testing will be contingent on verified Project Rulison-related radionuclide detection in Tier I zone wells.

1.2 Laramie Energy II Furr 16-22B and Furr 16-22D Gas Wells

Both the Furr 16-22B and Furr 16-22D are directionally drilled wells meaning that the bottom of the wells are located several hundred feet away from the surface location as shown on Figure 2 and Figure 3.

The Laramie Energy Furr 16-22B well is the closest Tier II well in Sector 11, and as such is required to be sampled quarterly during the first year. However, it was shut-in on April 14, 2009, and could not be sampled at that time. It was sampled on December 17, 2008 as part of the baseline sampling, and was sampled on June 24, 2009, on October 1, 2009, and again on December 16, 2009.

The Furr 16-22D has a surface location in sector 11 and a bottom hole location in sector 10. The Furr 16-22D was sampled on April 14, 2009 in lieu of the Furr 16-22B as it is the next closest Tier II well to Project Rulison operated by Laramie Energy II. The Furr 16-22D was sampled at the same times as the Furr 16-22 B for consistency, but may be dropped from subsequent sampling events

since there are wells with bottom hole locations closer to Project Rulison within sector 10. The Furr 16-22D has been sampled to provide continuity in the data in the event that the 16-22B well does not yield sufficient produced water to allow for a sample. Noble Energy has Tier I and Tier II wells located in sector 10 that are closer to the dividing line between sector 10 and sector 9 but that are also closer to the former Project Rulison site than any of the Furr wells as shown on Figure 1.

Olsson Associates conducted the fourth quarter 2009 sampling event for both the Furr 16-22D and Furr 16-22B wells. This report presents the results from Furr 16-22B and Furr 16-22D gas and produced water samples collected on December 16, 2009. Copies of the Isotech Laboratories Inc. laboratory reports for the Furr 16-22B and Furr 16-22D gas samples submitted for tritium and carbon-14 (^{14}C) analysis are included as Appendix A. The analytical results for the produced water samples from the Furr 16-22B and the Furr 16-22D, analyzed by GEL Laboratory LLC, are presented as Appendix B. Monthly produced water volumes have declined over time in both wells. Graphs showing the monthly production from data on the COGCC internet website are included as Appendix C.

1.3 Tier II Zone Drilling Monitoring Requirements

The drilling monitoring requirements in the RSAP consist of a review of the open- or cased-hole gamma-ray logs through the Williams Fork Formation interval for evidence of elevated gamma radiation. This review is conducted to determine whether there is potential evidence of Project Rulison-related gamma radiation observed in the formation during gas well drilling. The gamma-ray logs also detect naturally occurring radionuclides such as potassium-40, uranium, and thorium isotopes. According to the URS RSAP, the logs will be reviewed for evidence of above normal gamma-ray signatures. A gamma radiation measurement greater than 500 API gamma units or any other gamma readings that appear to be anomalous are to be noted by the drilling supervisor or his designated representative and immediately reported to the Company management and the Radiation Safety Officer (RSO) for review and guidance. Mr. Richard Henry with URS Corp. has agreed to act as RSO for Laramie Energy II.

A review of the well logs for the Furr 16-22B and Furr 16-22D wells on the COGCC website database shows that gamma-ray signatures were typically less than 200 API gamma units. Special attention was paid to the well log intervals

from below 6,000 feet to the bottom of each the wells. Copies of these logs were presented and discussed in the first quarter 2009 report.

1.4 Data Verification and Validation Requirements

Section 9 of the RSAP outlines the data verification and validation requirements. Olsson retained Diane Short & Associates of Lakewood, Colorado to perform the independent data validation on the November and December 2008 radiochemistry and non-radiochemistry baseline and production data, and also on the radiochemistry parameters for the 2009 quarterly production data for the Furr 16-22D and Furr 16-22B wells.

The data verification and validation was provided as an addendum (July 2009) to the Laramie Energy II, L.L.C. Tier II Gas Well Baseline Monitoring and Production Monitoring Report, Rulison Field, Garfield County, Colorado November - December 2008 (May 2009). The July 2009 addendum was also submitted to the COGCC, CDPHE-HMWMD Radiation Management, S.M. Stoller/DOE, Garfield County, and URS Corp. The data in this report and subsequent quarterly reports will also be verified and validated.

1.5 Background Radiation Studies

Tritium, a radioactive isotope of hydrogen (^3H), is produced naturally in small quantities in the upper atmosphere, and produced in much larger quantities during the detonation of a nuclear device. Tritium is a weak beta emitter and does not emit gamma rays. Since tritium can potentially be entrained within natural gas, and tritium is the most abundant and most mobile nuclide in the Rulison inventory, it is the primary radionuclide of concern. Tritium levels were evaluated in groundwater and surface water in the area before and after the Project Rulison experiment and were found to be comparable to background concentrations for that time in both sets of samples.

One tritium unit (TU) is equivalent to 3.2 picocuries per liter (pCi/L). The USGS sample results ranged from less than 220 TU (not detected) to a maximum of 618 TU reported for a well sample collected in May 1969, approximately four months before Project Rulison was conducted. Background activities for tritium were higher at the time due to nuclear weapons testing, so tritium activities in the late 1960s and early 1970s ranged from 700 pCi/L to more than 1,000 pCi/L (Voegeli and Claassen, 1971).

Today natural background tritium levels in precipitation typically range from 10 TU to 20 TU (32 pCi/L to 64 pCi/L). The CDPHE basic groundwater quality

standard for tritium is 20,000 pCi/L referenced as the level of activity that could potentially result in an annual dose of 4 millirems of beta radiation.

According to the USGS Open File Report 474-68 Geohydrology - Project Rulison (Voegeli, West, Cordes, 1970), intervals below 6,000 feet below ground surface (bgs) in the R-EX hole were analyzed in 1968 for the presence of gross alpha as Uranium equivalent and gross beta as ^{90}Sr-^{90}Y. The alpha activities ranged from < 0.4 µg/L to 9.8 µg/L, and gross beta activities ranged from 29 pCi/L to 70 pCi/L (Voegeli, 1969).

Additionally, Olsson Associates obtained a copy of the Basic Data Report No. 7 - Radiochemical Analyses of Ground and Surface Water in Colorado, 1954-1961 (Scott and Voegeli, 1961) a study conducted by the USGS in cooperation with the Colorado Water Conservation Board. Tritium activities were not analyzed in this study; however, since it was conducted eight years before Project Rulison it does provide information on background radiation throughout the state. The geometric mean for beta-gamma activity in groundwater samples collected throughout the state was 17.34 picocuries per liter (pCi/L) while the median and mode were both 14 pCi/L. The arithmetic mean of these groundwater samples was 62.2 pCi/L.

1.6 Rulison Path Forward

In June 2009 the U.S. Department of Energy (DOE), Office of Legacy Management issued a draft report entitled "Rulison Path Forward" which was intended to serve as a guide for discussions with the Colorado State regulators and other interested stakeholders in response to increased drilling for natural gas reserves near the underground nuclear explosion site near Rulison, Colorado. The report outlines the DOE's recommendation that gas development occur in a conservative, staged drilling approach as the gas production companies move closer toward the COGCC established half-mile radius surrounding the DOE 40-acre institutional control boundary around the Rulison site. Operators wishing to drill within the COGCC half-mile radius would require a full hearing before the commission before the application for permit to drill (APD) could be approved.

Institutional controls are legally enforceable spatial boundaries that limit intrusion at a site to a safe distance, typically to be protective of human health and the environment. The institutional controls at Rulison prohibit drilling below the 6,000 feet depth within the 40-acres known as Lot 11 (NE ¼ SW ¼ Section 25, T7S, R95W) surrounding the Project Rulison site. The depth at which the detonation occurred (8,426 feet bgs) and the low permeability of the Williams Fork Formation and overlying strata inhibit any potential migration of impacted water

from the cavity. Investigations and remediation of surface contamination were conducted from the 1970s up through 1996 with the cleanup of non-radiological contamination associated with the drilling mud pits and effluent pond that were remediated in 1996, as documented in the Rulison Site Surface Report Published in July 1998. Although no feasible technology exists to remove the subsurface radioactivity contamination from in or around the cavity, the DOE has no evidence that indicates radionuclides from the Rulison site have migrated or ever will migrate beyond the 40-acre institutional control boundary.

The DOE had the Desert Research Institute conduct modeling which calculates potential transport distances from the Rulison site to a hypothetical producing well. The results of the most recent conservative modeling show that wells at the half-mile radius, even in the east-west direction of the natural fracture trend, are safe for gas production. Despite low risks, the DOE recommends a cautious approach to gas development near the Rulison site.

1.7 Radionuclides of Concern

According to the DOE Rulison Path Forward (June 2009), tritium is the only contaminant of concern, which is consistent with the 1973 AEC Project Manager's report. Most of the longer-lived radionuclides produced by the detonation were incorporated into the molten rock that cooled to form a melt glass at the bottom of the cavity. Krypton-85 and carbon-14 were two other longer-lived radionuclides that were produced by the detonation that could potentially be present in natural gas. However, gas production testing of the re-entry well in 1970 removed almost all of the krypton-85 and carbon-14 created by the detonation, leaving tritium as the only contaminant of concern. According to the DOE Rulison Path forward, *Table 1 - Radionuclides in Re-entry Well Gas* the estimated remaining krypton-85 was < 10 curies, and the remaining carbon-14 was estimated at < 1 curie; where the curie is a unit of radioactivity measurement.

Of the 10,000 curies of tritium produced by the Rulison detonation, 2,824 curies were estimated to have been removed by production testing measurements. Following correction for decay, the estimated remaining tritium activity in and around the Rulison cavity in Lot 11 was estimated to be between 700 curies and 1,036 curies by late 2009. The DOE Rulison path forward states that even if tritium were to reach a producing gas well the risk is low in that there is no reasonable exposure scenario. Water vapor is removed from the gas stream at the well pad where it condenses and is separated as a waste byproduct. The produced water is separated from the gas stream prior to the gas entering the

distribution system. The gas in the distribution system is co-mingled with gas from other wells producing throughout the area.

According to the U.S. Nuclear Regulatory Commission (NRC) *Fact Sheet on Tritium, Radiation Protection Limits, and Drinking Water Standards*, the NRC has evaluated several instances of abnormal releases of liquid tritium from several nuclear power plants, which have resulted in groundwater contamination. The NRC determined that while these releases were unplanned, that the levels of tritium were within radiation protection limits and did not pose a threat to public health and safety.

Although Project Rulison is regulated by the DOE Legacy Management, and not regulated by the NRC, the NRC Fact Sheet provides a general overview of the health effects of tritium and the technical basis for the regulatory standards that the NRC uses to protect public health and safety, as well as the drinking water standards established by the U.S. EPA. The NRC Fact Sheet on Tritium can be found at http://www.nrc.gov/reading -rm/doc-collections/fact-sheets/tritium-radiation-fs.html.

The Fact Sheet states the following about tritium:

- Tritium is almost always found as a liquid and primarily enters the body when people eat food or drink water containing tritium or absorb it through their skin. People can also inhale tritium as a gas in the air.
- Once tritium enters the body, it disperses quickly and is uniformly distributed throughout the soft tissues. Half of the tritium is excreted within approximately 10 days after exposure.
- Everyone is exposed to small amounts of tritium every day, because it occurs naturally in the environment and in the foods that we eat. Workers in Federal weapons facilities, medical, biomedical, or university research facilities; or nuclear fuel cycle facilities may receive increased exposures to tritium.
- The type of radiation dose from tritium is the same as from any other type of radiation, including natural background radiation and medical administrations (e.g. x-rays).
- The tritium dose from nuclear power plants is much lower than the exposures attributable to natural background radiation and medical administrations, and exposures from consumer products.

Tritium concentrations have not been detected in natural gas and produced water samples collected from Laramie Energy's Furr 16-22B and Furr 16-22D wells.

2.0 Natural Gas and Produced Water Sampling

Laramie Energy II authorized sampling of the Furr 16-22D and Furr 16-22B wells, are both Tier II wells with wellheads located in sector 10. The Furr 16-22D has a surface location in sector 11 and a bottom of hole location in sector 10. Olsson performed the sampling of the natural gas and produced water by following the URS RSAP, Revision 2, March 2008. There are no Tier I wells within Sector 11; therefore, the Furr 16-22B is the closest Tier II well in this sector.

The Furr 16-22D is the next closest Tier II well to Project Rulison operated by Laramie Energy II. Noble Energy has completed Tier I wells in Sector 10 that are closer to Project Rulison than any of the Laramie Energy II wells. However, these Noble Energy wells are located near the dividing line between sectors 9 and 10.

2.1 Quarterly Production Sampling

Well Identification:	Well Surface Location:
• Furr 16-22B	SE ¼, SE ¼, Section 22, T7S, R95W; and
• Furr 16-22D	SE ¼, SE ¼, Section 22, T7S, R95W.

Olsson personnel sampled natural gas and produced water from the Furr 16-22B and Furr 16-22D wells on December 16, 2009 for the radiochemistry parameters listed in Table 3 of the URS RSAP. The samples consisted of natural gas collected from the Furr 16-22B and 16-22D well separators with the assistance of Laramie Energy II's pumper. Olsson Associates collected the gas sample using a two-stage regulator and obtaining the gas from the separator.

Olsson collected the produced water samples from the dump lines on the separators for the Furr 16-22B and 16-22D wells. Since there are multiple wells on these pads and production fluids are co-mingled in the onsite tank batteries, it is not possible to collect representative produced water samples for individual wells from the onsite production tanks as described in the URS RSAP sampling protocols.

2.2 Natural Gas Sample Analysis

The natural gas samples collected from the Furr 16-22B and Furr 16-22D gas wells on December 16, 2009 were submitted to Isotech in Champaign, Illinois for gas compositional analysis including carbon-14 (^{14}C) and tritium (^{3}H), a radioactive form of hydrogen. The natural gas samples were each collected in

an evacuated propane tank provided by Isotech, using a two-stage pressure regulator connected to the separator or the natural gas wellhead. Copies of the laboratory reports from Isotech are included in Appendix A.

Isotech reported the tritium (^{3}H) results in tritium units (TU). One TU is equivalent to 3.19 picocuries per liter (pCi/L), and the results, which indicate that tritium was not detected, or shown as less than the reporting limit of 10 TU, are presented in Table 2. The tritium analysis measures counts above background, and if the concentration is high enough the laboratory can report a finite value with a calculated uncertainty. If the concentration is low relative to the standard deviation of the measurement then the values are reported as "less than" the laboratory reporting limit, meaning that tritium was not detected. Isotech's reporting limit for tritium ranges from about 10 TU to 15 TU.

Beginning in about 1954, atmospheric tritium levels rose in excess of 1,000 TU due to nuclear weapons testing, and have declined back to natural background levels since then as a result of the ban on nuclear testing. Current natural background levels for tritium in the atmosphere range from 5 TU to 50 TU (15.9 pCi/L to 159.5 pCi/L). The isotopic composition of hydrogen is compared relative to the Vienna Standard Mean Ocean Water (VSMOW) standard.

Isotopic composition of carbon is relative to the Vienna Peedee Belemnite (VPDB) δ^{13} Standard and is based on the carbon isotopes in the shell of a marine fossil. The laboratory detection limit is 1 percent modern carbon (pMC). The results indicate that carbon-14 (^{14}C) is not present in the natural gas, indicating that the natural gas has been isolated from sources of modern carbon. According to the DOE Rulison End State Vision (2005) and the Rulison Path Forward (2009) the amount of ^{14}C present in the Rulison Site source term was estimated at 2.2 curies to 2.4 curies. Less than 1 curie is estimated to remain in the Rulison cavity, after correction for the ^{14}C activity that was removed during production testing in the early 1970s.

2.3 Produced Water Sample Analysis

Produced water samples were collected from the dump lines on the Furr 16-22B and 16-22D separator units located on the well pad. These produced water samples were submitted for analysis of radiochemistry parameters as listed in Table 3, as specified for Tier II wells in Table 2 of the URS RSAP. Produced water samples collected on December 16, 2009 were submitted to Isotech (Champaign, IL) for tritium analysis and to GEL Laboratory in Charleston, South Carolina for radiochemistry analysis (gamma spectroscopy, gas flow proportional counting for gross alpha and gross beta, chlorine-36 (^{36}Cl), and strontium-90

(^{90}Sr), and liquid scintillation analysis for Technetium-99 (^{99}Tc), and total uranium. Copies of the laboratory reports from Isotech are included as Appendix A, and a copy of the GEL Laboratories report is included as Appendix B. The laboratory analytical results are discussed in the following section and the results are summarized in Table 1 through Table 5.

During previous sampling events, the Furr 16-22B has been slow to yield water. According to production records available on the COGCC internet website, monthly produced water volumes have shown a steady decline for both wells. Copies of the production records for these wells and graphs showing the rates of decline are presented in Appendix C.

2.4 Performance and Monitoring Criteria

During the June 2009 sampling event, a duplicate gas and produced water samples were collected from the Furr 16-22D well and a field blank was collected for QA/QC evaluation in keeping with the RSAP protocols. The duplicate sample (Sample ID: 22-9-16) was collected to satisfy the required one duplicate sample for every 20 samples collected. The gas sample and an aliquot of the produced water sample were submitted to Isotech Laboratory for compositional analysis of the gas, including tritium and carbon-14, and tritium analysis of the produced water sample. The remaining aliquots of the produced water sample were submitted to GEL Laboratories, Inc. for radiochemistry analyses.

Water samples for QA/QC evaluation were not collected on December 16, 2009, but will be collected during future events on the same sampling frequency as presented in the RSAP Section 9 for data verification and validation. The laboratory reports were provided to Diane Short and Associates for data verification and validation. Copies of the report prepared by Diane Short and Associates for the evaluation of the data are presented as Appendix D.

3.0 Laboratory Analytical Results

The following sections present the laboratory analytical results for natural gas samples and produced water samples. The laboratory analytical results for the natural gas and produced water samples show that there are no Project Rulison related radionuclides present in the natural gas or produced water collected from the Furr 16-22B and 16-22D Tier II gas wells.

3.1 Natural Gas Sample Results

The natural gas sample results are presented in Table 2 and copies of the Isotech laboratory gas sample reports are presented in Appendix A. The Isotech laboratory reports present the compositional analysis reported in mol. percent for components in each of the gas samples. The results show that the samples are predominantly composed of methane with lesser concentrations of helium, hydrogen, oxygen, carbon dioxide, nitrogen, ethane, propane, iso-butane, N-butane, iso-pentane, and hexanes. Argon, carbon monoxide, hydrogen sulfide, and ethylene gas were not detected. The gas samples were also analyzed for the radionuclides tritium (^{3}H) and carbon-14 (^{14}C).

3.1.1 Tritium Results

The tritium (^{3}H) in the two gas samples collected from the Furr 16-22B and Furr 16-22D, were each reported as less than 10 tritium units (TU) which means that tritium not detected above the laboratory method detection limits in any of the samples. One TU is equal to 3.19 pCi/L so this corresponds to a detection limit of approximately 31.9 pCi/L.

3.1.2 Carbon-14 Results

The carbon-14 results were reported for the gas samples from the Furr 16-22B and Furr16-22D, as < 0.5, and <0.4, percent modern carbon (pMC), respectively. The results were reported as less than the laboratory method detection limit (0.4 to 0.5 pMC); meaning that carbon-14 (^{14}C) activity was not detected, which indicates that the gas sample has been isolated from sources of modern carbon. The absence of ^{14}C activity also indicates that there is no Project Rulison related radioactivity in the gas samples, although relatively little (2 pCi/L) ^{14}C is estimated to have been produced during the Rulison experiment.

3.2 Produced Water Sample - Radiochemistry Results

The following sections present the laboratory analytical results for the produced water samples collected from the Furr 16-22B and 16-22D gas wells on December 16, 2009. Copies of the laboratory reports from Isotech and GEL are included as Appendix A and Appendix B, respectively.

3.2.1 Tritium Results

The Isotech laboratory results for tritium (^{3}H) in the produced water samples were reported as < 10.0 TU in the Furr 16-22B sample and in the Furr 16-22D sample, or approximately less than 31.9 pCi/L. The minimum detectable concentration (MDC) that Isotech is able to achieve for ^{3}H using the direct count method is 10.0 TU. The tritium results in produced water are summarized in Table 3.

Natural background tritium levels in precipitation typically range from 10 TU to 20 TU (approximately 32 pCi/L to 64 pCi/L) and a reasonable upper bound for tritium background activities may be estimated at 100 TU (or approximately 320 pCi/L). The CDPHE basic groundwater quality standard for tritium is 20,000 pCi/L referenced as the level of activity that could potentially result in an annual dose of 4 millirems of beta radiation.

3.2.2 Gross Alpha Radiation Results

The GEL Laboratories, LLC (GEL) laboratory results for gross alpha activities show that alpha radiation was not detected in the produced water sample from the Furr 16-22B ("U" -1.05 ± 12.9 pCi/L) or, in the produced water sample from the Furr 16-22D ("U" 10.2 ± 10.1 pCi/L). The laboratory detection limit (DL) ranged from 16.7pCi/L to 23.4 pCi/L and the laboratory reporting limit (RL) was 5.00 pCi/L, as indicated on page 6 of the GEL laboratory report.

The detected gross alpha activity is likely due to naturally occurring radionuclides associated with high total dissolved solids (TDS) concentrations present in the samples. The alpha activity is within the expected range of natural background radiation for the area and is likely due to the presence of naturally occurring uranium, thorium, and their daughter products present in the produced water from the producing formation. One part per million (ppm) uranium (^{238}U) equals 0.33 picocuries per gram (pCi/g) gross alpha; and one ppm thorium (^{232}Th) equals 0.11 pCi/g gross alpha.

The results for the gross alpha activities in the produced water sample are summarized on Table 4 and copies of the laboratory report are presented in Appendix B.

3.2.3 Gross Beta Radiation Results

The GEL laboratory results for gross beta activities in produced water samples indicated that gross beta activities were detected in the Furr 16-22B (20.1± 11.2 pCi/L but were not detected in the Furr 16-22D samples (reported as 'Not Detected', symbolized with a "U" qualifier, with beta activity results of 9.84 ± 7.18 pCi/L). The laboratory detection limit (DL) ranged from 11.6 pCi/L to 18.2 pCi/L and the laboratory reporting limit (RL) was 5.00 pCi/L.

The gross beta results are within the expected range of natural background radiation for the area and are likely due to the presence of naturally occurring potassium-40 (^{40}K). GEL reported that potassium-40 (^{40}K) analyzed as part of the gamma spectroscopy analysis was detected in the Furr 16-22B and Furr 16-22D produced water samples, with reported activities of 48.5 ± 19.8 pCi/L and 42.4 ± 24.8 pCi/L, respectively. The laboratory detection limit (DL) ranged from 16.6 to 16.7 pCi/L.

The results for the gross beta activities are summarized on Table 3 and copies of the laboratory reports are presented in Appendix B for the June 24, 2009 samples.

3.2.4 Strontium-90 and Technetium-99 Results

The produced water samples submitted to GEL Laboratories were analyzed for Strontium-90 (^{90}Sr) and Technetium-99 (^{99}Tc). The laboratory results show that Strontium-90 (^{90}Sr) and Technetium-99 (^{99}Tc) were not detected in either of the produced water samples. The results for the ^{90}Sr and ^{99}Tc activities are summarized on Table 3 and copies of the laboratory reports are presented in Appendix B.

3.2.5 Chlorine-36 results

The produced water samples were submitted to GEL for analysis of chlorine-36 (^{36}Cl). The results show that ^{36}Cl activities were not detected above the laboratory reporting limits in either of the produced water samples. The results for the ^{36}Cl activities are summarized on Table 3 and copies of the laboratory reports are presented in Appendix B.

According to the January 2005 DOE Rulison Site End State Vision document, the estimated inventory of ^{36}Cl produced by the Rulison detonation was 2.82 curies (Ci), and according to the URS 3rd Quarter 2008 Report, ^{36}Cl is a less common radionuclide in the inventory at Project Rulison.

3.2.6 Gamma-Emitting Radionuclide Results

The majority of the results for the gamma-emitting radionuclides show that gamma activities were not detected above laboratory reporting limits. This is indicated with a letter 'U' in the results of the laboratory report and also in the first row of Table 4.

The GEL gamma spectroscopy results for the Furr 16-22B produced water sample show that Bismuth-214 was detected at 12.3 ± 4.96 pCi/L with a detection limit of 2.97 pCi/L; and the results for the Furr 16-22D produced water sample show that Bismuth-214 was detected at 6.91 ± 4.05 pCi/L with a detection limit of 3.31 pCi/L. Bismuth-214 is a daughter product of the naturally occurring Uranium-238 decay series.

The GEL gamma spectroscopy results for the Furr 16-22B produced water sample show that Actinium-228 was detected at 12.4 ± 7.70 pCi/L with a detection limit of 5.02 pCi/L; and the results for the Furr 16-22D produced water sample show that Actinium-228 was detected at 9.89 ± 6.47 pCi/L with a detection limit of 5.54 pCi/L. Actinium-228 is a daughter product of the naturally occurring Thorium-232 decay series.

The GEL gamma spectroscopy results for the Furr 16-22B produced water sample show that Radium-228 was detected at 12.4 ± 7.70 pCi/L with a detection limit of 5.02 pCi/L; and the results for the Furr 16-22D produced water sample show that Radium-228 was detected at 9.89 ± 6.47 pCi/L with a detection limit of 5.54 pCi/L. Radium-228 is a daughter product of the naturally occurring Thorium-232 decay series.

The GEL laboratory results for gamma-emitting radionuclides in the Furr 16-22B produced water sample show that Lead-212, Lead-214, and Thorium-230 were qualified as "UI" Gamma Spectroscopy - 'Uncertain Identification.' The GEL laboratory results for gamma-emitting radionuclides in the Furr 16-22D sample show that Americium-241 and Thorium-230 results were qualified as "UI" with results of '0.00.' Lead-212, Lead-214, and Thorium-230 are naturally occurring radionuclides that are daughter products of Uranium-238 (^{238}U) and Thorium-232 (^{232}Th) decay series. Copies of the laboratory reports for gamma spectroscopy results are included in Appendix B.

Gamma spectroscopy results for potassium-40 activity were detected in the Furr 16-22B produced water sample at 48.5 ± 19.8 with a detection limit of 16.6 pCi/L and in the Furr 16-22D sample at 42.4 ± 24.8 with a detection limit of 16.7 pCi/L. Potassium-40 (^{40}K) was previously detected in several produced water samples previously submitted from these wells. Potassium-40 is one of the most common

radionuclides in nature and is frequently found in sedimentary rocks high in clay minerals since these minerals contain potassium in their chemical formulas.

Krypton-85 (^{85}Kr) is included as a radionuclide in the GEL gamma spectroscopy report, and was not detected in either of the two produced water samples. Krypton-85 has not been detected as a gamma spectroscopy constituent in the samples previously submitted from the Laramie Energy II wells.

In addition to Tritium (^{3}H) and Carbon-14 (^{14}C), Krypton-85 (^{85}Kr), an inert gas, is considered as a gas phase radionuclide that potentially could be entrained in the natural gas. However, the initial activity of ^{85}Kr was estimated at 1,100 curies and the majority of ^{85}Kr was removed during the Project Rulison production tests. The amount of ^{85}Kr recovered was used to calculate the yield of the Project Rulison device and to estimate the size of the chimney and the cavity. According to the Rulison Path Forward document it is estimated that < 10 curies of ^{85}Kr may remain in the subsurface by late 2009. Krypton-85 is a weak beta particle emitting radionuclide and has a 10.76 year half-life.

GEL Laboratories does not perform Krypton isotopic analysis or Krypton-85 beta activity analysis. Analyzing for ^{85}Kr beta activity is problematic due to the large sample volumes required, long counting time, and because only a limited number of laboratories worldwide have the specialized equipment to perform the analysis.

3.3 Data Verification and Validation

The following presents the results of the data verification and validation analysis of the Isotech and GEL laboratory reports.

3.3.1 Isotech Results

Samples of natural gas and produced water were collected from the Furr 16-22B and Furr 16-22D on December 16, 2009. Isotech Laboratories received two produced water samples and two gas LP tanks on December 16, 2009. The produced water samples were submitted for tritium analysis by the direct count method and the gas samples were submitted for compositional analysis including carbon-14 and tritium.

Olsson requested that Isotech perform the analysis consistent with what they are doing for URS per the RSAP. No QA/QC data was provided by Isotech; however, the ^{3}H in all of the gas and produced water samples were reported as less than the laboratory reporting limit (< 10 TU). According to Isotech the chemical analysis was based on standards accurate to within 2%. A duplicate error ratio (DER) cannot be calculated for the tritium in produced water since a

field duplicate sample was not collected and the results were reported as less than the laboratory reporting limit.

Diane Short and Associates was retained to verify and validate the data. The tritium results were provided to Diane Short and Associates; however since Isotech only provided sample results without quality control information it was not possible for Diane Short and Associates to validate the Isotech data.

3.3.2 GEL Results for GFPC, LSC, and Total Uranium

Diane Short and Associates reviewed and validated the GEL laboratory data and prepared two separate reports. One report was for the gas flow proportional counting (GFPC) for gross alpha/beta, Cl-36 and Sr-90, liquid scintillation (LSC) for Tc-99, and total uranium in water. The second report was for validation of the gamma spectroscopy results.

According to Diane Short and Associates, the data are considered fully useable for project purposes with consideration of the following. Aliquots of the two produced water samples were received by GEL Laboratories on December 16, 2009 for analysis of gross alpha, gross beta, ^{90}Sr, ^{99}Tc, ^{36}Cl, and total uranium.

According to the laboratory receipt and review form, the samples were received intact and stored on ice. Chain of custody documents were included, sample containers were intact and sealed, and the samples were received within holding time. The sample identifications, date and time, and the number of containers indicated on the chain of custody matched with the sample containers, and the chain of custody was signed in relinquished /received sections. The laboratory commented that both the samples were biphasic with a thick layer of oil at the top. The laboratory decanted off the oil layer and discarded it, and only analyzed the aqueous portion of the sample.

According to Diane Short and Associates, GEL provided a QC summary as part of the analytical data package, but did not include raw data. Diane Short and Associates conducted a Level II review of the GEL data. Non-conformance reports were generated to document any procedural anomalies that may deviate from referenced standard operating procedures or contractual documents. The non-conformance report was generated due to the sample being improperly preserved upon receipt. This was due to buffering by the sample matrix, and although the sample containers contained acid prior to sample collection, it was neutralized by the produced water. The laboratory added acid upon receipt per Olsson's approval. The laboratory added preservative to bring the sample pH into the acceptance range, as permitted by 40 CFR, and according to Diane

Short and Associates, this should have no impact on the results. No qualifiers are applied.

Additionally, the laboratory noted that the samples were received at 6 °C. Chilling samples to less than 6 °C is not required for radiological testing by 40 CFR. No qualifiers are applied.

Gross alpha and gross beta were analyzed by EPM Method 900.0, ^{36}Cl by GL-RAD-A-033 Method, ^{90}Sr by EPA Method 905.0, ^{99}Tc by DOE EML HASL-300 Method, Tc-02-RC Modified, and total uranium by ASTM D-5174. The Level II review indicated that the Analytical Report or Data Sheets are present and complete for all requested analyses, the contract holding times were met for all analyses, chain-of-custody records were complete, and samples were properly preserved, or applicable preservative was used. Sample containers were pre-preserved by the laboratory but the produced water contains dissolved salts that buffer the acid preservative. Therefore, the laboratory added preservative to bring the sample pH into the acceptance range upon receipt of the samples. According to Diane Short & Associates, this is permissible per 40 CFR and should have no impact on the results. No qualifiers are added.

The GEL data package did not include the raw data; therefore, it was not possible for Diane Short & Associates to validate the calibration and standardization methods used by the laboratory to establish daily counting efficiency for the requested analytical methods, calibration data plots, daily QC check standards, and other information on the laboratory procedures.

The laboratory reported the results with uncertainties that included all uncertainties associated with the preparation and analytical procedures. Samples where uncertainties were greater than the result or the result was reported as estimated, "J" qualified, may have unrealistically low MDC values. If the value calculated is less than the reported MDC, the activity result is qualified JQ as estimated below the MDC. No such instances were observed and therefore, no qualifiers were applied.

Diane Short and Associates' overall assessment of the laboratory data was that the data are considered fully useable for project purposes with consideration of the following:

- The GEL Laboratories data package did not include raw data. Only summary QC results were provided.
- The Isotech data only reported results without QC.

- The GEL data package included a non-conformance report for ^{36}Cl stating that the required detection limit is not met due to the sample matrix. No qualification was applied.
- Matrix spikes were conducted on sample 16-22D for ^{90}Sr, ^{36}Cl, and total uranium. Although not all methods were spiked in this sample set, counting prior sets the recommended frequency of matrix spikes has been met. All matrix spike recoveries were in control.
- Matrix duplicates, not matrix spike duplicates, were analyzed using the same samples as used for the matrix spikes. The matrix duplicates for ^{90}Sr, ^{36}Cl, and total uranium were in control.

3.3.3 GEL Results for Gamma Spectroscopy

The overall assessment of the gamma spectroscopy data reviewed by Diane Short and Associates was that the data were considered fully useable for project purposes with consideration of the following qualification or comments.

- As stated above, the GEL Laboratories data package did not include raw data, only summary QC results were provided. The method used for gamma spectroscopy was EPA 901.1.
- Samples were received at a pH of approximately 7. The sample containers were provided by the laboratory pre-acidified, but due to the buffering capacity of the produced water, the acid was neutralized. The laboratory added more acid to bring the sample pH to within the acceptance range. This is permissible per 40 CFR and should have no impact on the results. No qualifiers are added.
- The laboratory noted that the sample 16-22B contained a layer of light nonaqueous phase liquid (LNAPL). Olsson instructed the laboratory to decant the oil phase and analyze only the aqueous phase. Thus the analytical results pertain only to the produced water portion of the sample.
- Instrument detection limits were within isotope-specific limits for the calibration standards and QC samples.
- Gamma spectroscopy evaluates whether a radionuclide is detected above the minimum detect concentration (MDC), and if so, then to determine if the result is greater than the total propagated uncertainty (TPU). All results in this case are less than the MDC. In cases where the sample result is less than the TPU the result is not considered to be different from zero. If it is greater than the TPU, the result could be high enough to represent detection below the MDC. Negative results that have absolute values above the TPU could potentially indicate a low bias due to shifting background.

- The laboratory flagged some results with “UI” to indicate that they suffer from some type of detection issue. These results could potentially suffer from a negative bias and are qualified as “JQ”.
- In addition, in the results for ^{85}Kr, there are high negative values greater than the MDC and also greater than the TPU. These results could suffer from some negative bias and are qualified “JQ.”
- Some analytes did not meet the duplicate error ratio (DER) for matrix duplicates. Diane Short & Associates tabulated these in their report included as Appendix D. The non-detected results are acceptable since they are non-detects in both duplicate and parent samples. The detected results with ‘out of limit DER values’ suggest that he data may be impacted by sample non-homogeneity. These results are qualified as “JD#,” where ‘#’ is the DER value, in both the duplicate and parent sample. Detections agree in both parent and duplicate samples with the exception of ^{214}Pb, which was not detected in the parent sample, but was detected in the duplicate.
- All results were reported as non-detect. No method blank corrections are required.
- Americium-241, Lead-214, and Thorium-230 were reported by the laboratory as “UI” in the method blank due to low abundance. With the exception of Americium-241 reported as ‘U’ (not detected) in sample 16-22B, these analytes are also reported as “UI” in the samples. In addition, Lead-212 was qualified as “UI” by the laboratory in sample 16-22B. These results are qualified as “JQ.”

4.0 Summary

The results of the third quarter 2009 sampling of Laramie Energy II's two closest Tier II wells indicate that no radiation related to Project Rulison was detected. The surface locations for the Furr 16-22B and Furr 16-22D gas wells are both located in Section 22, Township 7S, Range 95 West of the Sixth Principal Meridian, but were directionally drilled . The Furr 16-22B and Furr 16-22D are Tier II wells in RSAP Sectors 10 and 11 and are located within the 3-mile radius of Project Rulison as shown on Figure 1 and Figure 2.

Isotech Laboratories indicated that the LP tanks containing the gas samples and the produced water samples submitted for tritium analysis arrived in good condition. GEL laboratories indicated that both of the produced water samples, were bi-phasic, meaning that there was a thick layer of oil floating on top of the water samples. Olsson gave the laboratory permission to remove the oil and analyze only the aqueous portion of the samples as the RSAP requires for Tier II wells.

The analytical results show that tritium (^{3}H), reportedly the only radionuclide of concern in the Project Rulison estimated inventory, was not detected in either gas samples or in produced water samples analyzed by Isotech in Champaign, Illinois. Tritium has a 12.3 year half-life and a significant amount of the tritium estimated to have been produced by the detonation was released in 1970 during the production testing of the re-entry well. The DOE estimated amount of Project Rulison related tritium remaining in late 2009 is 700 curies.

Carbon-14 (^{14}C) was also identified in the Project Rulison estimated inventory as a radionuclide that potentially could be present in natural gas. The Isotech analytical results for the natural gas samples collected from the Furr 16-22B and Furr 16-22D wells show that ^{14}C was not detected (< 0.5 pMC). The laboratory results show the samples have been isolated from modern carbon sources.

Gross alpha activities were reported in one of the two produced water samples. Gross alpha activities in the produced water are likely to due to high TDS that were reported in the baseline samples collected in December 2008.

Potassium-40 (^{40}K), one of the most abundant naturally occurring radionuclides, was reportedly detected in the Furr 16-22D produced water sample and was indicated as 'UI', uncertain identification, in the Furr 16-22B produced water sample. Potassium-40 is a beta emitting radionuclide. Gross beta activities are likely to be related to naturally occurring ^{40}K. The laboratory analytical results indicate that ^{36}Cl, ^{90}Sr, ^{99}Tc, and total Uranium results were reported as "U" meaning that they were 'not detected' in the produced water samples.

The results of the gamma spectroscopy analysis show that gamma emitting radionuclides were generally not detected. Bismuth-214 was detected in both produced water samples at relatively low activities, and is related to naturally occurring Uranium-238 decay series. Other naturally occurring radionuclides, such as Actinium-228, Lead-212, Lead-214, Thorium-230, and Radium-228 were reported as uncertain identification in the Furr 16-22D produced water sample. These radionuclides are daughter products of natural Uranium-238 and Thorium-232 decay. Other gamma emitting radionuclides were reportedly not detected, as shown with a 'U' qualifier preceding the result in the laboratory report.

Laboratory analytical results for gross alpha and gross beta indicate that alpha activities and beta activities were within the range of natural background and these low level activities are most likely due to naturally occurring radionuclides in the Uranium-238 and Thorium-232 decay chain, such as Bismuth-214 (^{214}Bi), Lead-214 (^{214}Pb), and Potassium-40 (^{40}K).

The laboratory analytical results show that gas flow proportional counting of Chlorine-36 and Strontium-90 indicate that these radionuclides were not detected in any of the produced water samples. Laboratory results for liquid scintillation counting of Technetium-99 indicate that ^{99}Tc was not detected in the two produced water samples. Total Uranium was not detected in either of the produced water samples.

Results of the data verification and validation indicate that the data is usable for the purposes of this project with consideration of the qualifications mentioned in the laboratory report, and those of the independent data reviewer. The laboratory data was reviewed by Diane Short and Associates. The data validation report is included as Appendix D.

5.0 References

Clark, I.D. and Fritz, P., Environmental Isotopes in Hydrogeology, 1997, CRC Press, LLC, 2000 N.W. Corporate Blvd., Boca Raton, FL 33431;

Gholam, K.A.; Lehr, J.H., PhD.; Perrochet, P., Groundwater Age, 2006, John Wiley & Sons, Inc., Hoboken, NJ;

Scott, R.C., and Voegeli, P.T., Sr, Radiochemical Analyses of Ground and Surface Water in Colorado, 1954-1961, Colorado Water Conservation Board Basic-Data Report No. 7, pp 27, two figures;

Rulison End State Vision, 2005, U.S. Department of Energy;

Rulison Path Forward, June 2009, U.S. Department of Energy, Office of Legacy Management;

URS Corp. Rulison Sampling and Analysis Plan, Revision 2, March 2008 Denver, Colorado;

Voegeli, P.T., Sr.; Claassen H.C.; Radiochemical Analyses of Water from Selected Streams, Wells, Springs, and Precipitation Collected Prior to Re-entry Drilling, Project Rulison, USGS Open File Report USGS-474-83 (Rulison-6), 16 pages;

Voegeli, P.T., Sr.; West , S.W.; Geohydrology of Project Rulison, Garfield County, Colorado with a section on Aquifer Response by Cordes, E.H., 1970, U.S.G.S. Open File Report USGS-474-68, 56 pages;

Voegeli, P.T., Sr.; Geology and Hydrology of the Project Rulison Exploratory Hole, Garfield County, Colorado, 1969, USGS-474-16;

http://www.nrc.gov/reading -rm/doc-collections/fact-sheets/tritium-radiation-fs.html

TABLES AND FIGURES

TABLE 1

FURR GAS WELL INFORMATION

Summary of Well Locations and Sampling Activities
Laramie Energy II
Rulison Area Gas Well Monitoring

			Surface Location										
COUNT	**WELL**	**PAD**	**QTR/QTR**	**SEC**	**TWP**	**RNG**	**TOTAL DEPTH (FT.)**	**COMPLETION INITIATION DATE**	**4th Quarter 2008**	**1st Quarter 2009**	**2nd Quarter 2009**	**3rd Quarter 2009**	**4th Quarter 2009**
1	Furr A11-15B	Furr A-11	NE SW	15	7S	95W	7,643	9/22/08	B (11/13/08)	N/A	N/A	N/A	N/A
2	Furr A11-15D	Furr A-11	NE SW	15	7S	95W	7,645	9/29/08	B (11/13/08)	N/A	N/A	N/A	N/A
3	Furr Hagen 6-22B	F-1	SW NE	22	7S	95W	8,225	10/3/08	B (12/17/08)	N/A	N/A	N/A	N/A
4	Furr Hagen 6-22D	F-1	SW NE	22	7S	95W	8,225	10/3/08	B (12/17/08)	N/A	N/A	N/A	N/A
5	Furr 7-22B	F-1	SW NE	22	7S	95W	8,077	10/8/08	B (12/17/08)	N/A	N/A	N/A	N/A
6	Furr 7-22D	F-1	SW NE	22	7S	95W	8,110	10/8/08	B (12/17/08)	N/A	N/A	N/A	N/A
7	Furr 10-22B	F-1	SW NE	22	7S	95W	8,130	10/13/08	B (12/17/08)	N/A	N/A	N/A	N/A
8	Furr 9-22B	F-2	SE SE	22	7S	95W	8,820	10/24/08	B (12/17/08)	N/A	N/A	N/A	N/A
9	Furr 9-22D	F-2	SE SE	22	7S	95W	8,720	10/30/08	B (12/17/08)	N/A	N/A	N/A	N/A
10	Furr 16-22B	F-2	SE SE	22	7S	95W	8,520	10/24/08	B (12/17/08)	QP (NS)	QP (6/24/09)	QP (10/01/09)	QP (12/16/09)
11	Furr 16-22D	F-2	SE SE	22	7S	95W	8,540	10/30/08	B (12/17/08)	QP (4/14/09)	QP (6/24/09) D	QP (10/01/09)	QP (12/16/09)
12	Furr 10-22D	F-3	SW SE	22	7S	95W	8,606	11/6/08	B (12/17/08)	N/A	N/A	N/A	N/A
13	Furr 15-22B	F-3	SW SE	22	7S	95W	9,172	11/6/08	B (12/17/08)	N/A	N/A	N/A	N/A
14	Furr 15-22D	F-3	SW SE	22	7S	95W	8,476	11/6/08	B (12/17/08)	N/A	N/A	N/A	N/A

Notes:
Abbreviations:
B - Baseline Data Collection Date (Date)
QP - Quarterly Production Data Collection Date
D - Duplicate Sample Collected
N/A - Not Applicable (See explanation below)
NS - Not Sampled (The Furr 16-22B was shut-in during the 04/14/09 sampling event and could not be sampled.)

Shaded rows indicate the wells sampled in this report on December 16, 2009.

According to the URS Rulison SAP, Revision 2, March 2008, Table 2 - *Tier I and Tier II Sampling and Analysis Scheme for Gas Wells within a Three-Mile Radius of Project Rulison*, Tier II Zone wells require a One-Time sampling and analysis (Baseline) for the radiological and non-radiological analytes in SAP Tables 3 and 4 and natural gas for the radiological analytes listed in SAP Table 3 as soon as possible after fracing but no later than 30 days after first gas delivery from a new gas well. If a Tier II well is the closest well in a sector (i.e., no Tier I well), produced water and natural gas will be sampled and analyzed for the radiological analytes listed in Table 3 quarterly during Year 1, semiannually during Years 2 and 3, and annually thereafter.

The Furr 16-22B and Furr 16-22D are the two Tier II wells closest to Project Rulison in Sector 11, and there are no Tier I wells in this sector.
A duplicate sample (D) was collected from the Furr 16-22D and was identifiied as '22-9-16' during the 06/24/09 sampling event.
A field blank sample was also collected during the 06/24/09 sampling event.

TABLE 2

GAS SAMPLE DATA
Rulison Area Well Monitoring for Natural Gas Samples
Furr 16-22B and Furr 16-22D Wells
Laramie Energy II - Rulison Field, Garfield County, Colorado

Well Name/ No.	Sample Source	Latitude/	Longitude	Qtr/Qtr	Section	Township	Range	P.M.	Isotech Lab No.	Sample Name	Date Sample	CO %	H_2S %	He %	H_2 %	Ar %	O_2 %	CO_2 %	N_2 %	C_1 %	C_2 %	C_2H_4 %	C_3 %	iC_4 %	nC_4 %	iC_5 %	nC_5 %	C_6+ %	$^{14}C_1$ pMC	Std. Dev. (±)	Tritium TU	Std. Dev. (±)	Total BTU calc	Specific Gravity calc
Furr 16-22B	Separator	39.41669	-107.97507	SE SE	22	7S	95W	6th	152400	Furr 16-22B	12/17/2008	ND	ND	0.0029	0.0036	ND	ND	2.97	0.029	89.26	5.12	ND	1.50	0.335	0.322	0.139	0.0981	0.220	< 0.4	N/A	< 10.0	N/A	1076	0.642
									N/A		4/14/2009	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
									165099		6/24/2009	ND	ND	0.0033	0.0029	ND	0.0324	3.00	0.17	89.76	4.86	ND	1.35	0.278	0.248	0.0969	0.0640	0.133	< 0.5	N/A	< 10.0	N/A	1061	0.634
									172338		10/1/2009	ND	ND	0.0030	0.0026	NA	0.006*	3.58	0.056	88.86	5.04	ND	1.47	0.340	0.292	0.0830	0.0574	0.211	< 0.4	N/A	< 10.0	NA	1065	0.644
									176955		12/16/2009	ND	ND	0.0029	0.0027	ND	0.027	3.60	0.14	89.25	4.97	ND	1.19	0.253	0.190	0.102	0.0773	0.192	< 0.5	N/A	< 10.0	N/A	1055	0.640
Furr 16-22D	Separator	39.416623	-107.97512	SE SE	22	7S	95W	6th	152398	Furr 16-22D	12/17/2008	ND	ND	0.0029	0.0033	ND	0.0060	3.25	0.053	88.76	5.35	ND	1.52	0.337	0.307	0.128	0.0895	0.192	< 0.8	N/A	< 10.0	N/A	1073	0.644
									160503		4/14/2009	ND	ND	0.0029	0.0042	ND	0.0098	3.39	0.086	88.87	5.24	ND	1.45	0.309	0.278	0.117	0.0789	0.167	0.5	0.1	< 10.0	N/A	1066	0.643
									165100		6/24/2009	ND	ND	0.0038	0.0040	ND	0.0272	2.88	0.16	89.50	5.15	ND	1.43	0.296	0.261	0.0094	0.0656	0.121	< 0.4	N/A	< 11.7	N/A	1066	0.636
									172337		10/1/2009	ND	ND	0.0028	0.0033	NA	0.008*	3.69	0.050	88.42	5.35	ND	1.50	0.314	0.270	0.105	0.0716	0.218	0.4	0.1	< 10.0	N/A	1067	0.647
									176954		12/16/2009	ND	ND	0.0031	0.0029	ND	0.034	3.58	0.16	88.54	5.31	ND	1.45	0.312	0.257	0.110	0.0774	0.164	< 0.4	N/A	< 10.0	N/A	1063	0.645
22-9-16	Separator	39.416623	-107.97512	SE SE	22	7S	95W	6th	165101	22-9-16 (Duplicate)	6/24/2009	ND	ND	0.0033	0.0040	ND	0.0144	3.36	0.10	89.07	5.17	ND	1.42	0.297	0.263	0.101	0.0666	0.133	< 0.5	N/A	< 12.8	N/A	1063	0.640

Note: Shaded rows present the analytical data for the samples collected on December 16, 2009 which are discussed in this report. The table presents the data as compared to the results for samples collected previously from these wells.

Accronyms:
pMC - Percent Modern Carbon.
TU - Tritium Units (One TU is equivalent to 3.19 pCi/L of water)
< - Not Detected (ND) (Above Laboratory Method Detection Limit)
Std. Dev. (±) - Standard Deviation
BTU - British Thermal Units (cu. Ft. dry calculated at 60°F and 14.7 psia)
calc - calculated value
N/A - not applicable
NA - not analyzed
ND - not detected (Mol %)
NS - not sampled (Furr 16-22B shut in on 04/14/09)

Gas Component:
CO - Carbon Monoxide
H_2S - Hydrogen Sulfide
He - Helium
H_2 - Hydrogen
Ar - Argon
O_2 - Oxygen
CO_2 - Carbon Dioxide
N_2 - Nitrogen
C_1 - Methane
C_2 - Ethane
C_2H_4 - Ethylene
C_3 - Propane
iC_4 - Iso-Butane
nC_4 - N-Butane
iC_5 - Iso-Pentane
nC_5 - N-Pentane
C_6+ - Hexanes+

$^{14}C_1$ - Carbon 14 — Carbon-14 (14C) Detection Limit is 1.0 pMC. Isotopic composition of carbon is relative to the Vienna Peedee Belemnite (VPDB).
Tritium — Tritium (^3H) Detection Limit 10.0 TU. Isotopic composition of hydrogen is relative to Vienna Standard Mean Ocean Water (VSMOW)

Std. Dev./ (±) — Standard Deviation (±) Uncertainty

Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol.% Chemical analysis based on standards accurate to within 2%.

Table presents cummulative quarterly results for 2009 (12/16/09, 10/01/09, 06/24/09, 04/14/09) and baseline (12/17/08) laboratory analytical results for the Furr 16-22B and the Furr 16-22D wells.

* Isotech did not analyze Argon separately, but reported combined results for Oxygen and Argon for the analysis of the 10/01/09 samples.

TABLE 3

TRITIUM ANALYTICAL RESULTS FOR PRODUCED WATER SAMPLES
Furr 16-22B and Furr 16-22D Tier II Wells
Laramie Energy II, Rulison Field, Garfield County, Colorado

Well Name/Number	Sample Source	Latitude	Longitude	QTR/ QTR	Section	Township	Range	P.M.	SAMPLE ID	LAB Number	DATE SAMPLED	TIME SAMPLED	Laboratory	Tritium (TU)	Tritium (pCi/L) calculated
Furr 16-22B	Separator	39.41669	-107.97507	SE SE	22	7S	95W	6th	Furr 16-22B		12/17/2008	12:54	ISO	< 10.8	< 34.5
											4/14/2009	NS	ISO	NS	NS
											6/24/2009	11:55	ISO	< 13.7	< 43.7
											10/1/2009	11:30	ISO	< 10.0	< 31.9
										177011	12/16/2009	13:00	ISO	< 10.0	< 31.9
Furr 16-22D	Separator	39.41662	-107.97512	SE SE	22	7S	95W	6th	Furr 16-22D		12/17/2008	12:13	ISO	< 10.0	< 31.9
											4/14/2009	11:00	ISO	< 10.0	< 31.9
											6/24/2009	11:40	ISO	< 12.0	< 38.3
											10/1/2009	11:40	ISO	< 10.0	< 31.9
										177010	12/16/2009	12:55	ISO	< 10.0	< 31.9
22-9-16 (Furr 16-22D Duplicate)	Separator	39.41662	-107.97512	SE SE	22	7S	95W	6th	22-9-16		6/24/2009	12:50	ISO	< 10.5	< 33.5
Field Blank	NA	NA	NA	SE SE	22	7S	96W	6th	Blank		6/24/2009	12:05	ISO	54 ± 3.8	173.22 ± 12.1

Notes:
Shaded rows present the results for samples collected on December 16, 2009 as presented in this report. The table also presents the results from previous sampling events for these gas wells.

Tritium (^3H) Detection Limit 10.0 TU. Isotopic composition of hydrogen is relative to Vienna Standard Mean Ocean Water (VSMOW).

Abbreviations:
ISO - Isotech Laboratories, Inc. of Champaign, Illinois
TU - Tritium Units (One TU is equivalent to 3.19 pCi/L of water.) Isotech reported the tritium results in TU and Olsson Associates converted to equivalent picocuries per liter.
pCi/L - picocuries per liter

< - Result is less than the method detection limit
NS - Not Sampled (Furr 16-22B was shut-in and the separator did not yield sufficient water volume to enable sample collection in April 14, 2009.)

TABLE 4

Radiochemistry Gas Flow Proportional Counting/Liquid Scintillation Analysis/Total Uranium for Produced Water Samples
Furr 16-22B and Furr 16-22D Tier II Wells
Laramie Energy II - Rulison Field, Garfield County, Colorado

WELL NAME/ Sample ID	Sample Source	Latitude/	Longitude	QTR/ QTR	Section	Township	Range	P.M.	SAMPLE ID	DATE SAMPLED	TIME SAMPLED	Laboratory	GFPC Gross Alpha	Result ± Uncertainty (pCi/L)	Detection Limit (pCi/L)	GFPC Gross Beta	Result ± Uncertainty (pCi/L)	Detection Limit (pCi/L)	GFPC Chlorine-36	Result ± Uncertainty (pCi/L)	Detection Limit (pCi/L)	GFPC Strontium-90	Result ± Uncertainty (pCi/L)	Detection Limit (pCi/L)	LSA Technetium-99	Result (pCi/L)	Detection Limit (pCi/L)	Total Uranium	Result ± Uncertainty (µg/L)	Detection Limit (µg/L)
Furr 16-22B	Separator	39.41669	-107.9751	SE SE	22	7S	95W	6th	16-22B	12/17/2008	12:54	GEL	U	5.88 ± 16.8	30.4	U	15.9 ± 27.6	46.8	U	-98.4 ± 152	271	U	0.817 ± 0.781	1.27	U	8.00 ± 17.5	29.7		0.548 ± 0.116	0.267
										4/14/2009	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
										6/24/2009	11:55	GEL		21.8 ± 13.3	20.2		31.9 ± 11.6	18.1	U	125 ± 136	229	U	-0.98 ± 0.861	1.93	U	-8.79 ± 13.0	22.8	U	-0.0389 ± 0.0302	0.0766
										10/1/2009	11:30	GEL		26.0 ± 11.5	15.9	U	11.1 ± 10.9	18.3	U	37.1 ± 135	234	U	0.103 ± 0.785	1.44	U	4.47 ± 27.2	46.8	U	0.0175 ± 0.0161	0.928
										12/16/2009	13:00	GEL	U	-1.05 ± 12.9	23.4		20.1 ± 11.2	18.2	U	75.7 ± 244	416	U	-0.136 ± 0.947	1.85	U	8.67 ± 18.2	31.1	U	0.0057 ± 0.000823	0.660
Furr 16-22D	Separator	39.41662	-107.9751	SE SE	22	7S	95W	6th	16-22D	12/17/2008	12:13	GEL	U	-40 ± 27.6	56.2	U	0.428 ± 30.6	52.5	U	195 ± 210	353	U	-0.727 ± 0.945	1.92	U	9.98 ± 17.6	29.8		0.394 ± 0.0727	0.267
										4/14/2009	11:00	GEL		33.0 ± 16.3	21.8		79.4 ± 23.0	34.8	U	47.7 ± 72.7	124	U	-0.567 ± 0.476	1.17	U	-7.01 ± 22.5	39.5	U	0.00 ± 0.00	0.289
										6/24/2009	11:40	GEL		27.1 ± 12.4	17.4		61.7 ± 16.3	25.2	U	70.4 ± 117	201	U	-0.586 ± 0.826	1.61	U	-9.54 ± 16.1	28.0	U	0.00 ± 0.00	0.0766
										10/1/2009	11:40	GEL	U	6.70 ± 9.46	16.3	U	7.27 ± 11.3	19.1	U	159 ± 107	173	U	0.826 ± 1.13	1.92	U	3.17 ± 27.3	47.0	U	0.00 ± 0.00	0.928
										12/16/2009	12:55	GEL	U	10.2 ± 10.1	16.7	U	9.84 ± 7.18	11.6	U	231 ± 209	349	U	1.09 ± 1.02	1.66	U	6.84 ± 18.4	31.5	U	0.111 ± 0.0104	0.660
22-9-16 (Furr 16-22D Duplicate)	Separator	39.4166	-107.975	SE SE	22	7S	95W	6th	22-9-16	6/24/2009	12:50	GEL		20.8 ± 11.4	17.1		35.5 ± 10.9	16.5	U	168 ± 126	207	U	-0.318 ± 0.594	1.32	U	3.11 ± 24.0	41.0	U	0.00 ± 0.00	0.0766
Field Blank	N/A	N/A	N/A							6/24/2009	12:05	GEL	U	-1.14 ± 1.63	4.26	U	-1.12 ± 2.54	4.97		258 ±158	256	U	-0.498 ± 0.784	1.54	U	-10.4 ± 12.6	22.1	U	0.00 ± 0.00	0.0766
										April 2009 GEL Reporting Limits:					5.00			5.00			100			2.00			50.0			1.00
										June 2009 GEL Reporting Limits:					5.00			5.00			100			2.00			50.0			1.00
										October 2009 GEL Reporting Limits:					5.00			5.00			100			2.00			50.0			1.00
										December 2009 GEL Reporting Limits:					5.00			5.00			100			2.00			50.0			1.00

Table presents 4th Quarter 2009 (12/16/09) laboratory analytical results (shaded) for the Furr 16-22B and 16-22D wells. Previous sample results are also presented for each well, and also for a Furr 16-22D duplicate sample and field blank sample collected during the 6/24/09 sampling event.
The Furr 16-22B well was shut-in and was not sampled during the April 14, 2009 sampling event.

Abbreviations:
pCi/L - picocuries per liter (activity in trillionths of a curie per liter)
µg/L - micrograms per liter (concentration in parts per billion)
GFPC - Gas Flow Proportional Counting
LSA - Liquid Scintillation Analysis
Qualifier
U - Result is less than the sample specific Minimum Detectable Concentration (MDC) or Minimum Detectable Activity (MDA), Method Detection Limit (MDL), Limits of Detection (LOD), total propogated uncertainty (TPU), or laboratory reporting limit (RL).
NS - Not Sampled (Furr 16-22B well was shut-in during the 4/14/09 sampling event and was not sampled)
N/A - Not Applicable

TABLE 5

GAMMA SPECTROSCOPY RESULTS FOR PRODUCED WATER SAMPLES
Furr 16-22B and Furr 16-22D Tier II Wells
Laramie Energy II - Rulison Field, Garfield County, Colorado

WELL NAME/No.	Sample Collection Point	Latitude/ Longitude	QTR/QTR	SEC	TWP	RNG	P.M.	SAMPLE ID	DATE SAMPLED	TIME SAMPLED	Gamma Emitting Radionuclides	Ac-228 Result (pCi/L)	Am-241 Result (pCi/L)	Sb-124 Result (pCi/L)	Sb-125 Result (pCi/L)	Ba-133 Result (pCi/L)	Ba-140 Result (pCi/L)	Be-7 Result (pCi/L)	Bi-212 Result (pCi/L)	Bi-214 Result (pCi/L)	Ce-139 Result (pCi/L)	Ce-141 Result (pCi/L)	Ce-144 Result (pCi/L)	Cs-134 Result (pCi/L)	Cs-136 Result (pCi/L)	Cs-137 Result (pCi/L)	Cr-51 Result (pCi/L)	Co-56 Result (pCi/L)	Co-57 Result (pCi/L)	Co-58 Result (pCi/L)	Co-60 Result (pCi/L)	Eu-152 Result (pCi/L)	Eu-154 Result (pCi/L)	Eu-155 Result (pCi/L)	Ir-192 Result (pCi/L)	Fe-59 Result (pCi/L)	Kr-85 Result (pCi/L)
Furr 16-22B	Separator	39.4167 -107.9751	SE SE	22	7S	95W	6th	16-22B	12/17/2008	12:54	Qualifier	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	3.91	0.459	1.22	-1.04	-0.923	16.6	-4.13	-3.67	4.67	0.590	-0.838	-6.11	1.19	11.4	0.177	6.72	-0.858	0.0899	-3.17	0.181	-5.17	-0.406	-7.3	-0.128	-2.27	-1760
											Uncertainty (±)	15.7	11.6	4.83	5.60	3.29	25.1	20.1	15.9	5.23	2.03	4.96	14.1	2.41	9.13	2.18	31.3	2.24	1.78	2.47	2.39	5.88	5.55	7.85	2.49	4.80	638
											MDC	15.6	17.3	8.58	9.02	4.63	44.1	34.0	25.9	8.60	3.55	8.54	22.2	4.20	17.6	3.41	52.8	3.52	2.90	3.47	3.54	9.11	9.20	11.3	4.13	7.62	928
									4/14/2009	NS	Qualifier	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
											Result																											
											Uncertainty (±)																											
											MDC																											
									6/24/2009	11:55	Qualifier	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	11.6	-3.81	-0.143	3.25	-7.26	-19.4	-14.5	18.6	8.74	-2.29	1.36	-7.7	3.36	0.283	-0.784	-1.22	0.205	1.31	-1.14	-1.26	2.57	-0.359	-2.93	0.868	-1.35	-911
											Uncertainty (±)	14.6	16.1	4.82	6.38	3.46	13.0	20.0	19.0	8.05	2.40	4.54	16.7	2.62	3.86	2.31	22.8	2.15	2.17	2.01	2.30	6.37	5.55	9.14	2.31	4.48	737
											MDC	19.8	27.2	8.14	11.2	4.99	15.9	31.7	34.2	10.9	3.81	7.43	27.3	5.04	6.58	3.69	39.0	3.72	3.73	3.22	3.47	11.2	9.15	15.2	4.05	7.24	1160
									10/1/2009	11:30	Qualifier	UI	U	U	U	U	U	U	U		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	0.00	7.60	1.67	5.38	0.881	0.820	-0.107	7.16	19.5	-1.97	1.36	3.43	0.565	-0.589	0.433	-5.4	0.180	2.67	-0.88	1.32	-3.69	0.355	0.0159	0.730	1.38	706
											Uncertainty (±)	12.1	14.4	4.83	5.26	2.73	8.67	17.2	15.6	8.70	1.95	3.61	14.1	2.50	3.40	2.13	18.3	1.97	1.73	2.03	2.24	5.97	6.25	7.73	1.94	4.12	496
											MDC	17.2	23.2	8.57	9.33	4.36	14.3	28.4	27.2	6.38	3.09	6.10	23.8	4.26	5.73	3.67	30.6	3.30	3.07	3.27	3.98	9.75	10.6	13.1	3.36	7.24	797
									12/16/2009	13:00	Qualifier		U	U	U	U	U	U	U		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	12.4	3.01	-0.276	-1.17	0.825	2.26	-3.22	-0.0361	12.3	-0.159	-0.501	-2.45	1.16	0.966	-0.412	-5.03	-0.197	0.640	-0.0759	1.11	-0.0193	0.770	-0.174	-0.188	-0.358	-2250
											Uncertainty (±)	7.70	5.28	2.19	2.49	1.29	7.16	8.77	12.5	4.96	0.905	2.03	6.24	1.06	2.61	0.943	10.7	0.964	0.814	0.943	0.961	2.52	2.61	3.32	0.991	2.12	341
											MDC	5.02	7.91	3.67	4.17	2.01	12.2	14.6	12.9	2.97	1.52	3.42	10.5	1.91	4.49	1.52	16.9	1.64	1.42	1.62	1.71	4.37	4.42	5.72	1.59	3.52	370
Furr 16-22D	Separator	39.4166 -107.9751	SE SE	22	7S	95W	6th	16-22D	12/17/2008	12:13	Qualifier	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	6.57	10.3	0.498	-6.79	-5.81	-30.8	-26	-3.97	6.13	-1.31	-1.39	-2.9	2.66	-2.31	-1.74	-19.8	1.70	0.0278	1.50	1.43	0.715	-6.94	0.437	-1.18	-4.79	-2410
											Uncertainty (±)	10.1	22.4	5.76	5.66	2.79	26.3	24.1	20.4	6.34	2.20	6.31	16.2	2.31	11.2	1.90	32.4	2.33	1.92	2.25	1.97	5.84	6.17	8.57	2.44	7.67	690
											MDC	16.6	37.9	9.76	8.29	3.75	36.6	35.6	29.3	9.09	3.71	8.90	25.9	4.37	18.0	2.90	52.2	4.23	3.12	4.07	3.69	9.84	8.75	14.1	3.96	8.56	852
									4/14/2009	11:00	Qualifier	U	U	U	U	U	U	U	U	UI	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	3.93	-10.6	0.632	-1.06	0.308	3.77	13.1	3.89	0.00	-1.36	-0.631	17.5	-0.322	0.121	-0.996	-12.4	1.67	-0.601	-1.09	-0.177	-2.33	2.46	-9.25	-0.574	0.757	-1490
											Uncertainty (±)	9.67	10.2	4.64	5.56	2.84	10.5	16.5	18.5	7.94	1.87	3.96	16.0	2.39	3.24	2.14	18.0	1.88	1.75	2.02	2.26	5.99	5.39	7.58	1.87	3.70	638
											MDC	15.5	16.5	7.82	9.28	4.25	17.9	29.4	29.1	9.5	2.97	6.02	24.6	3.87	5.52	3.39	29.5	3.50	2.87	3.11	3.74	9.37	9.62	12.0	3.14	6.42	930
									6/24/2009	11:40	Qualifier	UI	U	U	U	U	U	U	U	UI	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	0.00	4.88	1.84	-1.85	2.04	2.77	7.48	23.9	0.00	0.623	0.679	3.99	-0.793	-2.91	0.326	-3.56	-0.387	1.67	-0.27	1.11	-2.98	-2.66	4.97	0.672	-3.15	-942
											Uncertainty (±)	13.4	18.6	5.43	5.60	2.80	11.1	17.5	17.0	8.10	2.02	3.85	14.2	2.85	4.31	2.05	21.4	1.99	1.81	1.91	2.17	6.66	5.60	8.54	2.03	3.95	660
											MDC	18.5	32.1	9.49	9.05	4.43	18.6	29.9	32.2	9.55	3.35	6.38	23.8	4.43	6.48	3.56	35.9	3.26	3.13	3.17	3.92	10	8.84	14.6	3.51	5.66	990
									10/1/2009	11:40	Qualifier	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	5.78	-2.63	-4.23	0.697	-3.35	3.20	9.60	0.631	12.7	-1.39	0.355	-3.83	1.54	0.946	0.496	20.3	-0.475	0.448	-0.729	-0.576	-2.71	-1.89	-1.78	-2.63	-1.02	-2770
											Uncertainty (±)	10.4	14.3	4.09	4.95	2.73	7.31	14.8	14.1	8.27	1.75	3.13	12.1	2.21	3.16	2.52	16.4	1.78	1.58	1.83	1.85	5.32	5.66	6.77	1.69	3.67	605
											MDC	16.5	24.5	5.50	8.41	3.56	12.5	26	24.2	6.09	2.77	5.25	19.8	4.00	5.44	4.18	29.9	2.92	2.69	2.98	3.02	8.77	9.28	11.3	2.59	5.86	686
									12/16/2009	12:55	Qualifier		UI	U	U	U	U	U	U		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	9.89	0.00	-1.5	1.40	-0.392	2.50	-1.82	5.71	6.91	-1.0	0.897	5.64	0.524	0.615	-0.03	-0.759	-0.133	0.241	-0.75	-0.00422	4.04	-0.384	-0.506	0.412	0.00723	-2180
											Uncertainty (±)	6.47	5.35	2.66	2.65	1.41	7.65	9.20	7.62	4.05	0.972	2.26	7.10	1.22	2.94	0.986	11.8	1.06	0.886	1.09	1.11	4.56	3.00	3.62	1.04	2.41	322
											MDC	5.54	8.31	4.17	4.56	2.07	12.9	15.4	13.0	3.31	1.57	3.51	11.6	2.06	5.05	1.63	20.1	1.81	1.49	1.73	1.85	4.90	4.99	6.05	1.80	4.08	395
22-9-16 (Furr 16-22D Duplicate)	Separator	39.4166 -107.9751	SE SE	22	7S	95W	6th	16-22D	6/24/2009	12:50	Qualifier	UI	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	UI
											Result	0.00	-7.85	-0.11	1.08	1.47	4.08	-10.9	12.5	9.42	-1.9	0.752	-7.86	1.40	3.40	-1.36	22.9	-0.561	-1.08	-1.94	0.580	0.102	-6.16	5.08	-2.51	2.09	0.00
											Uncertainty (±)	17.5	5.75	5.97	6.51	3.42	13.8	23.3	21.1	8.32	2.06	4.24	13.9	3.34	4.75	2.68	22.7	2.22	1.98	2.55	2.65	7.95	8.04	7.50	2.35	5.68	604
											MDC	16.0	8.49	10.1	11.2	5.29	23.6	37.8	36.9	12.4	3.26	6.28	22.6	5.94	8.72	4.19	41.1	3.67	2.97	3.99	4.55	11.8	11.9	13.0	3.76	9.96	1140
Field Blank	N/A	N/A N/A	N/A	N/A	N/A	N/A	N/A	N/A	Field Blank	6/24/2009	12:05	Qualifier	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	-8.32	3.60	0.111	-2.66	-0.91	3.20	-4.91	5.91	4.43	-0.423	-0.568	12.1	-0.56	-2.09	1.43	-8.03	-1.11	0.120	-1.26	0.371	-0.384	0.803	2.42	-1.23	3.90	-1010
											Uncertainty (±)	8.01	12.5	4.60	4.95	2.56	10.4	16.7	15.1	6.78	1.87	4.52	14.9	2.02	3.46	1.82	18.0	1.87	1.88	2.27	2.34	5.78	5.26	7.63	1.88	3.71	578
											MDC	11.9	19.1	7.84	8.02	4.26	17.7	27.4	25.8	7.83	3.07	6.59	24.8	3.36	5.38	3.26	30.0	2.98	3.17	3.02	3.97	9.85	8.95	13.1	3.10	7.00	871

Notes:
Table presents gamma spectroscopy analytical results for the Furr 16-22B and Furr 16-22D wells - current data (12/16/09) shaded in gray.
Samples were all analyzed by GEL Laboratories, LLC in Charleston, SC

Four Rows:

1) Qualifier	The laboratory data qualifers are designated by one or two letters to provide information about the reported results.
2) Result	Results are the level of activity reported for the individual produced water sample.
3) Uncertainty (±)	The margin of error, or range of activity, when added to the result.
4) MDC	The laboratory minimum detectable concentration (MDC) for the analytical method.
	If the result is less than the reporting limits the radionuclide is reported as 'not detected' (U).

The qualifiers used in the laboratory reports are listed below:
U - Result is less than the sample specific Minimum Detectable Concentration (MDC) or Minimum Detectable Activity (MDA),
Method Detection Limit (MDL), Limits of Detection (LOD), total propogated uncertainty (TPU), or laboratory reporting limit (RL).
UI - Gamma Spectroscopy Uncertain Identification
NS - Not Sampled (Furr 16-22B was shut-in on April 14, 2009 and was not sampled)
NA - Not Analyzed
N/A - Not Applicable

Values shown in blue represent a detection or an uncertain identification such as Americium-241 (^{241}Am), Lead-212 (^{212}Pb), and Lead-214 (^{214}Pb). The gamma emitting radionuclides that were detected are naturally occurring Actinium-228 (^{228}Ac), Bismuth-214 (^{214}Bi),Potassium-40 (^{40}K), and Radium-228 (^{228}Ra).

TABLE 5

GAMMA SPECTROSCOPY RESULTS FOR PRODUCED WATER SAMPLES
Furr 16-22B and Furr 16-22D Tier II Wells
Laramie Energy II - Rulison Field, Garfield County, Colorado

(Table Continued)

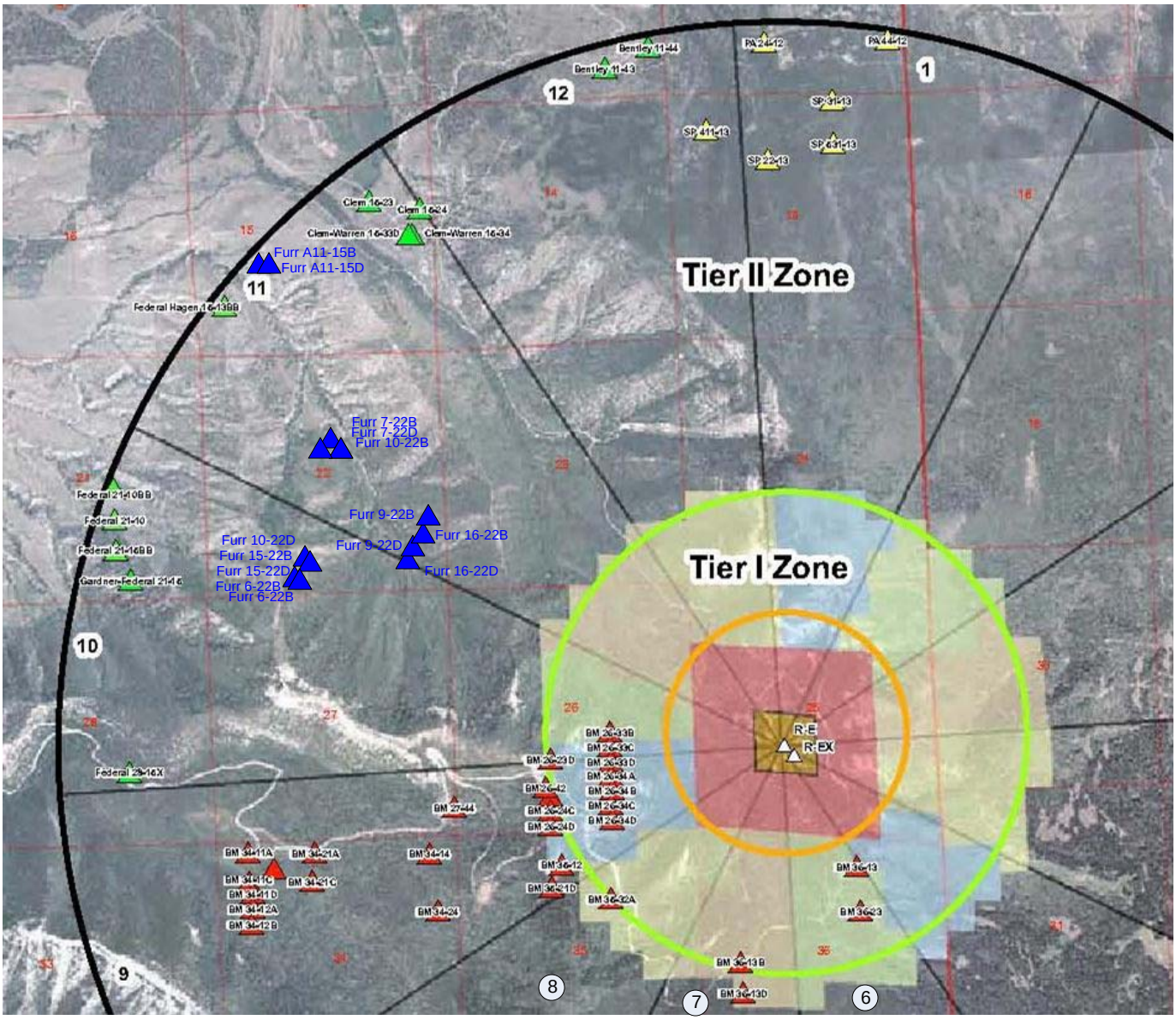
WELL NAME/No.	Sample Collection Point	Latitude/ Longitude	QTR/QTR	SEC	TWP	RNG	P.M.	SAMPLE ID	DATE SAMPLED	TIME SAMPLED	Gamma Emitting Radionuclides	Pb-210 Result (pCi/L)	Pb-212 Result (pCi/L)	Pb-214 Result (pCi/L)	Mn-54 Result (pCi/L)	Hg-203 Result (pCi/L)	Nd-147 Result (pCi/L)	Np-239 Result (pCi/L)	Nb-94 Result (pCi/L)	Nb-95 Result (pCi/L)	K-40 Result (pCi/L)	Pm-144 Result (pCi/L)	Pm-146 Result (pCi/L)	Ra-228 Result (pCi/L)	Ru-106 Result (pCi/L)	Ag-110m Result (pCi/L)	Na-22 Result (pCi/L)	Tl-208 Result (pCi/L)	Th-230 Result (pCi/L)	Th-234 Result (pCi/L)	Sn-113 Result (pCi/L)	U-235 Result (pCi/L)	U-238 Result (pCi/L)	Y-88 Result (pCi/L)	Zn-65 Result (pCi/L)	Zr-95 Result (pCi/L)
Furr 16-22B	Separator	39.4167 -107.97507	SE SE	22	7S	95W	6th	16-22B	12/17/2008	12:54	Qualifier	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	31.4	-3.14	3.30	0.333	2.44	-16.7	3.69	0.251	-1.36	27.2	-0.00461	0.616	3.91	13.6	-1.81	-0.146	-0.272	802	134	-0.35	-19.5	134	-0.221	-0.378	1.72
											Uncertainty (±)	347	4.74	6.03	1.84	2.87	58.5	12.9	1.97	3.27	34.0	2.04	2.29	15.7	17.4	1.83	2.00	2.57	5220	128	2.97	16.4	128	2.39	4.28	4.19
											MDC	517	6.62	8.61	3.10	5.04	97.2	21.3	3.33	5.21	27.3	3.42	4.02	15.6	31.4	2.75	3.31	3.92	1300	140	4.84	23.2	140	3.97	7.16	7.26
									4/14/2009	NS	Qualifier	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
											Result																									
											Uncertainty (±)																									
											MDC																									
									6/24/2009	11:55	Qualifier	U	U	U	U	U	U	U	U	U	95.1	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	-65.5	2.59	9.75	1.64	-0.51	4.09	-15.1	1.99	0.896		-1.01	-0.297	11.6	2.67	0.102	-0.128	2.41	-268	-77	-3.23	21.8	-77	-2.46	-5.41	1.65
											Uncertainty (±)	522	5.83	6.13	2.15	2.55	24.1	17.2	2.05	2.55	26.1	2.28	2.95	14.6	20.1	2.15	1.98	3.01	2030	149	2.72	18.7	149	2.80	5.73	4.08
											MDC	799	8.40	10.2	3.95	4.35	41.0	27.8	3.72	4.34	41.7	3.60	4.95	19.8	33.8	3.58	3.26	4.34	1890	231	4.19	28.8	231	4.02	8.22	7.01
									10/1/2009	11:30	Qualifier	U	U	UI	U	U	U	U	U	U	UI	U	U	UI	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	-146	2.04	0.00	-1.93	-0.682	4.96	5.50	0.473	0.997	0.00	-0.564	-1.13	0.00	8.42	-0.728	0.126	2.39	54.1	138	-1.04	-3.37	138	0.699	-2.95	-0.199
											Uncertainty (±)	524	5.33	6.03	2.05	2.07	17.6	13.5	1.71	2.16	47.8	1.83	2.58	12.1	18.2	1.92	2.23	3.76	942	178	2.42	18.5	178	2.12	4.23	3.42
											MDC	722	6.66	9.37	3.13	3.49	29.4	23.2	2.96	3.75	29.6	3.02	4.14	17.2	32.1	3.17	3.77	3.33	1520	178	3.94	25.9	178	3.75	6.71	5.72
									12/16/2009	13:00	Qualifier	U	UI	UI	U	U	U	U	U	U	48.5	U	U	12.4	U	U	U	U	UI	U	U	U	U	U	U	U	U
											Result	-172	0.00	0.00	0.443	-0.224	11.2	1.87	0.193	0.981		-0.677	0.207		2.60	0.270	0.303	0.0956	0.00	27.3	-0.0612	-8.49	27.3	0.188	1.48	0.127
											Uncertainty (±)	211	3.18	4.51	0.897	1.18	16.3	5.83	0.866	1.73	19.8	0.884	1.12	7.70	8.36	0.855	0.936	1.76	5940	78.1	1.21	10.9	78.1	1.11	2.25	1.82
											MDC	210	3.5	4.64	1.58	1.91	28.1	10.1	1.44	2.08	16.6	1.39	1.92	5.02	14.1	1.44	1.59	1.91	574	63.5	2.08	11.6	63.5	1.89	3.45	2.99
Furr 16-22D	Separator	39.4166 -107.97512	SE SE	22	7S	95W	6th	16-22D	12/17/2008	12:13	Qualifier	U	U	U	U	U	U	U	U	U	82.8	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	-315	0.140	7.30	0.566	-0.0842	63.1	10.1	-2.03	3.15		-1.15	-0.113	6.57	-6.7	-0.317	-2.18	-0.229	320	115	-0.121	10.6	115	0.554	-4.33	-0.501
											Uncertainty (±)	648	5.38	5.73	2.14	2.90	59.3	15.1	2.06	3.29	39.1	2.59	2.46	10.1	19.6	1.82	2.18	2.73	2430	182	3.01	20.6	182	2.54	5.20	4.21
											MDC	1070	7.16	9.15	3.69	4.89	111	25.4	3.16	6.06	32.2	3.66	4.03	16.6	32.5	3.04	3.16	4.30	2230	293	4.98	23.5	293	4.38	7.61	7.01
									4/14/2009	11:00	Qualifier	U	U	UI	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	-190	0.756	0.00	1.22	1.25	10.4	10.2	0.598	-1.38	27.8	0.421	-0.895	3.93	-21.9	2.41	0.825	0.916	910	-2.78	-0.26	1.04	-2.78	0.687	-6.48	0.509
											Uncertainty (±)	240	4.68	7.21	2.00	2.13	20.0	12.8	1.92	2.84	47.5	2.04	2.45	9.67	21.7	1.99	1.91	2.61	5900	110	2.50	17.0	110	2.17	5.04	3.95
											MDC	357	7.16	9.00	3.62	3.78	34.8	22.2	3.27	3.64	32.3	3.44	4.01	15.5	31.0	3.65	3.41	4.26	1170	158	4.22	23.8	158	3.88	7.36	6.59
									6/24/2009	11:40	Qualifier	U	U	UI	U	U	U	U	U	U	U	U	U	UI	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	415	0.247	0.00	-0.416	-1.31	-2.3	1.70	-0.993	-0.866	33.1	1.40	-0.968	0.00	1.56	-0.974	-1.45	3.03	504	-69.2	0.553	-2.75	-69.2	-0.959	-3.13	-4.78
											Uncertainty (±)	718	5.19	6.52	2.05	2.07	21.6	13.8	1.99	2.15	42.0	1.95	2.71	13.4	16.6	1.92	2.05	4.48	3400	173	2.72	19.0	173	2.20	4.53	4.59
											MDC	1270	6.93	9.41	3.37	3.38	35.0	23.0	3.23	3.48	39.0	3.52	4.36	18.5	28.7	3.11	3.12	4.78	1970	267	4.61	25.9	267	3.31	6.72	6.11
									10/1/2009	11:40	Qualifier	U	UI	UI	U	U	U	U	U	U	61.6	U	U	U	U	U	U	U	UI	U	U	U	U	U	U	U	U
											Result	171	0.00	0.00	-0.429	0.815	-4.86	7.85	-0.797	1.53		-0.54	-1.86	5.78	-7.82	-2.73	-0.756	1.69	0.00	-42.3	-1.02	0.285	-42.3	-0.0891	0.989	0.475
											Uncertainty (±)	531	4.66	7.03	1.65	2.18	14.8	12.6	1.57	1.86	31.7	1.72	2.34	10.4	15.0	1.88	2.03	2.97	12500	154	2.12	12.7	154	1.87	4.14	3.13
											MDC	942	7.07	9.57	2.72	3.42	23.7	21.9	2.56	3.41	29.6	2.87	3.64	16.5	23.0	2.84	3.33	3.84	1510	209	3.44	21.1	209	3.07	6.18	5.41
									12/16/2009	12:55	Qualifier	U	U	UI	U	U	U	U	U	U	42.4	U	U	9.89	U	U	U	U	UI	U	U	U	U	U	U	U	U
											Result	-168	-1.82	0.00	0.113	0.693	3.06	0.496	-0.262	0.773		-0.288	0.658		-0.217	-0.0655	-0.187	-0.814	0.00	44.5	-0.597	2.58	44.5	-0.323	1.65	-0.542
											Uncertainty (±)	144	3.52	4.45	0.975	1.21	17.0	6.56	0.982	1.29	24.8	0.982	1.22	6.47	8.75	0.937	1.07	1.73	6090	71.2	1.30	7.69	71.2	1.16	2.29	1.95
											MDC	179	3.45	4.36	1.68	2.11	28.8	11.0	1.16	2.18	16.7	1.60	2.10	5.54	14.6	1.55	1.78	1.82	576	67.6	2.17	11.3	67.6	1.93	3.53	3.17
22-9-16	Separator	39.4166 -107.97512	SE SE	22	7S	95W	6th	16-22D	6/24/2009	12:50	Qualifier	U	U	UI	U	U	U	U	U	U	62.6	U	U	UI	U	U	U	U	U	U	U	U	U	U	U	U
											Result	-0.942	5.17	0.00	0.182	-1.71	-19.8	-0.0838	0.0467	3.94		-0.737	-1.41	0.00	1.13	0.131	-2.2	1.37	-828	-17.7	-1.27	-21.5	-17.7	0.0911	-5.15	5.90
											Uncertainty (±)	57.6	6.75	7.63	2.48	2.81	27.3	13.4	2.41	2.78	44.7	2.47	3.07	17.5	20.4	2.45	2.86	4.60	5300	57.2	2.96	19.1	57.2	3.03	6.71	4.85
											MDC	94.2	9.10	11.2	4.27	4.33	42.5	22.6	3.99	5.25	34.4	3.96	4.98	16.0	34.1	4.09	4.24	3.75	837	96.1	4.87	24.0	96.1	5.16	9.02	8.95
Field Blank	N/A	N/A N/A	N/A	N/A	N/A	N/A	N/A	Field Blank	6/24/2009	12:05	Qualifier	U	U	U	U	U	U	U	U	U	UI	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
											Result	-309	0.613	-0.377	-0.0957	-1.74	-23.8	6.22	-0.303	2.83	0.00	-0.444	-0.0827	-8.32	1.73	-0.887	0.212	1.56	0.00	15.5	-0.823	-0.877	15.5	-0.723	-0.977	3.86
											Uncertainty (±)	329	4.61	4.57	1.81	2.71	20.1	14.5	1.73	2.26	27.1	1.98	2.37	8.01	16.1	1.74	1.87	3.47	10600	128	2.37	18.5	128	2.14	3.71	3.51
											MDC	492	7.21	7.46	3.07	3.68	29.5	24.9	2.80	4.13	29.0	3.20	3.99	11.9	27.0	2.73	3.16	4.00	1350	152	3.92	26.0	152	3.41	6.02	6.38

Notes:
Samples were all analyzed by GEL Laboratories, LLC in Charleston, SC

Four Rows:
1) Qualifier The laboratory data qualifers are designated by one or two letters to provide information about the reported results.
2) Result Results are the level of activity reported for the individual produced water sample.
3) Uncertainty (The margin of error, or range of activity, when added to the result.
4) MDC The laboratory minimum detectable concentration (MDC) for the analytical method.
If the result is less than the reporting limits the radionuclide is reported as 'not detected' (U).

The qualifiers used in the laboratory reports are listed below:
U - Result is less than the sample specific Minimum Detectable Concentration (MDC) or Minimum Detectable Activity (MDA),
Method Detection Limit (MDL), Limits of Detection (LOD), total propogated uncertainty (TPU), or laboratory reporting limit (RL).
UI - Gamma Spectroscopy Uncertain Identification
NS - Not Sampled (Furr 16-22B was shut-in on April 14, 2009 and was not sampled)
NA - Not Analyzed
N/A - Not Applicable

Values shown in blue represent a detection or an uncertain identification such as Americium-241 (^{241}Am), Lead-212 (^{212}Pb), and Lead-214 (^{214}Pb). The gamma emitting radionuclides that were detected are naturally occurring Actinium-228 (^{228}Ac), Bismuth-214 (^{214}Bi),Potassium-40 (^{40}K), and Radium-228 (^{228}Ra).



Furr 16-22B & Furr 16-22D Quarterly Sampling – Garfield County Colorado

Legend:

- Existing Laramie II Well
- Existing EnCana Well
- Existing Williams Well
- Existing Noble Well
- Project Rulison Well
- Project Rulison Lot 11
- 3 Mile Radius Tier II Zone Wells
- 1 Mile Radius – Tier I Zone Wells
- ½ Mile Radius
- 25 — Section, Township, Range
- (7) — Monitoring Sectors (1 through 12)

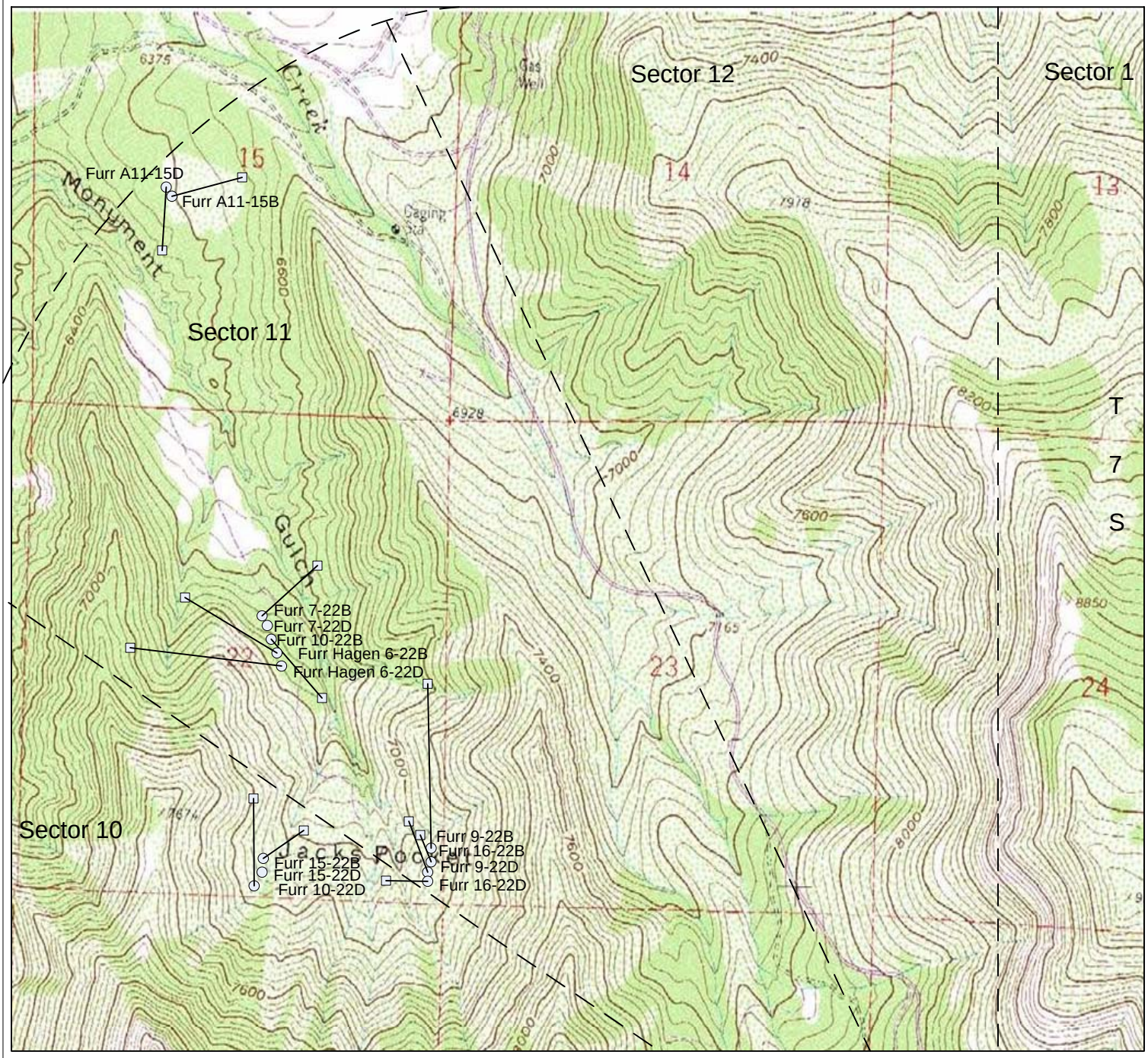
N

0 0.5 1 Miles

Base Map Adapted from URS 3rd Quarter Report 2008 (November 2008)

PROJECT NO: 008-2362	Laramie Energy II Gas Well Locations Project Rulison Area	OLSSON ASSOCIATES	4690 Table Mountain Dr. #200 Golden, CO 80403 TEL 303.237.2072 FAX 303.237-2659	FIGURE
DRAWN BY: JWH				1
DATE: 06/30/2010				

R 95 W



Legend:

Vertical Gas Well Location
Furr 7-22D

Directional Gas Well Location
Furr 16-22B

(square denotes approximate bottom hole location)

URS Rulison SAP Sector Line

Rulison 3-Mile Radius

N

Approximate Scale

0 0.5 1

Miles

Furr 16-22B & Furr 16-22D Quarterly Sampling – Garfield County Colorado

PROJECT NO: 008-2362	Laramie Energy II Rulison Area Gas Wells	OLSSON ASSOCIATES	4690 Table Mountain Dr. #200 Golden, CO 80403 TEL 303.237.2072 FAX 303.237.2659	FIGURE
DRAWN BY: JWH				2
DATE: 06/30/2010				

APPENDIX A

ISOTECH LABORATORIES INC.

SAMPLE RESULTS

ISOTECH
ISOTECH LABORATORIES INC

ANALYSIS REPORT

Lab #:	176954	Job #:	12367
Sample Name/Number:	16-22D		
Company:	Cordilleran, Div. of Olsson Assoc.		
Date Sampled:	12/16/2009	Cylinder: 62	
Container:	Steel tank		
Field/Site Name:	Laramie II- Rulison Area well Mtrg		
Location:	Furrhagen		
Formation/Depth:			
Sampling Point:			
Date Received:	12/21/2009	Date Reported:	1/29/2010

Component	Chemical mol. %	Delta C-13 per mil	Delta D per mil	C-14 conc. pMC	Tritium TU
Carbon Monoxide	nd				
Hydrogen Sulfide	nd				
Helium	0.0031				
Hydrogen	0.0029				
Argon	nd				
Oxygen	0.034				
Nitrogen	0.16				
Carbon Dioxide	3.58				
Methane	88.54			< 0.4	< 10.0
Ethane	5.31				
Ethylene	nd				
Propane	1.45				
Iso-butane	0.312				
N-butane	0.257				
Iso-pentane	0.110				
N-pentane	0.0774				
Hexanes +	0.164				

Total BTU/cu.ft. dry @ 60deg F & 14.7psia, calculated: 1063
Specific gravity, calculated: 0.645

nd = not detected. na = not analyzed. Isotopic composition of carbon is relative to VPDB. Isotopic composition of hydrogen is relative to VSMOW. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. % Chemical analysis based on standards accurate to within 2%

ISOTECH
ISOTECH LABORATORIES INC

ANALYSIS REPORT

Lab #:	176955	Job #:	12367
Sample Name/Number:	16-22B		
Company:	Cordilleran, Div. of Olsson Assoc.		
Date Sampled:	12/16/2009	Cylinder: 32	
Container:	Steel tank		
Field/Site Name:	Laramie II Area Well Mtrg		
Location:	Furr Hagen		
Formation/Depth:			
Sampling Point:			
Date Received:	12/21/2009	Date Reported:	1/29/2010

Component	Chemical mol. %	Delta C-13 per mil	Delta D per mil	C-14 conc. pMC	Tritium TU
Carbon Monoxide	nd				
Hydrogen Sulfide	nd				
Helium	0.0029				
Hydrogen	0.0027				
Argon	nd				
Oxygen	0.027				
Nitrogen	0.14				
Carbon Dioxide	3.60				
Methane	89.25			< 0.5	< 10.0
Ethane	4.97				
Ethylene	nd				
Propane	1.19				
Iso-butane	0.253				
N-butane	0.190				
Iso-pentane	0.102				
N-pentane	0.0773				
Hexanes +	0.192				

Total BTU/cu.ft. dry @ 60deg F & 14.7psia, calculated: 1055
Specific gravity, calculated: 0.640

nd = not detected. na = not analyzed. Isotopic composition of carbon is relative to VPDB. Isotopic composition of hydrogen is relative to VSMOW. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. % Chemical analysis based on standards accurate to within 2%

ISOTECH

Analysis Requested by

Name JAMES HIX

Company OLSSON ASSOCIATES

Address 4690 TABLE MOUNTAIN DRIVE

STE 200, GOLDEN, CO 80403

303.287.2072(p) 303.238.2659(f)

jhix@oaconsulting.com

Project 008-2362_100_100001 LARAMIE II - ROLLISON AREA WELL MONITORING

Location FURR HAGEN

Sampled by T. DOBRANSKY

Sample Description

Cylinder Number	Source or Description of Sample	Date Sampled	Analyses & Services Requested: NG-1 Analysis	NG-2 Analysis	NG-3 Analysis	BG-1 Analysis	BG-2 Analysis	BG-3 Analysis	SIW analysis	RAG Analysis	TAG Analysis	CARBON-14+Tritium	Comments
62 A	16-22D	12/16/09										X	
32 A	16-_2B	12/16/09										X	

Chain of Custody Record

	Signature	Company	Date	Time
Relinquished by		OLSSON ASSOCIATES	12/16/09	1500
Received by		ISOTECH LABS	12/21/09	845 am
Relinquished by				
Received by				
Relinquished by				
Received by				

ISOTECH
ISOTECH LABORATORIES INC

ANALYSIS REPORT

Water Analysis

Lab Number:	177010	Job Number:	12373
Submitter Sample Name:	16-22D		
Submitter Sample ID:			
Submitter Job #:	0082362-100-100		
Company:	Cordilleran, Div. of Olsson Assoc.		
Field or Site:	Laramie II - Rulison Area Monitorin		
Location:	Furr Hagen		
Depth/Formation:			
Container Type:	1 Liter Plastic Bottle		
Sample Collected:	12/15/2009	Results Reported:	1/12/2010

Delta D of water	na
Delta O-18 of water	na
Tritium content of water	< 10.0 TU
Delta C-13 of DIC	na
Carbon-14 content of DIC	na
Delta N-15 of nitrate	na
Delta O-18 of nitrate	na
Delta S-34 of sulfate	na
Delta O-18 of sulfate	na

Remarks:

ISOTECH®
ISOTECH LABORATORIES INC

ANALYSIS REPORT

Water Analysis

Lab Number: 177011 Job Number: 12373

Submitter Sample Name: 16-22B

Submitter Sample ID:

Submitter Job #: 0082362-100-100

Company: Cordilleran, Div. of Olsson Assoc.

Field or Site: Laramie II - Rulison Area Monitorin

Location: Furr Hagen

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 12/16/2009 Results Reported: 1/12/2010

Delta D of water	na
Delta O-18 of water	na
Tritium content of water	< 10.0 TU
Delta C-13 of DIC	na
Carbon-14 content of DIC	na
Delta N-15 of nitrate	na
Delta O-18 of nitrate	na
Delta S-34 of sulfate	na
Delta O-18 of sulfate	na

Remarks:

Analysis Requested by

Name JAMES HIX

Company OLSSON ASSOCIATES

Address 4690 TABLE MOUNTAIN DRIVE

STE 200, GOLDEN, CO 80403

303.287.2072(p) 303.237.2659(f)

jhix@oaconsulting.com

Project 008-2362_100_100001 LARAMIE II - HULISON AREA WELL MONITORING

Location FURR HAGEN

Sampled by T. DOBRANSKY

ISOTECH

Sample Description

Cylinder Number	Source or Description of Sample	Date Sampled	NG-1 Analysis	NG-2 Analysis	NG-3 Analysis	BG-1 Analysis	BG-2 Analysis	BG-3 Analysis	SIW analysis	RAG Analysis	TAG Analysis	CARBON-14 + Tritium	Comments
62 A	16-22D	12/16/09										X	Rec'd
32 A	16-22B	12/16/09										X	2 - 1 Liter P.B's
													↵
													2 - diss. gas btls.

Confirmed by Phone
TDC only - RPB's sent by mistake - will dispose After tritium is Complete. Shr.

Chain of Custody Record

	Signature	Company	Date	Time
Relinquished by		OLSSON ASSOCIATES	12/16/09	1500
Received by		ISOTECH LABS	12/21/09	1000
Relinquished by				
Received by				
Relinquished by				
Received by				

APPENDIX B

GEL LABORATORIES LLC

SAMPLE RESULTS

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171 F 843.766.1178

www.gel.com

January 15, 2010

Mr. James Hix
Olsson Associates
4690 Table Mountain Drive
Suite 200
Golden, Colorado 80403

Re: Olsson Associates - Rulison
Work Order: 243333

Dear Mr. Hix:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on December 19, 2009. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4297.

Sincerely,

Amanda Rasco
Project Manager

Purchase Order: Signed Quote
Enclosures

Page: 1 of 1
Project #: 008-2362-100-100001
GEL Quote #:
COC Number (1):
PO Number:

GEL Chain of Custody and Analytical Request

GEL Work Order Number: 243333

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: OLSSON ASSOCIATES - JAMES HIX Phone #: 303.237.2072
Project/Site Name: LARAMIE II RULISON AREA WELL MONITORING Fax #: 303.237.2659
Address: 4690 TABLE MOUNTAIN DR., STE 200, GOLDEN, CO 80403
Collected by: T. DOBRANSKY Send Results To: jhix@oaconsulting.com

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID (* For composites - indicate start and stop date/time)	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Should this sample be considered: Radioactive	Should this sample be considered: TSCA Regulated	Total number of containers	GAB, GAMMA Sr-90 T-99, Total U	Cl 36	<-- Preservative Type (6)
16-22D	12/16/09	1255	N	N	W			3	X	X	
16-22B	12/16/09	1300	N	N	W			3	X	X	

Comments
Note: extra sample is required for sample specific QC

TAT Requested: Normal: X Rush: ____ Specify: ____ (Subject to Surcharge) Fax Results: (Yes) / No

Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Sample Collection Time Zone
Eastern Pacific
Central Other ____
(Mountain)

Chain of Custody Signatures

	Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1		12/16/09	1500		12/19/09	0905
2						
3						

Sample Shipping and Delivery Details

GEL PM:
Method of Shipment: Date Shipped:
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: **N** = Normal Sample, **TB** = Trip Blank, **FD** = Field Duplicate, **EB** = Equipment Blank, **MS** = Matrix Spike Sample, **MSD** = Matrix Spike Duplicate Sample, **G** = Grab, **C** = Composite
3.) Field Filtered: For liquid matrices, indicate with a - **Y** - for yes the sample was field filtered or - **N** - for sample was not field filtered.
4.) Matrix Codes: **DW**=Drinking Water, **GW**=Groundwater, **SW**=Surface Water, **WW**=Waste Water, **W**=Water, **SO**=Soil, **SD**=Sediment, **SL**=Sludge, **SS**=Solid Waste, **O**=Oil, **F**=Filter, **P**=Wipe, **U**=Urine, **F**=Fecal, **N**=Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. **8260B, 6010B/7470A**) and number of containers provided for each (i.e. *8260B* - **3**, *6010B/7470A* - **1**).
6.) Preservative Type: **HA** = Hydrochloric Acid, **NI** = Nitric Acid, **SH** = Sodium Hydroxide, **SA** = Sulfuric Acid, **AA** = Ascorbic Acid, **HX** = Hexane, **ST** = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? (YES) NO
Cooler Temp: 0 °C

WHITE = LABORATORY **YELLOW = FILE** **PINK = CLIENT**

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: CORD	SDG/ARCOC/Work Order: 243333
Received By: SL	Date Received: 12/19/09

Suspected Hazard Information	Yes	No	*If Counts > x2 area background on samples not marked "radioactive", contact the Radiation Safety Group of further investigation.
COC/Samples marked as radioactive?		✓	Maximum Counts Observed*: 40cpm
Classified Radioactive II or III by RSO?		✓	
COC/Samples marked containing PCBs?		✓	
Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#:
Samples identified as Foreign Soil?		✓	

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: seals broken / damaged container / leaking container / other (describe)
2	Samples requiring cold preservation within 0 ≤ 6 deg. C?	✓			Preservation Method: (ice bags) / blue ice / dry ice / none / other (describe) 6°C
3	Chain of custody documents included with shipment?	✓			
4	Sample containers intact and sealed?	✓			Circle Applicable: seals broken / damaged container / leaking container / other (describe)
5	Samples requiring chemical preservation at proper pH?			✓	Sample ID's, containers affected and observed pH: 16-22D all containers are ~pH 7. 16-22B - small If Preservation added, Lot#:
6	VOA vials free of headspace (defined as < 6mm bubble)?		✓		Sample ID's and containers affected: 1 L container is ~pH 7.
7	Are Encore containers present?			✓	(If yes, immediately deliver to Volatiles laboratory)
8	Samples received within holding time?	✓			Id's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Sample ID's affected:
11	Number of containers received match number indicated on COC?	✓			Sample ID's affected:
12	COC form is properly signed in relinquished/received sections?	✓			

Comments: FedEx 966004514081

Samples are bi-layered. 16-22B have a 1-2 inch layer of liquid floating on a more opaque liquid. 16-22D has a tiny layer of solid (gray) floating on top of sample.

PM (or PMA) review: Initials AJL Date 12/21/09

Subject: RE: Samples received 12/19/09
From: "James Hix" <jhix@oaconsulting.com>
Date: Mon, 21 Dec 2009 14:26:34 -0600
To: "Amanda Rasco" <amanda.rasco@gel.com>

Amanda,
Please go ahead and add preservative to bring the samples to the proper pH. I attended the COGCC-URS RSAP technical group meeting last week and it was mentioned that we may need to change how we (Olsson) and URS are collecting and preserving our samples by having the laboratory or field personnel add more acid to account for the buffering affect of the produced water.
James

James W. Hix, PG| Olsson Associates
4690 Table Moutain Drive, Suite 200 | Golden, CO 80403 | jhix@oaconsulting.com
TEL 303.237.2072 | CELL 303.589.1572 | FAX 303.237.2659

OLSSON ASSOCIATES

From: Amanda Rasco [mailto:amanda.rasco@gel.com]
Sent: Monday, December 21, 2009 12:59 PM
To: James Hix
Subject: Re: Samples received 12/19/09

James,
Would you like the aqeous portion of the samples preserved prior to analysis, or would you like them analyzed at the pH received? They were received with a pH=7. Let me know if you havea any questions.

Thanks,
Amanda

James Hix wrote:

> Amanda,
>
> Thanks for letting me know that the samples arrived. Please skim off
> and discard the condensate or paraffin layers and analyze the aqueous
> portion of the samples.
>
> James
>
>
>
> James W. Hix, PG|* *Olsson Associates* *
>
> 4690 Table Moutain Drive, Suite 200 | Golden, CO 80403 |
> jhix@oaconsulting.com <mailto:jameshix@cordcomp.com>
>
> TEL 303.237.2072 | CELL 303.589.1572 | FAX 303.237.2659
>
>
>

> OA Email Logo
>
>
>
> *From:* Amanda Rasco [mailto:amanda.rasco@gel.com]
> *Sent:* Monday, December 21, 2009 7:00 AM
> *To:* James Hix
> *Subject:* Samples received 12/19/09
>
>
>
> James,
> We received 2 liquid samples on Saturday. Both samples are
> bi-phasic. Sample 16-22B has a 1-2 inch layer of liquid on top of a
> semi-opaque liquid. Sample 16-22D has a layer of solid on top of the
> sample. Please let me know how you'd like us to proceed with the
> analysis of these samples.
>
> Thanks,
> Amanda
>
> --
> ~~~~~~
>
> Amanda J. Rasco
> Project Manager
> GEL Laboratories, LLC
> 2040 Savage Road
> Charleston, SC (USA) 29407
> Direct: 843.769.7373
> Main: 843.556.8171 x4297
> Fax: 843.766.1178
> E-mail: Amanda.Rasco@gel.com
> Web: www.gel.com
>
>
>
>
> CONFIDENTIALITY NOTICE: This e-mail and any files transmitted with it
> are the property of The GEL Group, Inc. and its affiliates. All
> rights, including without limitation copyright, are reserved. The
> proprietary information contained in this e-mail message, and any
> files transmitted with it, is intended for the use of the recipient(s)
> named above. If the reader of this e-mail is not the intended
> recipient, you are hereby notified that you have received this e-mail
> in error and that any review, distribution or copying of this e-mail
> or any files transmitted with it is strictly prohibited. If you have
> received this e-mail in error, please notify the sender immediately
> and delete the original message and any files transmitted. The
> unauthorized use of this e-mail or any files transmitted with it is
> prohibited and disclaimed by The GEL Group, Inc. and its affiliates.
>

--
~~~~~~

Amanda J. Rasco
Project Manager
GEL Laboratories, LLC
~~~~~~

2040 Savage Road
Charleston, SC (USA) 29407
Direct: 843.769.7373
Main: 843.556.8171 x4297
Fax: 843.766.1178
E-mail: Amanda.Rasco@gel.com
Web: www.gel.com

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 – (843) 556–8171 – www.gel.com

Certificate of Analysis Report
for

CORD001 Olsson Associates

Client SDG: 243333 GEL Work Order: 243333

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria

** Analyte is a surrogate compound

U Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.

UI Gamma Spectroscopy––Uncertain identification

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the detection limit.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Amanda Rasco.

Reviewed by Amanda J Rasco

DATA EXCEPTION REPORT

Mo.Day Yr.	**Division:**	**Quality Criteria:**	**Type:**
15–JAN–10	Radiochemistry	Specifications	Process
Instrument Type:	**Test / Method:**	**Matrix Type:**	**Client Code:**
GFPC	GL–RAD–A–033	Liquid	CORD, URSC
Batch ID:	**Sample Numbers:**		
941544	See Below		

Potentially affected work order(s)(SDG): 243333,243650

Application Issues:

RDL less than MDA

Specification and Requirements Exception Description:	**DER Disposition:**
1. Samples 243333001, 243333002, 243650001, and 1202015273 did not meet the required detection limit due to reduced sample aliquots. Sample aliquots were reduced due to the matrix of the samples. An appropriate aliquot was analyzed and counted for 500 minutes.	1. Reporting results.

Originator's Name:

Van Culpepper 15–JAN–10

Data Validator/Group Leader:

Nat Long 15–JAN–10

List of current GEL Certifications as of 15 January 2010

State	Certification
Arizona	AZ0668
Arkansas	88–0651
CLIA	42D0904046
California – NELAP	01151CA
Colorado	GEL
Connecticut	PH–0169
Dept. of Navy	NFESC 413
EPA Region 5	WG–15J
Florida – NELAP	E87156
Georgia	E87156 (FL/NELAP)
Georgia DW	967
Hawaii	N/A
ISO 17025	2567.01
Idaho	SC00012
Illinois – NELAP	200029
Indiana	C–SC–01
Kansas – NELAP	E–10332
Kentucky	90129
Louisiana – NELAP	03046
Maryland	270
Massachusetts	M–SC012
Nevada	SC00012
New Jersey – NELAP	SC002
New Mexico	FL NELAP E87156
New York – NELAP	11501
North Carolina	233
North Carolina DW	45709
Oklahoma	9904
Pennsylvania – NELAP	68–00485
South Carolina	10120001/10120002
Tennessee	TN 02934
Texas – NELAP	T104704235–07B–TX
U.S. Dept. of Agriculture	S–52597
Utah – NELAP	GEL
Vermont	VT87156
Virginia	00151
Washington	C1641

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 – (843) 556–8171 – www.gel.com

Certificate of Analysis

Company : Olsson Associates
Address : 4690 Table Mountain Drive
Suite 200
Golden, Colorado 80403
Contact: Mr. James Hix
Project: **Olsson Associates – Rulison**

Report Date: January 15, 2010

Client Sample ID: 16–22D
Sample ID: 243333001
Matrix: PW
Collect Date: 16–DEC–09 12:55
Receive Date: 19–DEC–09
Collector: Client

Project: CORD00100
Client ID: CORD001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Rad Gamma Spec Analysis											
Gammaspec, Gamma, Liquid "As Received"											
Actinium–228		9.89	+/–6.47	5.54		pCi/L		KXG3 01/01/10	1758	936276	1
Americium–241	UI	0.00	+/–5.35	8.31		pCi/L					
Antimony–124	U	–1.5	+/–2.66	4.17		pCi/L					
Antimony–125	U	1.40	+/–2.65	4.56		pCi/L					
Barium–133	U	–0.392	+/–1.41	2.07		pCi/L					
Barium–140	U	2.50	+/–7.65	12.9		pCi/L					
Beryllium–7	U	–1.82	+/–9.20	15.4		pCi/L					
Bismuth–212	U	5.71	+/–7.62	13.0		pCi/L					
Bismuth–214		6.91	+/–4.05	3.31		pCi/L					
Cerium–139	U	–1.0	+/–0.972	1.57		pCi/L					
Cerium–141	U	0.897	+/–2.26	3.51		pCi/L					
Cerium–144	U	5.64	+/–7.10	11.6		pCi/L					
Cesium–134	U	0.524	+/–1.22	2.06		pCi/L					
Cesium–136	U	0.615	+/–2.94	5.05		pCi/L					
Cesium–137	U	–0.03	+/–0.986	1.63	5.00	pCi/L					
Chromium–51	U	–0.759	+/–11.8	20.1		pCi/L					
Cobalt–56	U	–0.133	+/–1.06	1.81		pCi/L					
Cobalt–57	U	0.241	+/–0.886	1.49		pCi/L					
Cobalt–58	U	–0.75	+/–1.09	1.73		pCi/L					
Cobalt–60	U	–0.00422	+/–1.11	1.85		pCi/L					
Europium–152	U	4.04	+/–4.56	4.90		pCi/L					
Europium–154	U	–0.384	+/–3.00	4.99		pCi/L					
Europium–155	U	–0.506	+/–3.62	6.05		pCi/L					
Iridium–192	U	0.412	+/–1.04	1.80		pCi/L					
Iron–59	U	0.00723	+/–2.41	4.08		pCi/L					
Krypton–85	U	–2180	+/–322	395		pCi/L					
Lead–210	U	–168	+/–144	179		pCi/L					
Lead–212	U	–1.82	+/–3.52	3.45		pCi/L					
Lead–214	UI	0.00	+/–4.45	4.36		pCi/L					
Manganese–54	U	0.113	+/–0.975	1.68		pCi/L					
Mercury–203	U	0.693	+/–1.21	2.11		pCi/L					
Neodymium–147	U	3.06	+/–17.0	28.8		pCi/L					
Neptunium–239	U	0.496	+/–6.56	11.0		pCi/L					
Niobium–94	U	–0.262	+/–0.982	1.61		pCi/L					
Niobium–95	U	0.773	+/–1.29	2.18		pCi/L					
Potassium–40		42.4	+/–24.8	16.7		pCi/L					
Promethium–144	U	–0.288	+/–0.982	1.60		pCi/L					
Promethium–146	U	0.658	+/–1.22	2.10		pCi/L					

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 – (843) 556–8171 – www.gel.com

Certificate of Analysis

Company : Olsson Associates
Address : 4690 Table Mountain Drive
Suite 200
Golden, Colorado 80403
Contact: Mr. James Hix
Project: **Olsson Associates – Rulison**

Report Date: January 15, 2010

Client Sample ID: 16–22D
Sample ID: 243333001

Project: CORD00100
Client ID: CORD001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Rad Gamma Spec Analysis											
Gammaspec, Gamma, Liquid "As Received"											
Radium–228		9.89	+/–6.47	5.54		pCi/L					
Ruthenium–106	U	–0.217	+/–8.75	14.6		pCi/L					
Silver–110m	U	–0.0655	+/–0.937	1.55		pCi/L					
Sodium–22	U	–0.187	+/–1.07	1.78		pCi/L					
Thallium–208	U	–0.814	+/–1.73	1.82		pCi/L					
Thorium–230	UI	0.00	+/–6090	576		pCi/L					
Thorium–234	U	44.5	+/–71.2	67.6		pCi/L					
Tin–113	U	–0.597	+/–1.30	2.17		pCi/L					
Uranium–235	U	2.58	+/–7.69	11.3		pCi/L					
Uranium–238	U	44.5	+/–71.2	67.6		pCi/L					
Yttrium–88	U	–0.323	+/–1.16	1.93		pCi/L					
Zinc–65	U	1.65	+/–2.29	3.53		pCi/L					
Zirconium–95	U	–0.542	+/–1.95	3.17		pCi/L					
Rad Gas Flow Proportional Counting											
GFPC, Chlorine–36 liquid "As Received"											
Chlorine–36	U	231	+/–209	349	100	pCi/L		DXM 2 01/14/10	1908	941544	2
GFPC, Gross A/B, liquid "As Received"											
Alpha	U	10.2	+/–10.1	16.7	5.00	pCi/L		DXF3 01/04/10	1135	936960	3
Beta	U	9.84	+/–7.18	11.6	5.00	pCi/L					
GFPC, Sr90, liquid "As Received"											
Strontium–90	U	1.09	+/–1.02	1.66	2.00	pCi/L		MXB1 01/01/10	1301	936971	4
Rad Liquid Scintillation Analysis											
Liquid Scint Tc99, Liquid "As Received"											
Technetium–99	U	6.84	+/–18.4	31.5	50.0	pCi/L		AXW 2 01/06/10	1806	936577	5
Rad Total Uranium											
KPA, Total U, Liquid "As Received"											
Total Uranium	U	0.111	+/–0.0104	0.660	1.00	ug/L		MXS2 12/30/09	1117	937019	6

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 901.1	
2	GL–RAD–A–033	
3	EPA 900.0	
4	EPA 905.0 Modified	
5	DOE EML HASL–300, Tc–02–RC Modified	
6	ASTM D 5174	

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 – (843) 556–8171 – www.gel.com

Certificate of Analysis

Company : Olsson Associates
Address : 4690 Table Mountain Drive
Suite 200
Golden, Colorado 80403
Contact: Mr. James Hix
Project: **Olsson Associates – Rulison**

Report Date: January 15, 2010

Client Sample ID: 16–22D
Sample ID: 243333001

Project: CORD00100
Client ID: CORD001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Potassium Chloride Carrier	GFPC, Chlorine–36 liquid "As Received"			101	(25%–125%)
Strontium Carrier	GFPC, Sr90, liquid "As Received"			80.7	(25%–125%)
Technetium–99m Tracer	Liquid Scint Tc99, Liquid "As Received"			116	(15%–125%)

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 – (843) 556–8171 – www.gel.com

Certificate of Analysis

Company : Olsson Associates
Address : 4690 Table Mountain Drive
Suite 200
Golden, Colorado 80403
Contact: Mr. James Hix
Project: **Olsson Associates – Rulison**

Report Date: January 15, 2010

Client Sample ID: 16–22B
Sample ID: 243333002
Matrix: PW
Collect Date: 16–DEC–09 13:00
Receive Date: 19–DEC–09
Collector: Client

Project: CORD00100
Client ID: CORD001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Rad Gamma Spec Analysis											
Gammaspec, Gamma, Liquid "As Received"											
Actinium–228		12.4	+/–7.70	5.02		pCi/L		KXG3 01/01/10	1758	936276	1
Americium–241	U	3.01	+/–5.28	7.91		pCi/L					
Antimony–124	U	–0.276	+/–2.19	3.67		pCi/L					
Antimony–125	U	–1.17	+/–2.49	4.17		pCi/L					
Barium–133	U	0.825	+/–1.29	2.01		pCi/L					
Barium–140	U	2.26	+/–7.16	12.2		pCi/L					
Beryllium–7	U	–3.22	+/–8.77	14.6		pCi/L					
Bismuth–212	U	–0.0361	+/–12.5	12.9		pCi/L					
Bismuth–214		12.3	+/–4.96	2.97		pCi/L					
Cerium–139	U	–0.159	+/–0.905	1.52		pCi/L					
Cerium–141	U	–0.501	+/–2.03	3.42		pCi/L					
Cerium–144	U	–2.45	+/–6.24	10.5		pCi/L					
Cesium–134	U	1.16	+/–1.06	1.91		pCi/L					
Cesium–136	U	0.966	+/–2.61	4.49		pCi/L					
Cesium–137	U	–0.412	+/–0.943	1.52	5.00	pCi/L					
Chromium–51	U	–5.03	+/–10.7	16.9		pCi/L					
Cobalt–56	U	–0.197	+/–0.964	1.64		pCi/L					
Cobalt–57	U	0.640	+/–0.814	1.42		pCi/L					
Cobalt–58	U	–0.0759	+/–0.943	1.62		pCi/L					
Cobalt–60	U	1.11	+/–0.961	1.71		pCi/L					
Europium–152	U	–0.0193	+/–2.52	4.37		pCi/L					
Europium–154	U	0.770	+/–2.61	4.42		pCi/L					
Europium–155	U	–0.174	+/–3.32	5.72		pCi/L					
Iridium–192	U	–0.188	+/–0.991	1.59		pCi/L					
Iron–59	U	–0.358	+/–2.12	3.52		pCi/L					
Krypton–85	U	–2250	+/–341	370		pCi/L					
Lead–210	U	–172	+/–211	210		pCi/L					
Lead–212	UI	0.00	+/–3.18	3.50		pCi/L					
Lead–214	UI	0.00	+/–4.51	4.64		pCi/L					
Manganese–54	U	0.443	+/–0.897	1.58		pCi/L					
Mercury–203	U	–0.224	+/–1.18	1.91		pCi/L					
Neodymium–147	U	11.2	+/–16.3	28.1		pCi/L					
Neptunium–239	U	1.87	+/–5.83	10.1		pCi/L					
Niobium–94	U	0.193	+/–0.866	1.44		pCi/L					
Niobium–95	U	0.981	+/–1.73	2.08		pCi/L					
Potassium–40		48.5	+/–19.8	16.6		pCi/L					
Promethium–144	U	–0.677	+/–0.884	1.39		pCi/L					
Promethium–146	U	0.207	+/–1.12	1.92		pCi/L					

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 – (843) 556–8171 – www.gel.com

Certificate of Analysis

Company : Olsson Associates
Address : 4690 Table Mountain Drive
Suite 200
Golden, Colorado 80403
Contact: Mr. James Hix
Project: **Olsson Associates – Rulison**

Report Date: January 15, 2010

Client Sample ID: 16–22B
Sample ID: 243333002

Project: CORD00100
Client ID: CORD001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Rad Gamma Spec Analysis											
Gammaspec, Gamma, Liquid "As Received"											
Radium–228		12.4	+/–7.70	5.02		pCi/L					
Ruthenium–106	U	2.60	+/–8.36	14.1		pCi/L					
Silver–110m	U	0.270	+/–0.855	1.44		pCi/L					
Sodium–22	U	0.303	+/–0.936	1.59		pCi/L					
Thallium–208	U	0.0956	+/–1.76	1.91		pCi/L					
Thorium–230	UI	0.00	+/–5940	574		pCi/L					
Thorium–234	U	27.3	+/–78.1	63.5		pCi/L					
Tin–113	U	–0.0612	+/–1.21	2.08		pCi/L					
Uranium–235	U	–8.49	+/–10.9	11.6		pCi/L					
Uranium–238	U	27.3	+/–78.1	63.5		pCi/L					
Yttrium–88	U	0.188	+/–1.11	1.89		pCi/L					
Zinc–65	U	1.48	+/–2.25	3.45		pCi/L					
Zirconium–95	U	0.127	+/–1.82	2.99		pCi/L					
Rad Gas Flow Proportional Counting											
GFPC, Chlorine–36 liquid "As Received"											
Chlorine–36	U	75.7	+/–244	416	100	pCi/L		DXM 01/14/10 2	1908	941544	2
GFPC, Gross A/B, liquid "As Received"											
Alpha	U	–1.05	+/–12.9	23.4	5.00	pCi/L		DXF3 12/31/09	0951	936960	3
Beta		20.1	+/–11.2	18.2	5.00	pCi/L					
GFPC, Sr90, liquid "As Received"											
Strontium–90	U	–0.136	+/–0.947	1.85	2.00	pCi/L		MXB1 01/01/10	1302	936971	4
Rad Liquid Scintillation Analysis											
Liquid Scint Tc99, Liquid "As Received"											
Technetium–99	U	8.67	+/–18.2	31.1	50.0	pCi/L		AXW 01/06/10 2	1838	936577	5
Rad Total Uranium											
KPA, Total U, Liquid "As Received"											
Total Uranium	U	0.0057	+/–0.000823	0.660	1.00	ug/L		MXS2 12/30/09	1120	937019	6

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 901.1	
2	GL–RAD–A–033	
3	EPA 900.0	
4	EPA 905.0 Modified	
5	DOE EML HASL–300, Tc–02–RC Modified	
6	ASTM D 5174	

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 – (843) 556–8171 – www.gel.com

Certificate of Analysis

Company : Olsson Associates
Address : 4690 Table Mountain Drive
Suite 200
Golden, Colorado 80403
Contact: Mr. James Hix
Project: **Olsson Associates – Rulison**

Report Date: January 15, 2010

Client Sample ID: 16–22B
Sample ID: 243333002

Project: CORD00100
Client ID: CORD001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Potassium Chloride Carrier	GFPC, Chlorine–36 liquid "As Received"			100	(25%–125%)
Strontium Carrier	GFPC, Sr90, liquid "As Received"			80.7	(25%–125%)
Technetium–99m Tracer	Liquid Scint Tc99, Liquid "As Received"			118	(15%–125%)

QC Summary

Report Date: January 15, 2010

Olsson Associates
4690 Table Mountain Drive
Suite 200
Golden, Colorado

Contact: **Mr. James Hix**

Workorder: **243333**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 936276										
QC1202003339 243333001 DUP										
Actinium-228		9.89 +/-6.47		13.4 +/-8.38	pCi/L	30.4		(0% - 100%)	KXG3	01/02/10 13:44
Americium-241	UI	0.00 +/-5.35	U	-2.9 +/-7.07	pCi/L	354		N/A		
Antimony-124	U	-1.5 +/-2.66	U	-0.19 +/-2.65	pCi/L	155		N/A		
Antimony-125	U	1.40 +/-2.65	U	2.77 +/-2.88	pCi/L	65.9		N/A		
Barium-133	U	-0.392 +/-1.41	U	0.307 +/-1.50	pCi/L	1650		N/A		
Barium-140	U	2.50 +/-7.65	U	-4.92 +/-9.43	pCi/L	612		N/A		
Beryllium-7	U	-1.82 +/-9.20	U	0.0124 +/-10.7	pCi/L	203		N/A		
Bismuth-212	U	5.71 +/-7.62	U	-4.09 +/-12.4	pCi/L	1210		N/A		
Bismuth-214		6.91 +/-4.05		11.8 +/-4.84	pCi/L	51.8		(0% - 100%)		
Cerium-139	U	-1.0 +/-0.972	U	0.0937 +/-1.18	pCi/L	241		N/A		
Cerium-141	U	0.897 +/-2.26	U	1.91 +/-2.60	pCi/L	72.2		N/A		
Cerium-144	U	5.64 +/-7.10	U	0.355 +/-7.60	pCi/L	176		N/A		
Cesium-134	U	0.524 +/-1.22	U	1.48 +/-1.34	pCi/L	95.3		N/A		
Cesium-136	U	0.615 +/-2.94	U	-1.82 +/-3.12	pCi/L	404		N/A		
Cesium-137	U	-0.03 +/-0.986	U	0.341 +/-1.07	pCi/L	239		N/A		
Chromium-51	U	-0.759 +/-11.8	U	-14.6 +/-12.5	pCi/L	180		N/A		
Cobalt-56	U	-0.133 +/-1.06	U	-1.01 +/-1.15	pCi/L	153		N/A		
Cobalt-57	U	0.241 +/-0.886	U	-0.246 +/-0.962	pCi/L	18700		N/A		
Cobalt-58	U	-0.75 +/-1.09	U	-0.599 +/-1.12	pCi/L	22.4		N/A		
Cobalt-60	U	-0.00422	U	0.0006	pCi/L	266		N/A		

QC Summary

Workorder: **243333**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 936276										
		+/-1.11		+/-1.67						
Europium-152	U	4.04	U	0.264	pCi/L	175		N/A	KXG3	01/02/10 13:44
		+/-4.56		+/-3.02						
Europium-154	U	-0.384	U	-1.74	pCi/L	128		N/A		
		+/-3.00		+/-2.95						
Europium-155	U	-0.506	U	-3.25	pCi/L	146		N/A		
		+/-3.62		+/-5.98						
Iridium-192	U	0.412	U	-0.169	pCi/L	476		N/A		
		+/-1.04		+/-1.08						
Iron-59	U	0.00723	U	0.0762	pCi/L	165		N/A		
		+/-2.41		+/-2.45						
Krypton-85	U	-2180	U	-2190	pCi/L	0.412		N/A		
		+/-322		+/-347						
Lead-210	U	-168	U	-287	pCi/L	52.0		N/A		
		+/-144		+/-368						
Lead-212	U	-1.82	U	1.64	pCi/L	3800		N/A		
		+/-3.52		+/-3.69						
Lead-214	UI	0.00		5.83	pCi/L	60.4		(0% - 100%)		
		+/-4.45		+/-4.22						
Manganese-54	U	0.113	U	-0.13	pCi/L	2880		N/A		
		+/-0.975		+/-1.05						
Mercury-203	U	0.693	U	0.909	pCi/L	26.9		N/A		
		+/-1.21		+/-1.33						
Neodymium-147	U	3.06	U	-3.93	pCi/L	1600		N/A		
		+/-17.0		+/-19.2						
Neptunium-239	U	0.496	U	0.0594	pCi/L	157		N/A		
		+/-6.56		+/-7.26						
Niobium-94	U	-0.262	U	0.562	pCi/L	549		N/A		
		+/-0.982		+/-0.969						
Niobium-95	U	0.773	U	-1.8	pCi/L	500		N/A		
		+/-1.29		+/-2.27						
Potassium-40		42.4		73.6	pCi/L	53.8*		(0% - 20%)		
		+/-24.8		+/-32.1						
Promethium-144	U	-0.288	U	0.0508	pCi/L	286		N/A		
		+/-0.982		+/-0.985						
Promethium-146	U	0.658	U	-0.0256	pCi/L	216		N/A		
		+/-1.22		+/-1.37						
Radium-228		9.89		13.4	pCi/L	30.4		(0% - 100%)		
		+/-6.47		+/-8.38						
Ruthenium-106	U	-0.217	U	-7.49	pCi/L	189		N/A		
		+/-8.75		+/-9.25						
Silver-110m	U	-0.0655	U	-0.354	pCi/L	138		N/A		
		+/-0.937		+/-1.00						
Sodium-22	U	-0.187	U	-0.616	pCi/L	107		N/A		

QC Summary

Workorder: **243333**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 936276										
		+/-1.07		+/-1.06						
Thallium-208		U -0.814	U	-2.31	pCi/L	95.6		N/A	KXG3	01/02/10 13:44
		+/-1.73		+/-1.91						
Thorium-230		UI 0.00	U	-65.5	pCi/L	230		N/A		
		+/-6090		+/-660						
Thorium-234		U 44.5	U	-20.1	pCi/L	529		N/A		
		+/-71.2		+/-116						
Tin-113		U -0.597	U	1.66	pCi/L	426		N/A		
		+/-1.30		+/-1.42						
Uranium-235		U 2.58	U	7.32	pCi/L	95.8		N/A		
		+/-7.69		+/-13.2						
Uranium-238		U 44.5	U	-20.1	pCi/L	529		N/A		
		+/-71.2		+/-116						
Yttrium-88		U -0.323	U	-0.15	pCi/L	73.2		N/A		
		+/-1.16		+/-1.19						
Zinc-65		U 1.65	U	-1.47	pCi/L	3440		N/A		
		+/-2.29		+/-2.50						
Zirconium-95		U -0.542	U	2.12	pCi/L	337		N/A		
		+/-1.95		+/-2.00						
QC1202003341 LCS										
Actinium-228			U	18.5	pCi/L					01/02/10 13:46
				+/-36.9						
Americium-241	1240			1430	pCi/L		116	(75%-125%)		
				+/-201						
Antimony-124			U	-6.37	pCi/L					
				+/-11.9						
Antimony-125			U	0.743	pCi/L					
				+/-22.1						
Barium-133			U	-14.1	pCi/L					
				+/-10.4						
Barium-140			U	-0.0429	pCi/L					
				+/-45.3						
Beryllium-7			U	77.2	pCi/L					
				+/-77.9						
Bismuth-212			U	-6.2	pCi/L					
				+/-60.9						
Bismuth-214			U	11.9	pCi/L					
				+/-16.9						
Cerium-139			U	3.91	pCi/L					
				+/-6.79						
Cerium-141			U	2.07	pCi/L					
				+/-12.9						
Cerium-144			U	42.6	pCi/L					
				+/-50.7						

QC Summary

Workorder: **243333**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 936276										
Cesium-134			U	5.81 +/-10.9	pCi/L					
Cesium-136			U	-0.0243 +/-20.6	pCi/L				KXG3	01/02/10 13:46
Cesium-137	433			430 +/-38.3	pCi/L		99.3	(75%-125%)		
Chromium-51			U	-33.9 +/-70.2	pCi/L					
Cobalt-56			U	6.97 +/-9.60	pCi/L					
Cobalt-57				20.8 +/-10.1	pCi/L					
Cobalt-58			U	3.08 +/-9.63	pCi/L					
Cobalt-60	506			537 +/-54.5	pCi/L		106	(75%-125%)		
Europium-152			U	1.12 +/-22.0	pCi/L					
Europium-154			U	1.30 +/-15.8	pCi/L					
Europium-155			U	3.68 +/-27.9	pCi/L					
Iridium-192			U	6.75 +/-7.36	pCi/L					
Iron-59			U	0.114 +/-23.0	pCi/L					
Krypton-85			U	-2770 +/-1990	pCi/L					
Lead-210			U	-2640 +/-2480	pCi/L					
Lead-212			U	3.42 +/-14.9	pCi/L					
Lead-214			U	32.9 +/-17.4	pCi/L					
Manganese-54			U	4.14 +/-9.92	pCi/L					
Mercury-203			U	2.27 +/-8.10	pCi/L					
Neodymium-147			U	9.40 +/-100	pCi/L					
Neptunium-239			U	13.9 +/-46.7	pCi/L					
Niobium-94			U	0.628 +/-6.86	pCi/L					
Niobium-95			U	8.38	pCi/L					

QC Summary

Workorder: **243333**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 936276										
				+/-8.82						
Potassium-40			U	28.1	pCi/L				KXG3	01/02/10 13:46
				+/-46.2						
Promethium-144			U	2.35	pCi/L					
				+/-6.82						
Promethium-146			U	6.45	pCi/L					
				+/-11.2						
Radium-228			U	18.5	pCi/L					
				+/-36.9						
Ruthenium-106			U	-29.3	pCi/L					
				+/-78.2						
Silver-110m			U	1.60	pCi/L					
				+/-8.72						
Sodium-22			U	1.17	pCi/L					
				+/-5.54						
Thallium-208			U	2.25	pCi/L					
				+/-8.13						
Thorium-230			U	-2320	pCi/L					
				+/-15300						
Thorium-234			U	-517	pCi/L					
				+/-552						
Tin-113			U	-3.06	pCi/L					
				+/-10.3						
Uranium-235			U	-14.4	pCi/L					
				+/-50.4						
Uranium-238			U	-517	pCi/L					
				+/-552						
Yttrium-88			U	3.48	pCi/L					
				+/-5.03						
Zinc-65			U	3.59	pCi/L					
				+/-20.3						
Zirconium-95			U	2.29	pCi/L					
				+/-14.9						
QC1202003338 MB										
Actinium-228			U	3.22	pCi/L					01/01/10 17:59
				+/-9.65						
Americium-241			U	-0.20	pCi/L					
				+/-1.69						
Antimony-124			U	-2.27	pCi/L					
				+/-2.37						
Antimony-125			U	-1.0	pCi/L					
				+/-2.57						
Barium-133			U	0.468	pCi/L					
				+/-1.37						

QC Summary

Workorder: **243333**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 936276										
Barium-140			U	3.29 +/-5.91	pCi/L					
Beryllium-7			U	-11.4 +/-8.99	pCi/L				KXG3	01/01/10 17:59
Bismuth-212			U	-0.0547 +/-15.3	pCi/L					
Bismuth-214			U	-1.71 +/-4.35	pCi/L					
Cerium-139			U	-0.384 +/-0.705	pCi/L					
Cerium-141			U	0.558 +/-1.46	pCi/L					
Cerium-144			U	-3.88 +/-4.89	pCi/L					
Cesium-134			U	1.42 +/-1.30	pCi/L					
Cesium-136			U	1.06 +/-2.37	pCi/L					
Cesium-137			U	1.67 +/-1.16	pCi/L					
Chromium-51			U	3.47 +/-8.83	pCi/L					
Cobalt-56			U	-0.903 +/-1.17	pCi/L					
Cobalt-57			U	-0.0941 +/-0.614	pCi/L					
Cobalt-58			U	-0.0253 +/-1.07	pCi/L					
Cobalt-60			U	1.01 +/-1.23	pCi/L					
Europium-152			U	0.424 +/-2.69	pCi/L					
Europium-154			U	1.35 +/-3.10	pCi/L					
Europium-155			U	0.033 +/-2.37	pCi/L					
Iridium-192			U	-0.435 +/-0.972	pCi/L					
Iron-59			U	0.633 +/-2.23	pCi/L					
Krypton-85			U	-2720 +/-372	pCi/L					
Lead-210			U	-62.7 +/-32.3	pCi/L					
Lead-212			U	0.417	pCi/L					

QC Summary

Workorder: **243333**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 936276										
				+/-3.94						
Lead-214			U	0.863	pCi/L				KXG3	01/01/10 17:59
				+/-4.48						
Manganese-54			U	0.0839	pCi/L					
				+/-1.11						
Mercury-203			U	-0.334	pCi/L					
				+/-1.04						
Neodymium-147			U	-2.42	pCi/L					
				+/-11.7						
Neptunium-239			U	2.31	pCi/L					
				+/-4.48						
Niobium-94			U	-0.233	pCi/L					
				+/-1.06						
Niobium-95			U	-0.476	pCi/L					
				+/-1.60						
Potassium-40			U	17.6	pCi/L					
				+/-11.5						
Promethium-144			U	0.536	pCi/L					
				+/-1.14						
Promethium-146			U	1.04	pCi/L					
				+/-1.29						
Radium-228			U	3.22	pCi/L					
				+/-9.65						
Ruthenium-106			U	-2.62	pCi/L					
				+/-9.83						
Silver-110m			U	-0.593	pCi/L					
				+/-1.06						
Sodium-22			U	0.454	pCi/L					
				+/-1.11						
Thallium-208			U	-1.19	pCi/L					
				+/-2.28						
Thorium-230			U	-50	pCi/L					
				+/-351						
Thorium-234			U	-60.7	pCi/L					
				+/-28.5						
Tin-113			U	-0.0715	pCi/L					
				+/-1.23						
Uranium-235			U	1.29	pCi/L					
				+/-9.99						
Uranium-238			U	-60.7	pCi/L					
				+/-28.5						
Yttrium-88			U	-0.228	pCi/L					
				+/-1.12						
Zinc-65			U	-0.161	pCi/L					

QC Summary

Workorder: 243333

Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec											
Batch 936276											
					+/-2.36						
Zirconium-95				U	-1.42	pCi/L				KXG3	01/01/10 17:59
					+/-2.10						
Rad Gas Flow											
Batch 936960											
QC1202004866 243499001 DUP											
Alpha		U	-0.558	U	-0.799	pCi/L	0.00		N/A	DXF3	12/31/09 09:38
			+/-1.69		+/-1.21						
Beta			10.2		6.10	pCi/L	50.0		(0% - 100%)		
			+/-3.66		+/-3.20						
QC1202004869 LCS											
Alpha	126				149	pCi/L		118	(75%-125%)		12/30/09 22:41
					+/-14.0						
Beta	386				433	pCi/L		112	(75%-125%)		
					+/-16.4						
QC1202004865 MB											
Alpha				U	0.471	pCi/L					01/04/10 11:34
					+/-1.62						
Beta				U	2.81	pCi/L					
					+/-1.97						
QC1202004867 243499001 MS											
Alpha	252	U	-0.558		291	pCi/L		116	(75%-125%)		12/30/09 23:00
			+/-1.69		+/-29.2						
Beta	772		10.2		873	pCi/L		112	(75%-125%)		
			+/-3.66		+/-32.1						
QC1202004868 243499001 MSD											
Alpha	252	U	-0.558		302	pCi/L	3.61	120	(0%-20%)		12/30/09 22:40
			+/-1.69		+/-31.3						
Beta	772		10.2		809	pCi/L	7.61	103	(0%-20%)		
			+/-3.66		+/-33.3						
Batch 936971											
QC1202004904 243333001 DUP											
Strontium-90		U	1.09	U	0.676	pCi/L	0.00		N/A	MXB1	01/01/10 13:01
			+/-1.02		+/-0.992						
QC1202004906 LCS											
Strontium-90	96.5				109	pCi/L		113	(75%-125%)		01/01/10 13:01
					+/-5.96						
QC1202004903 MB											
Strontium-90				U	-0.0791	pCi/L					01/02/10 19:59
					+/-0.883						
QC1202004905 243333001 MS											
Strontium-90	193	U	1.09		156	pCi/L		80.5	(75%-125%)		01/02/10 19:59
			+/-1.02		+/-11.4						
Batch 941544											
QC1202015273 243333001 DUP											

QC Summary

Workorder: **243333**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gas Flow										
Batch 941544										
Chlorine-36		U 231 +/-209	U	164 +/-221	pCi/L	0.00			N/A DXM2	01/14/10 19:08
QC1202015275 LCS										
Chlorine-36	47900			41400 +/-2240	pCi/L		86.5	(75%-125%)		01/14/10 19:08
QC1202015272 MB										
Chlorine-36			U	-71.1 +/-206	pCi/L					01/14/10 19:08
QC1202015274 243333001 MS										
Chlorine-36	47900	U 231 +/-209		55200 +/-2330	pCi/L		115	(75%-125%)		01/14/10 19:08
Rad Liquid Scintillation										
Batch 936577										
QC1202003980 243349001 DUP										
Technetium-99		U 6.29 +/-18.5	U	-0.95 +/-17.7	pCi/L	0.00			N/A AXW2	01/06/10 21:48
QC1202003982 LCS										
Technetium-99	1810			1440 +/-64.8	pCi/L		79.6	(75%-125%)		01/06/10 22:37
QC1202003979 MB										
Technetium-99			U	-0.584 +/-18.1	pCi/L					01/06/10 21:17
QC1202003981 243349001 MS										
Technetium-99	1810	U 6.29 +/-18.5		1400 +/-63.3	pCi/L		77.2	(75%-125%)		01/06/10 22:21
Rad Total U										
Batch 937019										
QC1202005073 243333001 DUP										
Total Uranium		U 0.111 +/-0.0104	U	-0.0264 +/-0.0037	ug/L	0.00			N/A MXS2	12/30/09 11:36
QC1202005075 LCS										
Total Uranium	50.0			50.7 +/-3.87	ug/L		101	(75%-125%)		12/30/09 11:44
QC1202005076 LCS										
Total Uranium	5.00			4.43 +/-0.113	ug/L		88.7	(75%-125%)		12/30/09 11:45
QC1202005072 MB										
Total Uranium			U	-0.0307 +/-0.00776	ug/L					12/30/09 11:33
QC1202005074 243333001 MS										
Total Uranium	50.0	U 0.111 +/-0.0104		53.0 +/-4.66	ug/L		106	(75%-125%)		12/30/09 11:40

Notes:
The Qualifiers in this report are defined as follows:

** Analyte is a surrogate compound

QC Summary

Workorder: **243333**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

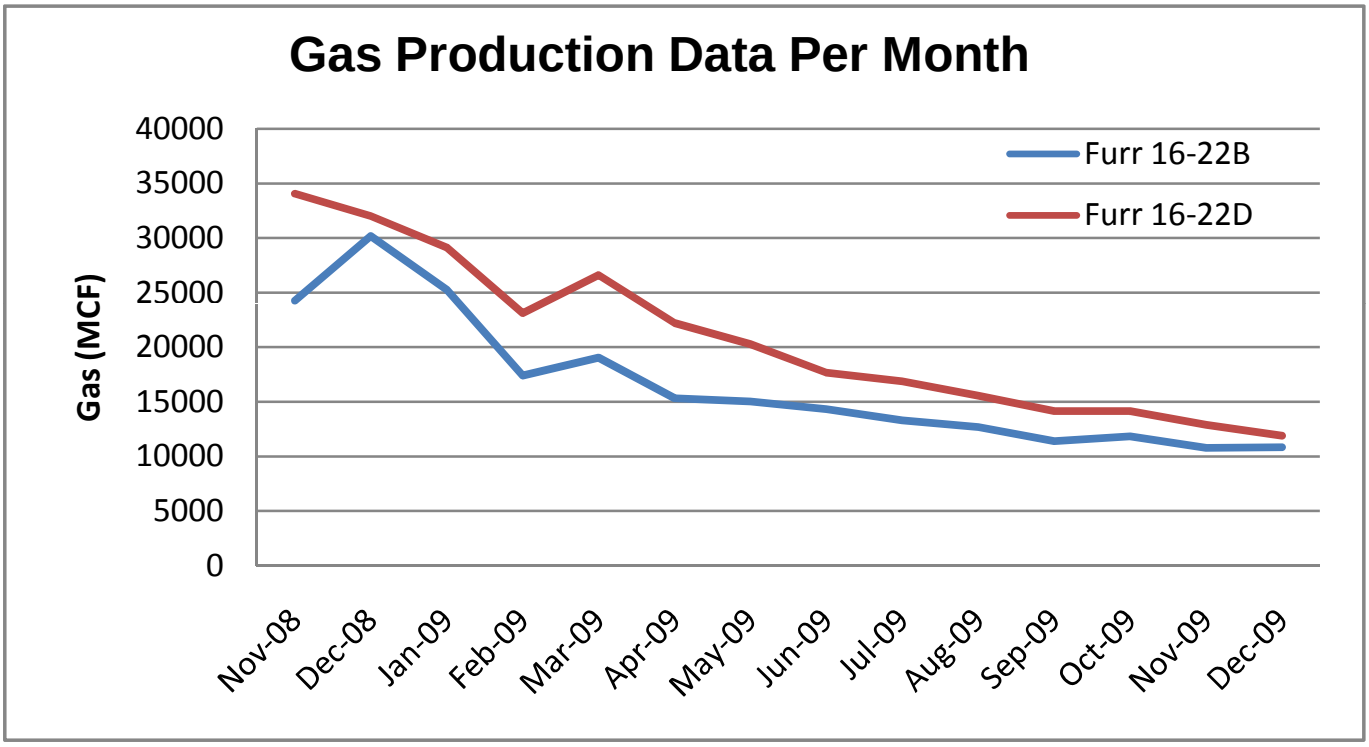
<	Result is less than value reported
>	Result is greater than value reported
A	The TIC is a suspected aldol-condensation product
B	For General Chemistry and Organic analysis the target analyte was detected in the associated blank.
BD	Results are either below the MDC or tracer recovery is low
C	Analyte has been confirmed by GC/MS analysis
D	Results are reported from a diluted aliquot of the sample
F	Estimated Value
H	Analytical holding time was exceeded
J	Value is estimated
M	M if above MDC and less than LLD
M	Matrix Related Failure
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
R	Sample results are rejected
U	Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.
UI	Gamma Spectroscopy--Uncertain identification
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	QC Samples were not spiked with this compound
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

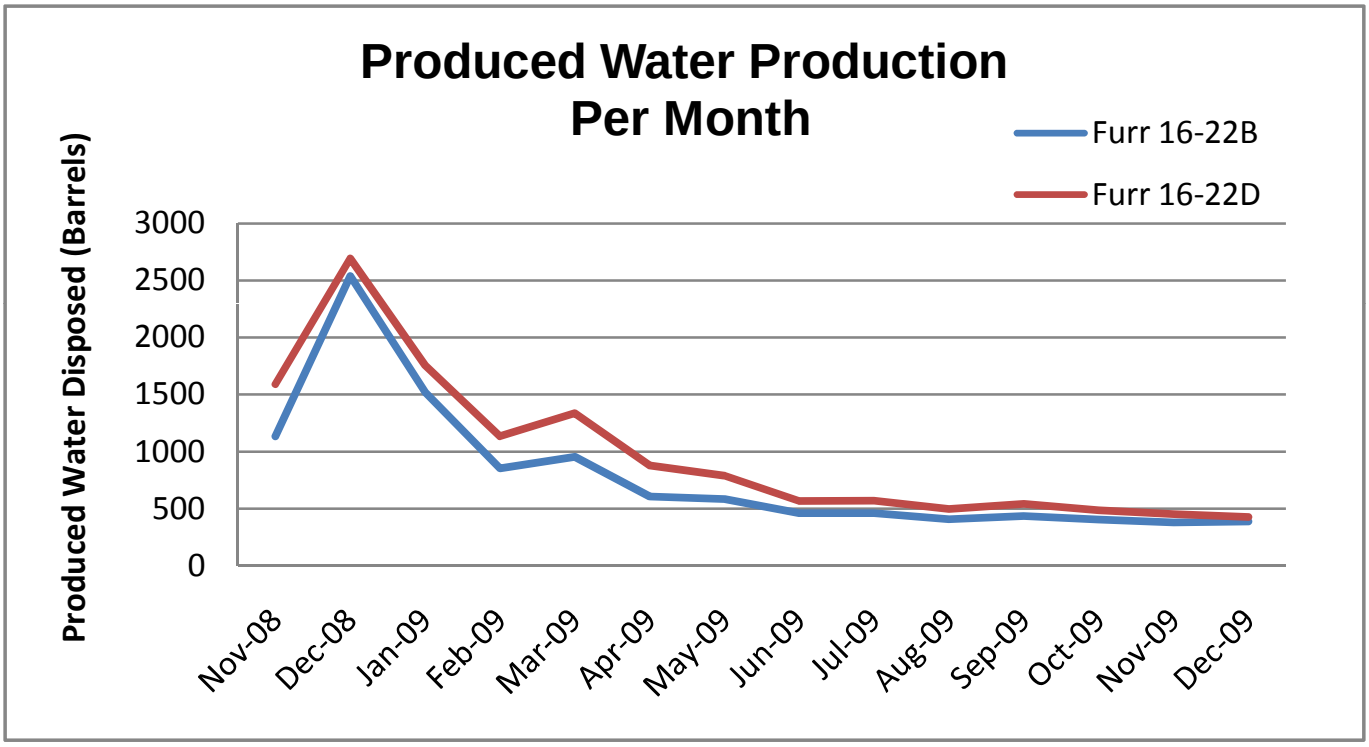
N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

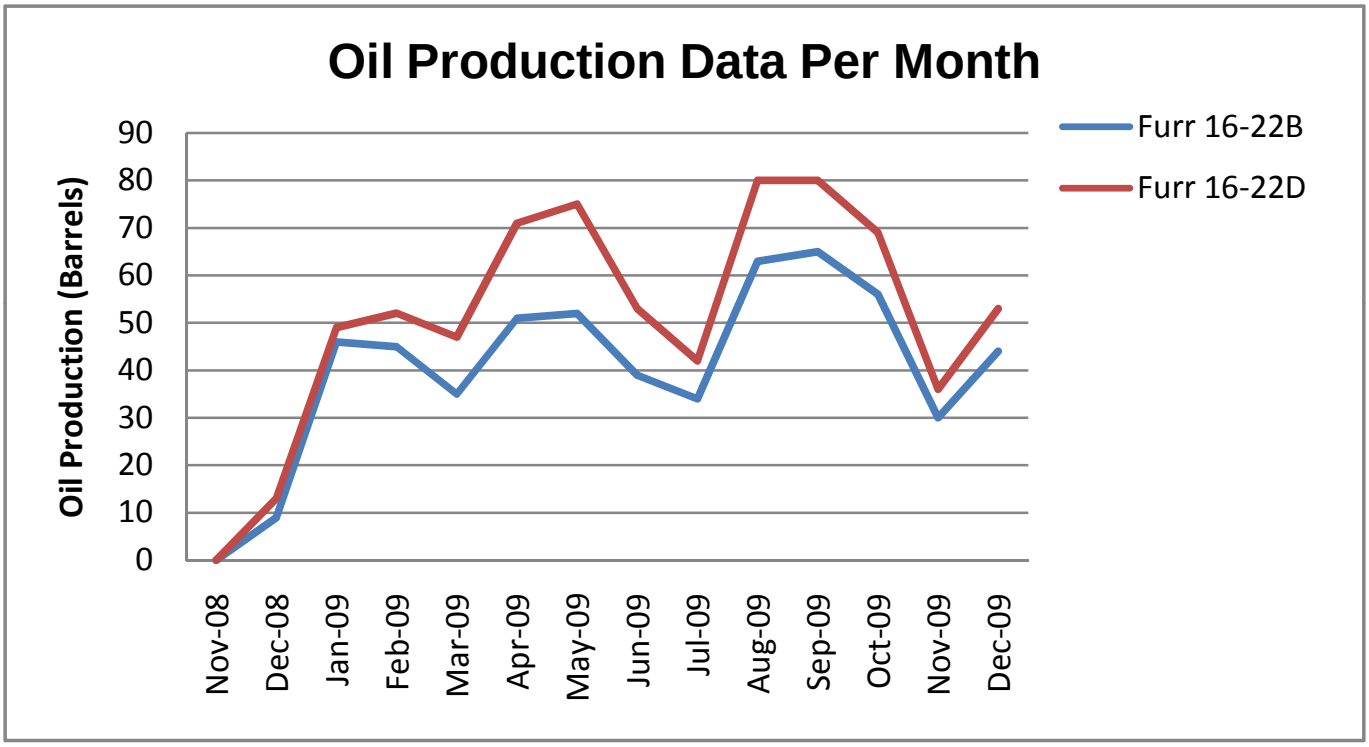
Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

APPENDIX C

Furr 16-22B and Furr 16-22D WELL PRODUCTION DATA


Gas Production Data Per Month
Gas (MCF)
40000
35000
30000
25000
20000
15000
10000
5000
0
Furr 16-22B
Furr 16-22D
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09


Produced Water Production Per Month
Furr 16-22B
Furr 16-22D
Produced Water Disposed (Barrels)
3000
2500
2000
1500
1000
500
0
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09


Oil Production Data Per Month
Oil Production (Barrels)
90
80
70
60
50
40
30
20
10
0
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Furr 16-22B
Furr 16-22D

APPENDIX D

DATA VERIFICATION AND VALIDATION REPORT

RADIOCHEMISTRY DATA QUALITY REVIEW REPORT
Gas Flow Proportional Counting (GFPC) and Liquid Scintillation (LSC),
Uranium in Water by Pulsed-Laser Phosphorimetry (ASTM-D-5174)

SDG: 243333 (GEL)

PROJECT: Garfield County CO, Rulison Project for Olsson Assoc. Golden CO

LABORATORY: GEL Laboratories, LLC, Charleston, South Carolina

SAMPLE MATRIX: Water

SAMPLING DATE (Mo/Yr): December, 2009

NO.SAMPLES: 2

ANALYSES REQUESTED: GEL: GFPC for Cl-36, gross alpha/beta, and Sr-90; LSC for Tc-99, Total U by PLP.

SAMPLE NUMBERS: 16-22B, 16-22D

DATA REVIEWER: John Huntington

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE:

Telephone Logs included Yes____ No __X___

Contractual Violations Yes____ No __X___

The project Quality Assurance Project Plan (QAPP), the EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, 2004, the laboratory Standard Operating Procedure (SOP), and the EPA Radiochemistry Methods (current updates) have been referenced by the reviewer to perform this data validation review. The review includes evaluation of calibration, holding times and QC for all samples and a 10% review of the calculation algorithms. General comments regarding the data/ analytical quality are part of the review when raw data are submitted. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the project Manager.

I. DELIVERABLES

1. All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.
Yes ___X_ No___
The following is noted:
The GEL Laboratories data package did not include raw data. Only summary QC results were provided. Gross alpha/beta was determined using EPA 900.0, Cl-36 by GL-RAD-A-033, Sr-90 by EPA 905.0, Tc-99 by DOE EML HASL-300, Tc-02-RC Modified, and total uranium by ASTM D-5174.

For the GEL data, a Level II review is conducted.

Please note: In addition to these data, tritium results from Isotech laboratories was reported. Only sample results were present with no QC. Therefore, it was not possible to validate the Isotech data.

II. ANALYTICAL REPORT FORMS

1. The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes _X___ No____

2. Holding Times
A. The contract holding times were met for all analyses.
Yes __X__ No____

B. Samples were properly preserved, or applicable preservative was used.
Yes _X___ No____
Samples were received at a pH of approximately 7. The sample containers were pre-preserved but the buffering capacity of the water (these are production water from gas wells) was such that the resulting pH was above 2. The laboratory added preservative to bring the sample pH into the acceptance range. This is permissible per 40CFR and should have no impact on the results. No qualifiers are added.

The laboratory noted that 16-22B contained a layer of nonaqueous phase liquid (LNAPL). They requested guidance from the client and were instructed to decant the oil phase and analyze the aqueous phase only. Thus the analytical results pertain only to that phase of the sample.

3. Chains of Custody (COC)
A. Chains of Custody (COC) were reviewed and all fields were complete, signatures were present and cross outs were clean and initialed.
Yes __X__ No ____

III. CALIBRATION AND STANDARDIZATION

1. Daily counting efficiency (Base Efficiency) for all methods was achieved.
Yes _____ No____ NA__X__
The GEL Laboratories data package did not include the raw data.

2. The calibration data include a plot of the counting efficiency obtained versus the various weights of salts spiked with a known DPM of the standard; The "best fit" curve or a computer fit equation with the estimated standard deviation meet the method calibration criteria. At least one complete self-absorption curve exists for one detector per array and the efficiency for the standard curve of $\geq$ 3 standards agree within 95% confidence level.
Yes _____ No_____ NA __X__
GEL data: This documentation is not part of the data package.

3. Reliability of the daily QC check standards are within a 2 to 3 sigma control limit of the mean count of long term counting
Yes ____ No_____ NA__X__
GEL data: Calibration documentation is not part of the data package.

4. The most recent background count duration is at least as long as the sample duration and this background total is within 99% confidence level or 2 to 3 sigma of the average of the last ten background checks on that detector.
Yes _____ No_____ NA__X__
Durations are not part of the data package.

5. The attenuation was with the (beta x r2) limits as appropriate to the method.
Yes _____ No ____ NA_X_
Not part of the data package.

6. There is documentation to verify that the standards are NIST traceable or the equivalent.
Yes _____ No_____ NA__X__
GEL data: This documentation is not part of the data package.

7. Quench factors were reported and noted as acceptable.
Yes ____ No____ NA__X__
GEL: Quench factors are not reported as part of the data package.

IV. DETECTION AND REPORTING LIMITS
1. Minimal detection concentrations (MDC) with efficiencies were established for all analytes every six months or whenever a significant background or instrument response is expected (e.g., detector change).
Yes ___X___ No _____ NA_____
Cl-36, GEL: for the Cl-36 analysis the laboratory provides a nonconformance report stating that the required detection limit is not met due to sample matrix. No qualification is applied.

2. The laboratory reported the results with uncertainties that included all uncertainties associated with the preparation and analytical procedures.
Yes __X_ No____
Samples where uncertainties are greater than the result or the result has been reported as

estimated "J" may have unrealistically low MDC values. The uncertainties are multiplied by 1.65. If the result is greater than the reported MDC, the isotope has been qualified UJQ for an unrealistically low MDC. If the value calculated is less than the reported MDA, the activity result is qualified JQ estimated below the MDC.

No such instances are observed and no qualifiers are applied.

V. MATRIX SPIKE

1. Matrix spike (MS) was analyzed for every analysis performed and for every 20 samples or for every matrix whichever is more frequent.
Yes _X__ No ____
Sr-90 – GEL: A matrix spike was conducted on sample 16-22D.
Cl-36 – GEL: A matrix spike was conducted on sample 16-22D.
Total Uranium – GEL: A matrix spike was conducted on sample 16-22D.

Although not all methods were spiked in this sample set, counting prior sets the recommended frequency of matrix spikes has been met.

2. The MS percent recoveries were within the limits defined in the contract or a guidance limit of 75-125%.
Yes __X__ No ____

3. The samples used for qualification are client samples.
Yes __X_ No___

VI. MATRIX DUPLICATE

1. The matrix spike duplicate relative percent difference of the percent recoveries were within the limits defined in the contract or the CLP 20% for water and 35% for soil, or $\pm$ RL for results < 5 x RL ($\pm$ 2x RL for soils).
Yes __X__ No _____ NA_____
Matrix duplicates, not matrix spike duplicates, were analyzed using the same samples as were used for the matrix spikes.
Sr-90 – GEL: The matrix duplicate is in control.
Cl-36 – GEL: The matrix duplicate is in control.
Total Uranium – GEL: The matrix duplicate is in control.

B. Or met the Duplicate Error Ratio (DER) criteria calculations which account for the 2 sigma efficiency values. DER limit is 1.
Yes ____ No ____ NA ___X_

VII. LABORATORY CONTROL SAMPLE

1. Laboratory Control Sample (LCS) was analyzed for every analysis performed and for every 20 samples or for every matrix, whichever is more frequent

Yes __X__ No____

2. The LCS %R for each analyte (background corrected) met the established control limits or the method limits of 75-125%.
Yes __X__ No ____

3. The LCSD %R for each analyte (background corrected) met the established control limits or the method limits of 75-125%.
Yes ____ No ____ NA__X__
LCSDs are not reported.

4. The duplicate relative percent difference of the percent recoveries were within the limits.
Yes ____ No _____ NA__X__

VIII. BLANKS

1. Low-level activities of isotopes were reported for laboratory preparation blanks and met the MDC or background CPM criteria
Yes _X__ No_____
For LSC methods, the MDC of the prep blank shall be less than the calibration MDC or the sample MDC whichever is reported. If all sample results in a batch are reported as detected, then the prep blank MDC must be less than the activity of the lowest MDC in the batch.

For the GFPC methods, if a sample activity is < 5 x MDC, the activity of the prep blank shall be equivalent to zero when the measurement uncertainty is considered or shall be less than the MDC. If the sample activity is > 5 x MDC, the activity of the prep blank shall be equivalent to zero when the measurement uncertainty is considered. This is determined from the Normalized Absolute Difference (NAD).

The impact of the blank contamination may be evaluated where appropriate by calculating the Normalized Absolute Difference (NAD) for the Method Blank and subsequent evaluation criteria as defined in the Army Corp. guidance section III and elsewhere. When the NAD is found to be greater than 1.96 but less than 2.58, the sample results are qualified JMB# where # represents the isotopes blank activity. Such results are considered to be estimated and possibly undetected values due to the presence of blank contamination.

GEL, gross alpha/beta: The GEL report provides results for the method blank but does not provide an MDC. MCD levels are provided for samples, and no sample result is >5x MDC. The method blank is reported as a non-detect. Therefore no qualifications are required for method blank levels.
GEL, Sr-90: Sample results are all non-detects and the method blank is reported as a non-detect. No qualifications are required.
GEL, Cl-36: Sample results are all non-detects and the method blank is reported as a non-detect. No qualifications are required.

GEL, Tc-99: Sample results are all non-detects and the method blank is reported as a non-detect. No qualifications are required.
GEL, Total U: Uranium is not detected in these samples. The results for the method blank are reported as a non-detect. No qualifiers are required. Samples do show detected levels of total uranium.

2. The cross talk summary was acceptable and indicated no interferences
Yes ___ No_____ NA__X__
This information is not available in the GEL data packages.

IX. CHEMICAL YIELD SUMMARY
Chemical Yield (Tracer) Summary was analyzed to monitor the accuracy of percent samples recoveries and the percent recoveries were within the control limits.
Yes __X__ No ____ NA ____
GEL: Chemical yield recoveries are reported for Cl-36, Sr-90, and Tc-99. The recoveries reported are within limits.

X. FIELD QC
A. If Field duplicates or Performance Check Compounds were identified, they met the RPD or % recovery criteria for the project. Guidelines of 35% RPD for water were used unless the reported results are < 5 x Reporting Limit (RL) in which case 2 x RL difference is acceptable.
Yes ___ No____ NA __X__
No field duplicates are present in this data set.

B. For low level data, the following DER calculations can be applied.
The Normalized Absolute Difference for isotopes with activities $\leq$ 5X the MDC is considered for data validation rather than the Relative Percent Difference (RPD). If the NAD calculated is 1.96 < x > 3.29 the results for all samples have been qualified JD# where # represents the NAD calculated. If the NAD calculated were greater than 3.29 the results would be rejected. If the results are less than 1.96 no qualification has been made. Where results are greater than 5X the MDC the RPD is considered for data validation.
Yes___ No___ NA__X_

XI. CALCULATIONS
The calculation algorithm has been checked for 10% of the submitted data packages and accuracy of the reported results is verified.
Yes _____ No _____ NA__X__
Data for calculation checks are not provided in the GEL data package.

XII. OVERALL ASSESSMENT OF THE CASE
The data are considered fully useable for project purposes with consideration of the follow comments.

<u>Deliverables</u>

The following is noted:
The GEL Laboratories data package did not include raw data. Only summary QC results were provided. Gross alpha/beta was determined using EPA 900.0, Cl-36 by GL-RAD-A-033, Sr-90 by EPA 905.0, Tc-99 by DOE EML HASL-300, Tc-02-RC Modified, and total uranium by ASTM D-5174.

For the GEL data, a Level II review is conducted.

Please note: In addition to these data, tritium results from Isotech laboratories was reported. Only sample results were present with no QC. Therefore, it was not possible to validate the Isotech data.

Detection and Reporting Limits:
Cl-36, GEL: for the Cl-36 analysis the laboratory provides a nonconformance report stating that the required detection limit is not met due to sample matrix. No qualification is applied.

Matrix Spikes
Sr-90 – GEL: A matrix spike was conducted on sample 16-22D.
Cl-36 – GEL: A matrix spike was conducted on sample 16-22D.
Total Uranium – GEL: A matrix spike was conducted on sample 16-22D.

Although not all methods were spiked in this sample set, counting prior sets the recommended frequency of matrix spikes has been met.

All matrix spike recoveries are in control.

Matrix Duplicate
Matrix duplicates, not matrix spike duplicates, were analyzed using the same samples as were used for the matrix spikes.
Sr-90 – GEL: The matrix duplicate is in control.
Cl-36 – GEL: The matrix duplicate is in control.
Total Uranium – GEL: The matrix duplicate is in control.

RADIOCHEMISTRY QUALITY REVIEW REPORT
GAMMA SPECTROMETRY

SDG: 243333 (GEL)

PROJECT: Garfield County CO, Rulison Project for Olsson Assoc. Golden CO

LABORATORY: GEL Laboratories, LLC, Charleston, South Carolina

SAMPLE MATRIX: Water

SAMPLING DATE (Mo/Yr): December, 2009

NO.SAMPLES: 2

ANALYSES REQUESTED**:** Ac-228, Ag-110m, Am-241, Ba-133, Ba-140, Be-7, Bi-212, Bi-214, Ce-139, Ce-141, Ce-144, Co-56, Co-57, Co-58, Co-60, Cr-51, Cs-134, Cs-136, Cs-137, Eu-152, Eu-154, Eu-155, Fe-59, Fe-59, Hg-203, K-40, Kr-85, Mn-54, Na-22, Nb-94, Nb-95, Nd-117, Np-239, Pb-210, Pb-212, Pb-214, Pm-144, Pm-146, Ra-228, Ru-106, Sb-124, Sb-125, Sn-113, Th-230, Th-234, Tl-208, U-235, U-238, Y-88, Zn-65, Zr-95

SAMPLE NUMBERS: 16-22B, 16-22D

DATA REVIEWER: John Huntington

QA REVIEWER Diane Short & Associates, Inc. Initials/ Date

Telephone Logs included Yes____ No _X___

Contractual Violations Yes____ No __X__

The project Quality Assurance Project Plan (QAPP), the EPA Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, (SOP), the EPA method 901.1 and the Standard Operating Procedure SOPS noted in the report have been used by the reviewer to perform this data validation review. Only a limited number of the Data Validation QC items apply to radiochemical analyses. The remaining QC items have been taken from the Paragon Method QC. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of EPA. All chains of custody, calibrations, QC Forms have been validated and qualifiers added from the QC data on the Forms and an overview of the raw data.

I. DELIVERABLES

A. All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.
Yes ___X_ No___
The following is noted:
The GEL Laboratories data package did not include raw data. Only summary QC results were provided. The method used is EPA 901.1
For the GEL data, a Level II review is conducted.

B. The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes _X___ No____

II. INSTRUMENTATION

A. The detector range is appropriate for the samples being analyzed.
Yes ___ No___ NA _X_
Not part of this review level.

B. The system resolution is within the 1332 KeV range for Co-60.
Yes ___ No___ NA _X_
Not part of this review level.

C. The resolution is within the 3 KeV range for Co-60.
Yes ___ No___ NA _X_
Not part of this review level.

III. STANDARDS

A. Standards were NIST traceable or equivalent.
Yes ___ No___ NA _X_
Not part of this review level.

B. Standards for efficiency checks are counted at least once a month for each detector.
Yes ___ No___ NA _X_
Not part of this review level.

C. The check source standard has not shifted more than 2 channels from the centroid position.
Yes ___ No___ NA _X_
Not part of this review level.

D. Samples are counted for a duration long enough to achieve the RDL.
Yes ___ No___ NA _X_
Not part of this review level.

E. Background counts for the same duration as the sample runs are submitted and acceptable.
Yes ___ No___ NA _X_
Not part of this review level.

F. Each standard is measured for peak resolution as full-width at half-maximum height

(FWHM) and absolute counting efficiency and all center column readings (bounds test) "Pass".
Yes ___ No___ NA _X_
Not part of this review level.

G. The MDA was checked for 10% of the samples and is $\leq$ RDL.
Yes __X_ No____

IV. BLANKS
A. The method blank was analyzed at the required frequency.
Yes _X___ No____

B. And the results were within the required control limits. When average blanks or instrument background is subtracted to determine net counts, the net blank must be < 2 sigma uncertainty.
Yes __X__ No ____NA___
GEL: All results are reported as ND. No blank corrections are required.

Americium-241, Lead-214, and Thorium-230 were reported by the laboratory as "UI" in the method blank due to low abundance. With the exception of Americium-241 in sample 16-22B, these analytes are also reported as "UI" in the samples. In addition, lead 212 was qualified as "UI" by the laboratory in sample 16-22B. These results are qualified as JQ.

B. Field Blanks are identified and results are below the detection limit or < 2 x IDL.
Yes ____ No ____ NA __X__
No field blank is identified.

V. SPIKE SAMPLE RECOVERY
A. A matrix (pre-digestion) spike sample was analyzed for each digestion group and/ or matrix or as required in the SOW.
Yes ____No _X___
GEL: No MS was prepared. The laboratory has not commented about the reason.

The spiking of the large sample size (~500g) required for these analyses usually prohibits the spiking of radioactive compounds. The acceptable QC sample for accuracy for this analysis is the Laboratory Control Sample (LCS).

And the Matrix spike percent recoveries were within the required control limits of 75 – 125%
Yes ____No____ NA__X___

VI. DUPLICATES
A. Matrix (pre-digestion) duplicate samples were analyzed at the required frequency.
Yes __X__ No ____

B. And met the Duplicate Error Ratio (DER) criteria calculations which account for the 2 sigma efficiency values. DER limit is 1.0 (the DOE limit is 1.42)
Yes ____ No __X__
Some analytes did not meet the DER limit, as shown below. The non-detected results are

acceptable since they are non-detects in both duplicate and parent. The detected results with out of limit DER values suggest that the data may be impacted by sample non-homogeneity. These results are qualified as JD#, where # is the DER value, in both the duplicate and the parent sample. Detections agree in both parent and duplicate with the exception of Pb-214, which was not detected in the parent sample but was in the duplicate.

Sample ID	Parameter	Conc	RL	QAQC Flag	DER	MDC	Qualifier
16-22D	Am-241	-2.9	12.2	U	2.94526	12.2	
16-22D	Ba-140	-4.92	14.9	U	1.1979	14.9	
16-22D	Bi-212	-4.09	14.3	U	1.32113	14.3	
16-22D	Bi-214	11.8	3.5		1.5037	3.5	JD1.5
16-22D	Ce-139	0.0937	1.75	U	1.40153	1.75	
16-22D	Co-56	-1.01	1.82	U	1.09485	1.82	
16-22D	Cr-51	-14.6	20.4	U	1.58236	20.4	
16-22D	Cs-134	1.48	2.36	U	1.02878	2.36	
16-22D	Cs-136	-1.82	5.16	U	1.11328	5.16	
16-22D	Eu-152	0.264	5.12	U	1.35129	5.12	
16-22D	K-40	73.6	14.7		1.50872	14.7	JD1.5
16-22D	Nb-94	0.562	1.68	U	1.17064	1.68	
16-22D	Nb-95	-1.8	2.5	U	1.93463	2.5	
16-22D	Pb-212	1.64	3.6	U	1.3298	3.6	
16-22D	Pb-214	5.83	3.6		1.61317	3.6	JD1.6
16-22D	Ru-106	-7.49	15.2	U	1.11893	15.2	
16-22D	Sn-113	1.66	2.46	U	2.29748	2.46	
16-22D	Tl-208	-2.31	2.07	U	1.13557	2.07	
16-22D	Zn-65	-1.47	3.48	U	1.80711	3.48	
16-22D	Zr-95	2.12	3.53	U	1.86633	3.53	

C. If suspected "hot particles" were found, were samples re-analyzed.
Yes____ No __X__
No hot particles found, sample results low or BDL.

VII. LABORATORY CONTROL SAMPLE

A. An LCS was analyzed at the required frequency.
Yes __X__ No____

The laboratory used a subset of the nuclide target list in the LCS. Am-241, Co-60, and Cs-137 were spiked.

B. The LCS was within a control limit of 80-120% for water and 70 – 130% for soil.
Yes _X___ No____

C. The LCS uncertainty calculation verifies that the observed value of the LCS is within 3 sigma control limits of the expected LCS value and the relative percent error does not exceed 5 %.
Yes _X___ No____

VIII. DETECTION LIMITS
A. Detection limits met the method limits.
Yes __X__ No____
The instrument detection limit was within an isotope-specific limit for the calibration standards and QC samples.

The test for detection of a radionuclide includes two distinct steps, first to evaluate if it is > MDC, then to determine if the sample result is > the TPU. All results in this case are less than the MDC. In cases where the sample result is < the TPU, the result is not considered to be different from zero. If it is above the TPU the result could be high enough to represent detection below the MDC.

Negative results that have absolute values above the TPU could potentially indicate a low bias due to shifting background.

The laboratory has flagged a number of results with "UI" to indicate that they suffer from some type of detection issue. These results could potentially suffer from negative bias and are qualified as JQ. See table below for details.

Client Sample	Analyte	Result	RL	Flag	Qualifier
16-22B	Pb-214	0	4.64	UI	JQ
16-22B	Th-230	0	574	UI	JQ
16-22D	Am-241	0	8.31	UI	JQ
16-22D	Pb-214	0	4.36	UI	JQ
16-22D	Th-230	0	576	UI	JQ

In addition, in the results for Kr-85, there are high negative values greater than the MDC, and also greater than the TPU. These results could suffer from some negative bias and are qualified JQ.

B. The energy of the identified peaks are within 2 KeV of the library energy of the radionuclide.
Yes____ No____ NA___X_
No raw data were provided for the GEL samples and results were all non-detect.

C. Decay-corrected results have been reports appropriately for the short half-life results
Yes____ No____ NA__X_

This could not be determined from the data provided from GEL. Past reports have indicated the reporting from GEL of decay corrected results with the following comment: "Decay correction is necessary for short half-life isotopes which are not in equilibrium with the parent isotope, thus the measured radionuclide has decayed to a lower level prior to analysis and would require correction back to collection. However, for virtually all isotopes of interest, the isotopes are in equilibrium and the decay is matched by its production from the parent isotope decay. Thus, decay correction would result in a high biased activity." In all reported results in past reported provided to the reviewer, the decay correction did not impact the use of the data, nor the accuracy of the reported result. This would be particularly true of the GEL results which are low level and considered to be 'J' estimated values.

D. Tentatively Identified Radionuclides (TIR)
TIRs were reported and correctly identified from the library search.
Yes____ No_____ N__X_
No TIRs are reported.

IX. PREPARATION AND ANALYSIS LOGS
A. All samples were prepared or analyzed within the required holding times referencing the SOW (time of sample receipt to preparation/distillation).
Yes _X___ No____

B. All samples were analyzed within the EPA Method recommended holding times (time of sample collection to date of analysis).
Yes __X__ No____
No 40 CFR limits exist for radchem, so method limits were referenced. All samples were analyzed within 90 days of collection.

X. CHAINS OF CUSTODY
A. All chains of custody were complete with initials, dates, times and any changes are crossed out with one line and initialed.
Yes __X_ No ___

B. Samples arrived intact, at the proper pH (< 2) and temperature.
Yes ___ No__X__
Samples were received at a pH of approximately 7. The sample containers were pre-preserved but the buffering capacity of the water (these are production water from gas wells) was such that the resulting pH was above 2. The laboratory added preservative to bring the sample pH into the acceptance range. This is permissible per 40CFR and should have no impact on the results. No qualifiers are added.

The laboratory noted that 16-22B contained a layer of nonaqueous phase liquid (LNAPL). They requested guidance from the client and were instructed to decant the oil phase and analyze the aqueous phase only. Thus the analytical results pertain only to that phase of the sample.

XI. FIELD QC
Field QC samples were identified and have met a guidance limit of CLP 30% for water and 50% for soil, or $\pm$ 2 x RL (water) or 3.5 x RL (soil) for results < 5 x RL. Or for radiochemistry, the results relative to the 2 sigma counting error (uncertainty) may be used.

The difference between the 2 results is compared against the uncertainty for each sample result. DER of > 1 is to be discussed. No qualifiers are applied.
Yes ____ No____ NA __X__
No field duplicates are present.

XII. OVERALL ASSESSMENT OF THE CASE
The data are considered fully useable for project purposes with consideration of the qualifications or comments.

Deliverables:
The following is noted:
The GEL Laboratories data package did not include raw data. Only summary QC results were provided. The method used is EPA 901.1
For the GEL data, a Level II review is conducted.

Sample Preservation and Chain of Custody:
Samples were received at a pH of approximately 7. The sample containers were pre-preserved but the buffering capacity of the water (these are production water from gas wells) was such that the resulting pH was above 2. The laboratory added preservative to bring the sample pH into the acceptance range. This is permissible per 40CFR and should have no impact on the results. No qualifiers are added.

The laboratory noted that 16-22B contained a layer of nonaqueous phase liquid (LNAPL). They requested guidance from the client and were instructed to decant the oil phase and analyze the aqueous phase only. Thus the analytical results pertain only to that phase of the sample.

Detection Limits
The instrument detection limit was within an isotope-specific limit for the calibration standards and QC samples.

The test for detection of a radionuclide includes two distinct steps, first to evaluate if it is > MDC, then to determine if the sample result is > the TPU. All results in this case are less than the MDC. In cases where the sample result is < the TPU, the result is not considered to be different from zero. If it is above the TPU the result could be high enough to represent detection below the MDC.

Negative results that have absolute values above the TPU could potentially indicate a low bias due to shifting background.

The laboratory has flagged a number of results with “UI” to indicate that they suffer from some type of detection issue. These results could potentially suffer from negative bias and are qualified as JQ.

In addition, in the results for Kr-85, there are high negative values greater than the MDC, and also greater than the TPU. These results could suffer from some negative bias and are qualified JQ.

Matrix Duplicates

Some analytes did not meet the DER limit, as shown in the table within this report. The non-detected results are acceptable since they are non-detects in both duplicate and parent. The detected results with out of limit DER values suggest that the data may be impacted by sample non-homogeneity. These results are qualified as JD#, where # is the DER value, in both the duplicate and the parent sample. Detections agree in both parent and duplicate with the exception of Pb-214, which was not detected in the parent sample but was in the duplicate.

Method Blanks

GEL: All results are reported as ND. No blank corrections are required.

Americium-241, Lead-214, and Thorium-230 were reported by the laboratory as "UI" in the method blank due to low abundance. With the exception of Americium-241 in sample 16-22B, these analytes are also reported as "UI" in the samples. In addition, lead 212 was qualified as "UI" by the laboratory in sample 16-22B. These results are qualified as JQ.