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*Date*: JAN 14 2011
*Refer To*: EP2011-0029

Mr. Brian Snyder, Water Division Director
Acting Public Utilities Division Director
Sangre de Cristo Water Division
City of Santa Fe
801 West San Mateo
P.O. Box 909
Santa Fe, New Mexico 87504

**Subject: Los Alamos National Laboratory Surface Water Monitoring Results, Rio Grande above the City of Santa Fe's Buckman Direct Diversion**

Dear Mr. Snyder:

This report, prepared by Los Alamos National Laboratory (LANL or the Laboratory), provides analytical results from the July 13, 2010, sampling of the Rio Grande above the City of Santa Fe's Buckman Direct Diversion (BDD). All results were below U.S. Environmental Protection Agency (EPA) drinking water standards, with the exception of the following naturally occurring metals.

- Aluminum (Al) was measured in an unfiltered sample at a concentration of 612 µg/L; the EPA national secondary drinking water standard for aluminum is 50 µg/L–200 µg/L. The concentration of aluminum in the filtered sample was <200 µg/L.

- Iron (Fe) was measured in an unfiltered sample at a concentration of 428 µg/L; the EPA national secondary drinking water standard for iron is 300 µg/L. The concentration of iron in the filtered sample was <100 µg/L.

- Manganese (Mn) was measured in an unfiltered sample at a concentration of 60.7 µg/L; the EPA national secondary drinking water standard for manganese is 50 µg/L. The concentration of manganese in the filtered sample was 4.46 µg/L.

In a November 1, 2007, letter the BDD Board requested that LANL and the U.S. Department of Energy (DOE) fund and implement six actions to protect public drinking water supplies (H. Montoya, Chair, BDD Board, to G. Rael, DOE, and S. Stiger, LANL). Pursuant to the letter's action item 2, *Properly monitor the transport of legacy contaminants in both the surface water and groundwater flow systems*, on July 30, 2008, LANL initiated bimonthly sampling of the Rio Grande at Otowi Bridge and at Buckman upstream of the BDD. This report presents the analytical results from the July 13, 2010, 11:30 a.m., sampling event at Buckman. The results from sampling the Rio Grande at Otowi Bridge will be reported separately once the Pueblo of San Ildefonso has had an opportunity to review the data.

Please be advised that the July 13, 2010, sampling of the Rio Grande at Buckman was the last surface water monitoring event conducted at this location under the above-referenced initiative; future monitoring will be executed pursuant to the May 13, 2010, Memorandum of Understanding Regarding Water Quality Monitoring between the BDD Board and the DOE.

Analytical results from the July 13, 2010, event are summarized in Tables 1.0 to 6.0. The attached CD also contains the following items: (1) Desert Research Institute (DRI) geotechnical reports for particle-size analysis from both the May 10, 2010, and July 13, 2010, sampling events; and (2) an Excel file of Tables 1.0 to 6.0 and a glossary of laboratory qualification codes, secondary validation codes, and secondary validation reason codes. A discussion of the analytical results follows.

**Radionuclides:** Samples were collected from the Rio Grande at Buckman and submitted to General Engineering Laboratories, Inc. (GEL) and American Radiation Services, Inc. (ARSL) for the analysis of radionuclides. Analytical results are summarized in Table 1.0. The results are discussed below.

- **Americium-241, Cesium-137, Neptunium-237, Plutonium-238, Plutonium-239/240, and Strontium-90**: All filtered and unfiltered results were nondetect, as indicated by the analytical laboratory qualifier code "U."

- **Gross Alpha:** Gross alpha was not detected in the filtered and unfiltered samples, as indicated by the analytical laboratory qualifier code "U."

- **Gross Beta:** Gross beta was not detected in the filtered sample, as indicated by the analytical laboratory qualifier code "U." Gross-beta activity in the unfiltered sample was 3.8 pCi/L, below the EPA screening level of 50 pCi/L for gross beta in drinking water.

- **Radium-226:** Radium-226 was not detected in the filtered and unfiltered samples, as indicated by the analytical laboratory qualifier code "U."

- **Radium-228:** Radium-228 was not detected in the filtered sample, as indicated by the analytical laboratory qualifier code "U." Radium-228 activity in the unfiltered sample was 2.42 pCi/L, below the EPA maximum contaminant level (MCL) of 5 pCi/L for radium-228 in drinking water.

- **Isotopic Thorium**: Filtered and unfiltered samples were submitted to GEL for isotopic thorium analysis. All filtered results were nondetect, as indicated by the analytical laboratory qualifier code "U." Unfiltered thorium activities were less than 0.08 pCi/L. The EPA has not established a drinking water standard for thorium. Thorium, like uranium, occurs naturally in the environment.

- **Tritium:** Tritium activity in the unfiltered sample was 12.5 pCi/L, below the EPA MCL of 20,000 pCi/L for tritium in drinking water and consistent with background atmospheric tritium levels in northern New Mexico of about 30 pCi/L.

- **Isotopic Uranium**: Filtered and unfiltered samples were submitted to GEL for isotopic uranium (U) analysis using alpha spectroscopy. The EPA has not established an activity-based MCL for uranium isotopes in drinking water; the current EPA MCL of 30 µg/L is a mass-based standard. The mass of uranium in each sample was calculated using the following formula, which incorporates the specific activities for the isotopes:

$$\text{Total uranium } (\mu g/L) = (^{233/234}U/6250) + (^{235/236}U/2.16) + (^{238}U/0.336)$$

The calculated concentrations of total uranium are presented below. These values are consistent with the total uranium results obtained from inductively coupled plasma/mass spectrometry (ICPMS) analysis presented in Table 6.0. All results are below the EPA MCL of 30 µg/L for total uranium in drinking water.

| Location | Field Prep (F/UF) | Total Uranium –Calculated– (pCi/L) | Total Uranium –ICPMS– (pCi/L) |
|---|---|---|---|
| Buckman Diversion SW | F | 1.2 | 1.4 |
| Buckman Diversion SW | UF | 1.3 | 1.4 |

**Organics:** Samples were collected from the Rio Grande at Buckman and submitted to GEL for the analysis of organics. The analytical results are summarized in Tables 2.0, 3.0, and 4.0 and are discussed below.

- **Volatile Organic Compounds (VOCs):** No VOCs were detected in the unfiltered sample or field trip blank at concentrations greater than GEL's method detection limit (MDL).

- **Semivolatile Organic Compounds (SVOCs):** No SVOCs were detected in the unfiltered sample at concentrations greater than GEL's MDL.

- **Pesticides:** No pesticides were detected in the unfiltered sample at concentrations greater than GEL's MDL.

- **Polychlorinated Biphenyls (PCBs):** An unfiltered sample and unfiltered field blank (FB) were submitted to Cape Fear Analytical (CFA) for the analysis of 209 PCB congeners using analytical method EPA:1668A. Congeners are individual PCB compounds. Table 4.0 presents the total detected PCBs—the sum of detected PCB congeners—in each sample. The results are summarized below.

| Location | Analyte | Field Prep | Result (µg/L) | Result (pg/L) | Lab Qual Code | Concat Flag Code | Fld QC Type Code |
|---|---|---|---|---|---|---|---|
| Buckman Diversion SW | Total detected PCBs | UF | <0.0000000 | <0.00 | U | U | |
| Buckman Diversion SW | Total detected PCBs | UF | <0.0000000 | <0.00 | U | U | FB |

The sample and FB were reported as nondetect for PCBs by CFA, as indicted by the qualifier code "U." Individual congener results have not been included in this report but are available online at RACER NM (http://www.racernm.com/).

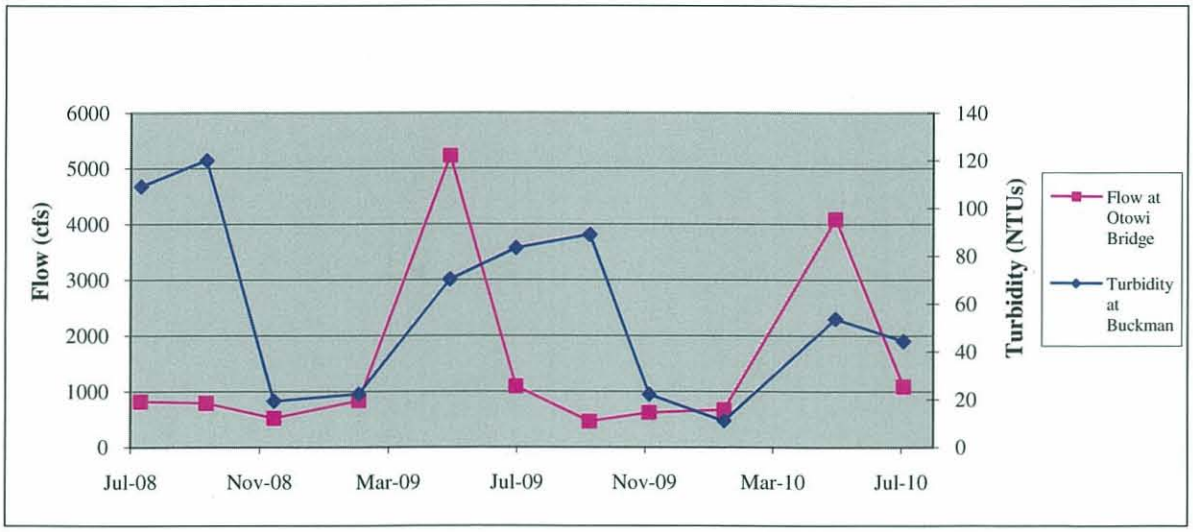
**General Inorganics:** Samples were submitted to GEL for the analysis of general inorganics. Field measurements were taken for dissolved oxygen, conductivity, temperature, turbidity, and pH. The results are summarized in Table 5.0 and discussed below.

- **Perchlorate**: The unfiltered perchlorate concentration was 0.08 µg/L. Currently, neither the federal government nor the State of New Mexico has established a drinking water standard for perchlorate.

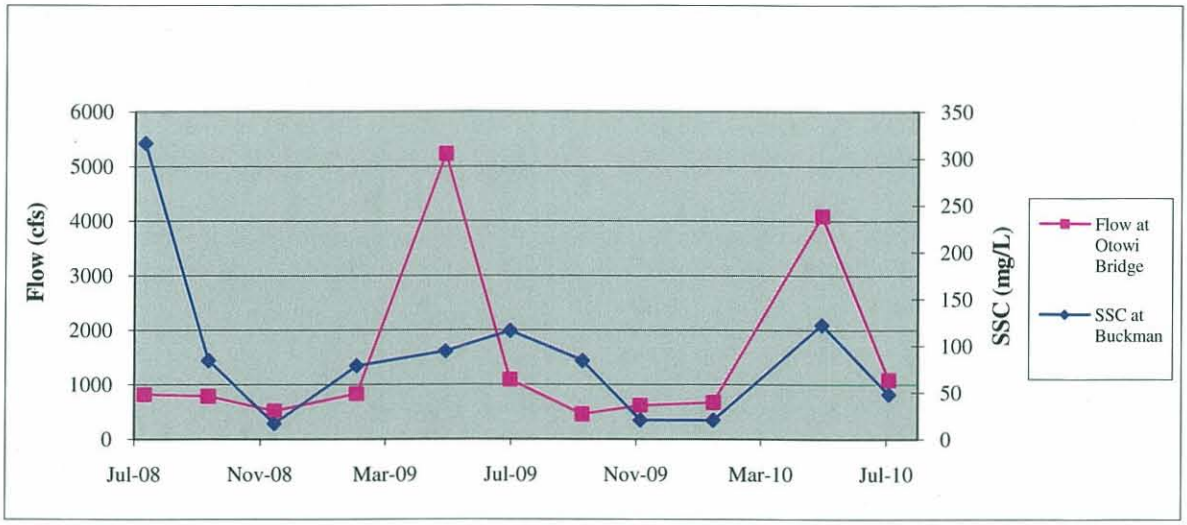
- **Cyanide, Fluoride, and Nitrate+Nitrite (as N):** All results were below EPA MCLs.

- **Chloride, Sulfate, Total Dissolved Solids, and pH:** All results were below EPA secondary drinking water standards.

- **Turbidity, Suspended Solids Concentration (SSC), and Streamflow:** Turbidity was measured at 44.2 nephelometric turbidity units (NTU). As shown in the figure below, turbidity values in the Rio Grande at Buckman have ranged from 11 to 120 NTU since July 2008.




The unfiltered SSC was 47.6 mg/L. As shown in the figure below, SSC values in the Rio Grande at Buckman have ranged from 16 to 316 mg/L since July 2008.




The U.S. Geologic Survey (USGS) collects real-time streamflow data from the Rio Grande and Rio Chama upgradient of the Buckman sampling site. Daily mean discharge data for July 13, 2010, are presented below.

| USGS Station Name | Date | Daily Mean Discharge ($ft^3/s$) |
|---|---|---|
| Rio Grande at Otowi Bridge (USGS 08313000) | 7/13/10 | 1080 |
| Rio Grande at Embudo (USGS 08279500) | 7/13/10 | 311 |
| Rio Chama near Chamita (USGS 08290000) | 7/13/10 | 627 |

Source: http://waterdata.usgs.gov/nm/nwis/current/?type=flow.

**Metals**: Filtered and unfiltered samples were collected from the Rio Grande at Buckman and submitted to GEL for metals analysis. All results are summarized in Table 6.0. The concentrations of filtered and unfiltered metals were below the EPA national primary and secondary drinking water standards, with the exception of aluminum, iron, and manganese reported on page 1 of this report.

**Particle Size:** Particle-size results from both the May 10, 2010, and July 13, 2010, sampling events are included in this report.

- May 10, 2010, Sampling Event. An unfiltered sample (CAWR-10-17019) and unfiltered field duplicate (FD) sample (CAWR-10-17022) were submitted to DRI, Reno, NV, for particle-size analysis (see the enclosed CD for a copy of the geotechnical report). The sand, silt, and clay contents of these two samples are presented in the following table.

| % Size Fraction | Rio Grande at Buckman CAWR-10-17019 | Rio Grande at Buckman-FD CAWR-10-17022 |
|---|---|---|
| Sand | 16.21% | 18.64% |
| Silt | 72.25% | 70.48% |
| Clay | 11.54% | 10.88% |

- July 13, 2010, Sampling Event. An unfiltered sample (CAWR-10-24220) was submitted to the DRI for particle-size analysis (see the enclosed CD for a copy of the geotechnical report). The sand, silt, and clay contents of the sample are presented in the following table.

| % Size Fraction | Rio Grande at Buckman CAWR-10-24220 |
|---|---|
| Sand | 22.77% |
| Silt | 69.84% |
| Clay | 7.39% |

In summary, all results presented in this report are below EPA drinking water standards, with the exception of unfiltered aluminum, iron, and manganese.

If you have any questions, please contact Bob Beers at (505) 667-7969 (bbeers@lanl.gov) or Cheryl Rodriguez at (505) 665-5330 (crodriguez2@doeal.gov).

Sincerely,

Michael J. Graham, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

George J. Rael, Manager
Environmental Projects Office
Los Alamos Site Office

MG/GR/SP/BB:sm

Attachment: CD with the following items:
(1) Geotechnical reports from the DRI for particle-size analysis
(2) Excel file of Tables 1.0–6.0 and glossary of laboratory qualification codes, secondary validation codes, and secondary validation reason codes (LA-UR-10-7037)

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