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LMS/RBL/S08511
Task Order LM00-502
Control Number 12-0232

December 21, 2011

U.S. Department of Energy
Office of Legacy Management
ATTN: Art Kleinrath
Site Manager
2597 Legacy Way
Grand Junction, CO 81503

SUBJECT: Contract No. DE-AM01-07LM00060, S.M. Stoller Corporation (Stoller)
Task Order LM00-502, Other Defense Activities – Other Sites
Rio Blanco, Colorado, Site Long-Term Hydrologic Monitoring Program (LTHMP) Sampling and Analysis Results for 2011

REFERENCE: Task Order LM00-502-07-618, Rio Blanco, Colorado, Site

Dear Mr. Kleinrath:

The U.S. Department of Energy (DOE) Office of Legacy Management conducted annual sampling at the Rio Blanco site for the LTHMP on May 16 and 17, 2011. The samples were shipped to the U.S. Environmental Protection Agency (EPA) Radiation & Indoor Environments National Laboratory in Las Vegas, Nevada, for analysis. All requested analyses were successfully completed, with the exception of the determination of tritium concentration by the enrichment method, because the laboratory no longer provides that service. Samples were analyzed for gamma-emitting radionuclides by high-resolution gamma spectrometry and tritium using the conventional method. Starting in 2012, DOE will retain a different laboratory that provides the enriched tritium analysis service.

Site Location and Background

The Rio Blanco site is located in Rio Blanco County in western Colorado (see enclosed Figure 1). The Rio Blanco test was designed and conducted to evaluate the use of nuclear detonations to fracture the tight, gas-bearing sandstone reservoirs in the Piceance Basin for enhanced natural gas production. The test involved the simultaneous detonation of three nuclear devices stacked vertically, that was designed to create a single elongate chimney. Each of the three detonations had an estimated yield of 33 kilotons. The test was conducted on May 17, 1973, at depths of 5,838, 6,230, and 6,689 feet below ground surface in the upper portion of the Mesaverde Group and the lower portion of the Fort Union Formation. The test failed to create a single elongate chimney.

Sampling locations (see enclosed Figure 2) are a combination of wells and surface water locations that range from approximately 100 feet from surface ground zero (SGZ) to 7 miles from SGZ. EPA performed the LTHMP sampling from program inception at Rio Blanco in 1976 through 2007. Results of the historical monitoring at Rio Blanco have consistently shown that nuclear-test-related contamination has not affected groundwater and surface water at the sampling locations. DOE has evaluated the LTHMP and concluded that monitoring shallow groundwater and surface water at locations both near to and distant from SGZ was not an effective method to detect detonation-related contamination. The evaluation concluded that an updated monitoring program focused on detecting contaminant migration from the detonation zone was warranted. Natural gas production wells are considered the most likely pathway for transporting detonation-derived contaminants. Therefore, the updated monitoring program emphasizes the sampling of natural gas production wells in the vicinity of the Rio Blanco site, in addition to the ongoing LTHMP sampling and analysis. Results of the natural gas monitoring program are available online at www.lm.doe.gov/Rio_Blanco/Documents.aspx at the link titled "Natural Gas Well Monitoring Results."

Sample Analytical Results

Table 1 shows sample analysis results. The results demonstrate that none of the sampling locations are being impacted by detonation-related contaminants. Conventional tritium analytical results for all of the sampling locations were below detection limits. Figures 3 and 4 show historical results of tritium analyses, the EPA drinking water standard, and the tritium decay line (Figure 3 only). For comparison, the EPA drinking water standard for tritium is 20,000 pCi/L. Figure 4 shows that very few of the historical sample results from wells have exceeded the detection limit.

The high-resolution gamma spectrometry results for gamma-emitting radionuclides detected measurable concentrations of potassium-40 at onsite well RB-D-01, bismuth-212 at the Johnson Artesian Well, and lead-214 at the Fawn Creek 6800 feet upstream sampling location (Table 1). All three of these radioisotopes occur naturally, are not fission products from a nuclear detonation, and therefore, do not indicate the presence of detonation-related contamination. Bismuth-212 occurs as a decay product in the thorium-232 decay chain, and lead-214 occurs as a decay product in the uranium-238 decay chain.

No other radionuclides were detected by the high-resolution gamma spectrometry analysis.

Table 1. Rio Blanco LTHMP Water Sample Analysis Results

Sample Location	Collection Date	Tritium[a] (pCi/L)	Gamma Spectrometry[b] (pCi/L)
RB-D-01 (onsite well)	05/17/2011	ND	29.1 (K-40)
RB-S-03 (onsite well)	05/17/2011	ND	ND
RB-D-03 (private well)	05/17/2011	ND	ND
RB-W-01 (private well)	05/17/2011	ND	ND
Johnson Artesian Well (private well)	05/16/2011	ND	20.4 (Bi-212)
Brennan Windmill (private well)	05/16/2011	ND	ND
Fawn Creek 500ft Dwn (surface location)	05/17/2011	ND	ND
Fawn Creek 500ft Ups (surface location)	05/17/2011	ND	ND
B-1 Equity Camp (surface location)	05/16/2011	ND	ND
CER #1 Black Sulphur (surface location)	05/16/2011	ND	ND
CER #4 Black Sulphur (surface location)	05/16/2011	ND	ND
Fawn Creek #1 (surface location)	05/16/2011	ND	ND
Fawn Creek #3 (surface location)	05/17/2011	ND	ND
Fawn Creek 6800ft Up (surface location)	05/17/2011	ND	4.97[c] (Pb-214)
Fawn Creek 8400ft Dw (surface location)	05/17/2011	ND	ND

[a] Conventional method tritium detection limits ranged from 144 pCi/L to 147 pCi/L.
[b] Gamma spectrometry detection limits are nuclide-specific and sample-specific.
[c] Estimated value (less than 3 times the detection limit).
ND = not detected

Conclusions

Tritium and gamma-emitting radionuclide concentrations in water samples collected at Rio Blanco are consistent with historical sample analysis results. The results continue to verify that groundwater and surface water supplies at the sampling locations have not been impacted by detonation-related contaminants.

Please contact me at (970) 248-6477 with any questions.

Sincerely,

Richard D. Hutton
Task Manager

Enclosures

cc: Jack Duray, Stoller
Rex Hodges, Stoller

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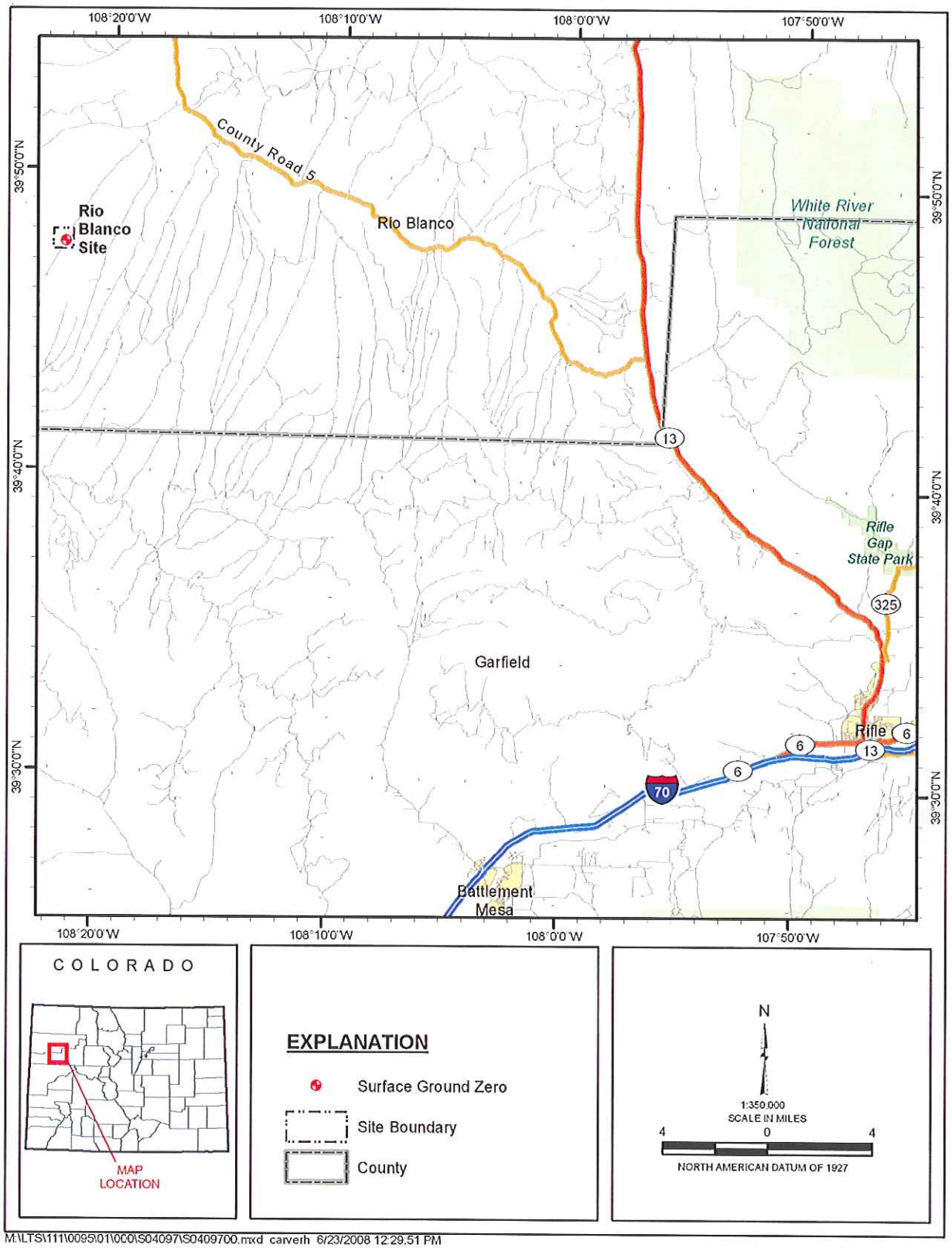

Figure 1. Rio Blanco, Colorado, Site Location Map

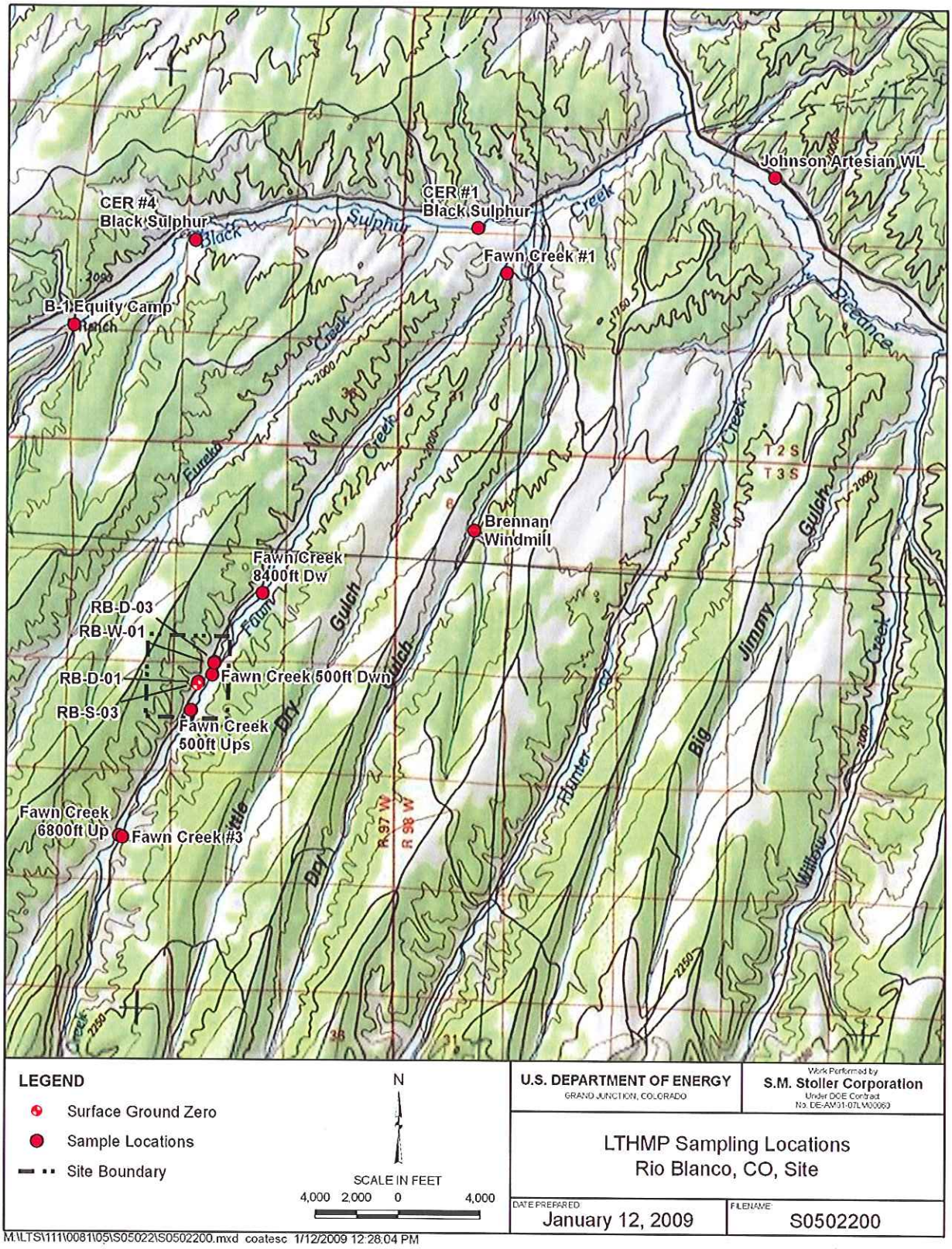

Figure 2. LTHMP Sampling Locations, Rio Blanco, Colorado, Site

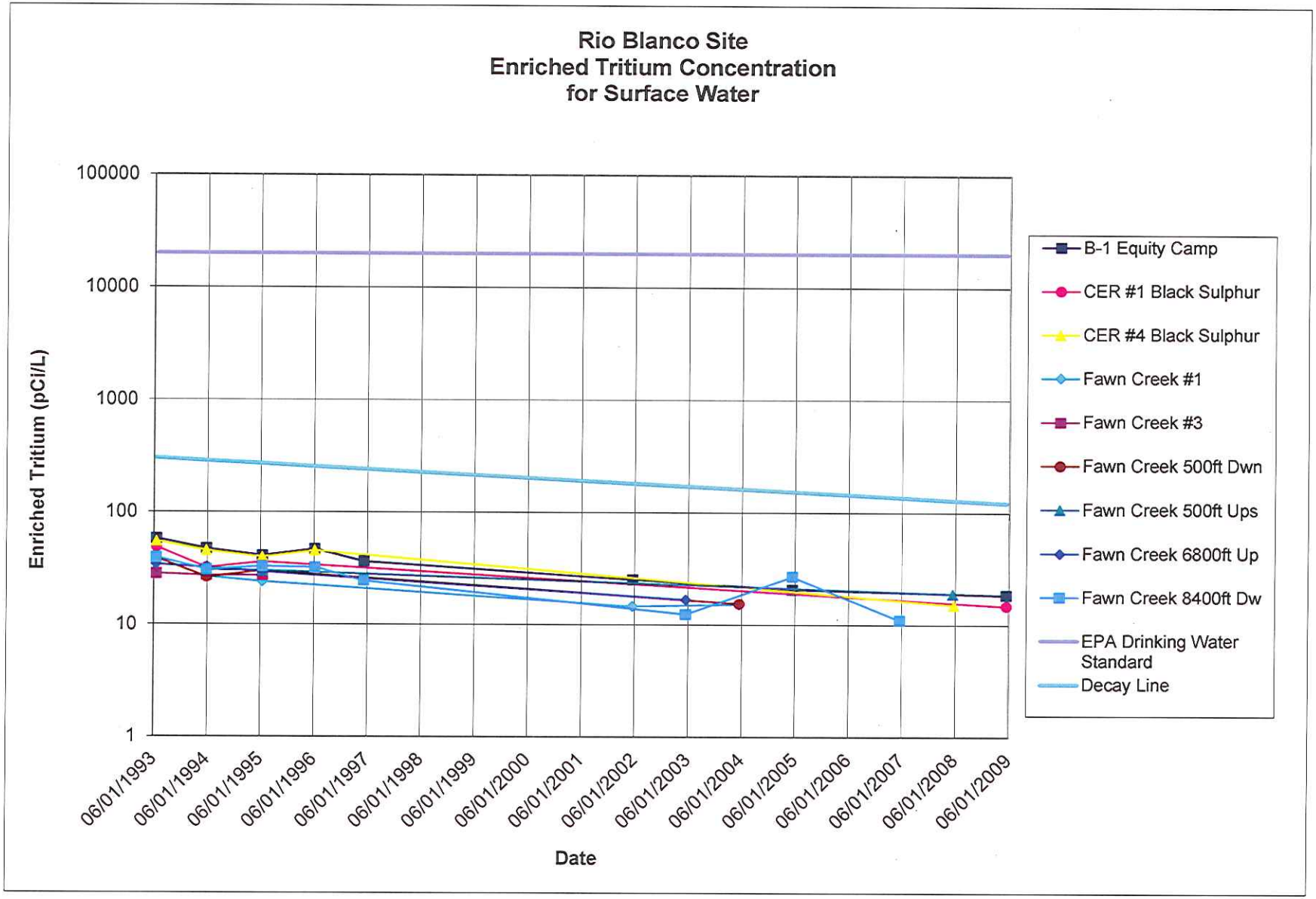

Figure 3. Tritium Concentration in Surface Water Samples Analyzed by Electrolytic Enrichment Method, Rio Blanco, Colorado, Site

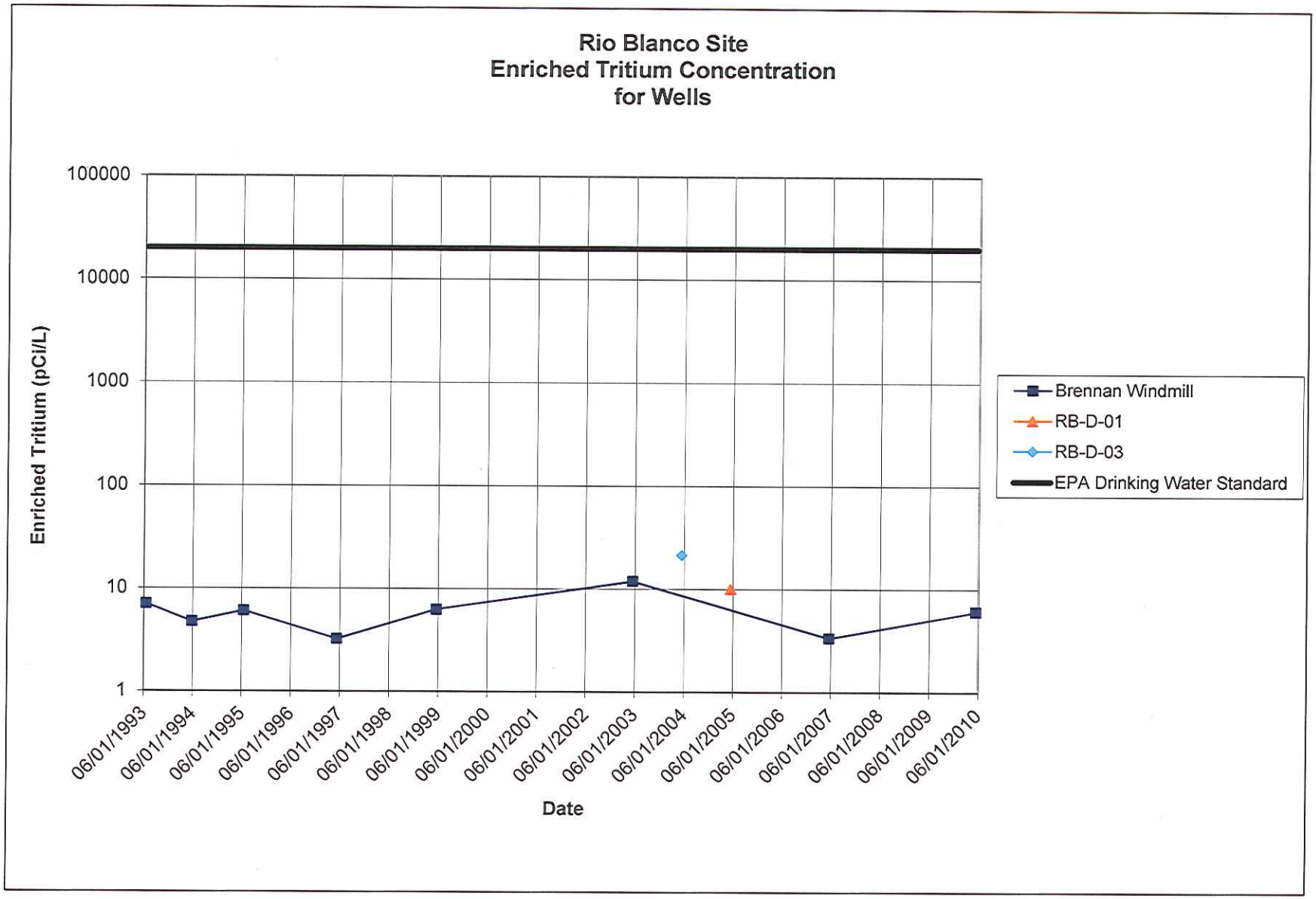

Figure 4. Tritium Concentration in Well Samples Analyzed by Electrolytic Enrichment Method, Rio Blanco, Colorado, Site