Los Alamos
NATIONAL LABORATORY

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Date: December 21, 2000
In Reply Refer To: ESH-18/WQ&H:00-0420
Mail Stop: K497
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Mr. Hank L. Daneman
P.O. Box 31056
Santa Fe, NM 87594

SUBJECT: GROUNDWATER STRONTIUM-90 DATA AT LOS ALAMOS FOR 1999

Dear Mr. Daneman:

I have been asked to respond to issues raised in your November 30, 2000 email to Dr. John Browne, Laboratory Director, concerning strontium-90 monitoring in the regional aquifer at Los Alamos National Laboratory. I am a hydrologist and a member of the Laboratory's Water Quality and Hydrology Group. I am responsible for groundwater monitoring conducted under the Laboratory's Environmental Surveillance Program.

Before responding specifically to your email, I provide some general comments.

Contamination of the Los Alamos regional aquifer by strontium-90 would be of significant concern to our community. The Laboratory staff, the Department of Energy, Los Alamos County, and the New Mexico Environment Department work together to assure that the best possible methods are used to monitor groundwater quality at Los Alamos. While strontium-90 contamination is present at LANL in the shallow alluvial groundwater of Los Alamos Canyon and Mortandad Canyon, there is no reliable evidence that this contamination has affected the underlying regional aquifer, which provides our drinking water. These groundwater bodies are separated in depth by hundreds of feet of unsaturated rock.

LANL, DOE, and NMED are committed to maintaining and improving our groundwater monitoring capability and to increasing our understanding of possible impacts by LANL on groundwater quality. Our actions taken to understand possible contamination of groundwater at Los Alamos include:

- Annual water supply sampling to ensure compliance with the Safe Drinking Water Act;
- Additional sampling at more frequent intervals in specific wells for contaminants such as strontium-90;
- Annual environmental surveillance monitoring since the late 1950s, conducted by the US Geological Survey and LANL, and supplemented by the NMED DOE Oversight Bureau and the US Environmental Protection Agency;
- Work by the Environmental Restoration Project to assess and remediate legacy contamination;
- Initiatives by the Laboratory to decrease discharges to the environment;

- A comprehensive groundwater characterization program by the Laboratory (the Hydrogeologic Workplan) in partnership with NMED; and

- Extensive site-specific studies to evaluate potential impacts on our drinking water of disposal operations at Area G and Area L and at other sites.

The US Geological Survey installed wells near areas of radioactive liquid effluent discharges in the 1950s and 1960s to determine whether the discharges endangered drinking water supplies. The results from 50 years of monitoring and studies indicate that radioactivity has not polluted our drinking water.

Your November 30 email includes an attachment that lists three of the NMED DOE Oversight Bureau's strontium-90 data points from water supply well PM-1. Your attachment appears to attribute these data to NMED's DOE Oversight Bureau. A response to these questions should therefore come from the DOE Oversight Bureau. We have, however, the following comments:

- The role of the NMED DOE Oversight Bureau is to supplement and verify the environmental sampling conducted by LANL, rather than to maintain their own rigorous sampling program for every analyte at every location;

- The NMED DOE Oversight Bureau has done an excellent job of obtaining high quality analytical data as part of their oversight function; and

- The NMED DOE Oversight Bureau has not officially released the strontium-90 value reported for August 14, 2000 to LANL or DOE at this time. Based on the informally released value (1.7 +/- 1.2 (two sigma) pCi/L, MDA 2.0 pCi/L), this measurement is a nondetection, because the analytical result is less than the three sigma value of 1.8 pCi/L and less than the analytical detection limit of 2.0 pCi/L. Note that Keith (1991) recommends the criterion of three sigma[1].

In your attachment you also assert that DOE has control over acceptance and publication of measurements of samples taken by the NMED DOE Oversight Bureau. While DOE is permitted a 30-day review and comment period prior to release of data by the NMED DOE Oversight Bureau, the DOE has no control whatsoever over acceptance and publication of the results.

In response to your concern about monitoring of strontium-90 in water supply well PM-1 we offer the following table, which compiles data collected by LANL and NMED's DOE Oversight Bureau. The LANL data show significant decreases in our analytical detection limit for strontium-90 since 1998. The NMED sample for August 14, 2000 is not included in the table because it has not been officially released. As noted above, judging by the informal release, this sample would be cited as a nondetection. The August 14, 2000 result listed in the table for LANL is the result of a sample split with the DOE Oversight Bureau.

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[1] p. 108 in Keith, L.H., Environmental Sampling and Analysis: A Practical Guide, Lewis Publishers, Boca Raton, 143 pp., 1991.

Regarding the issue of sample frequency, the table shows that LANL sampled PM-1 for strontium-90 much more frequently over the last two years than every 17 months. LANL collected two samples (on June 8 and December 13, 1999) after the March 9, 1999 date of the apparent detection of strontium-90 by NMED. LANL has sampled the well on a quarterly schedule in 2000 and this will continue during 2001.

Of the 15 measurements tabulated, only one, the March 9, 1999 NMED DOE Oversight Bureau sample, is an apparent analytical detection of strontium-90. In contrast, a split sample collected by LANL on March 9, 1999 yielded no detection of strontium-90, with a detection limit below the analytical result for the NMED sample.

In summary, the PM-1 strontium-90 data, taken over a 25-year period, do not make a case for presence of strontium-90 in this well. For any single measurement, an error may result due to problems such as contamination during collection; sample mix-ups; and analytical laboratory problems such as recording errors, analysis inaccuracy, or difficulties with analytical media or instruments. Therefore, regular monitoring is required to assemble the body of data needed to determine the presence of a particular analyte. LANL, DOE, and NMED are all committed to such monitoring.

Strontium-90 Data for Water Supply Well PM-1

LANL and NMED strontium-90 values prior to 1999

Station	Date	Value	1 Sigma Uncertainty	MDA	Detection?*	Data Source
PM-1	07/12/76	-1.10	0.80	3.00	ND	LANL
PM-1	02/28/80	0.10	0.30	3.00	ND	LANL
PM-1	12/02/94	0.30	0.80	3.00	ND	LANL
PM-1	06/12/95	4.60	10.80	3.00	ND	LANL
PM-1	04/25/96	0.20	0.90	3.00	ND	LANL
PM-1	06/25/97	<0.60		0.60	ND	NMED
PM-1	06/25/97	-0.90	1.80	3.00	ND	LANL
PM-1	06/08/98	0.33	0.78	3.00	ND	LANL

LANL and NMED strontium-90 values for 1999

Station	Date	Value	1 Sigma Uncertainty	MDA	Detection?*	Data Source
PM-1	3/9/99	0.31	0.25	0.77	ND	LANL
PM-1	3/9/99	1.14	0.115	0.15	Detect	NMED
PM-1	6/8/99	0.10	0.05	0.10	ND	LANL
PM-1	12/13/99	-0.75	0.22	0.44	ND	LANL

LANL strontium-90 values for 2000

Location	Date	Result	1 Sigma Uncertainty	MDA	Detection?*	Data Source
PM-1	2/14/00	0.01	0.03	0.10	ND	LANL
PM-1	6/20/00	0.04	0.045	0.15	ND	LANL
PM-1	8/14/00	-0.04	0.045	0.16	ND	LANL

*Note: detection defined as analytical result ≥ 3 × one sigma uncertainty and ≥ method detection limit (MDA)

Your November 30 email questions whether anyone reacted to the strontium-90 findings during 1999. In early August 1999, we learned that strontium-90 was apparently detected in the March 9, 1999 NMED sample from water supply well PM-1. We immediately submitted for analysis a larger volume sample previously collected from PM-1 on June 8, 1999, so that a better detection limit could be obtained. The larger volume sample did not show detection of strontium-90.

In reference to Director Browne's letter to you of November 30, 2000, we would like to provide additional insight about the strontium-90 analytical technique and why data were rejected. The Laboratory's Analytical Chemistry Sciences Group developed a new strontium-90 method using a chelating filter (disk) in an attempt to lower detection limits, improve cost effectiveness, and minimize solvent use. The Group started evaluating and testing the strontium-90 procedure in 1995. They ran National Institute of Standards and Technology, Environmental Measurements Laboratory, and open quality control samples during their data development and validation. They presented the procedure and data for peer review at the Bioassay, Environmental, and Analytical Radiochemistry conference in October 1996. This method was used for most strontium-90 analysis from 1997 to 1999.

Because of concern about possible presence of strontium-90 in water samples from the regional aquifer, the Analytical Chemistry Sciences Group was requested in 1999 to establish lower detection limits for the analytical method. This was accomplished by increasing the sample size and the count time.

Once 1999 analytical results became available, we determined that numerous analytical values for strontium-90 were questionable. We submitted a Corrective Action Request to the Analytical Chemistry Sciences Group, which included an initial list of seven samples suspected of being in error. After several iterations, this list was expanded to 28 samples. Our concerns regarding possible analytical problems were based on:

- Comparison of analytical results to previous sample values;
- Comparison of analytical results to split sample results from the NMED DOE Oversight Bureau;
- Lack of gross beta measurements supporting strontium-90 values for these samples and lack of strontium-90 in reanalysis of the samples;
- Knowledge that strontium-90 was detected in our quality control blanks (which could have been contaminated during preparation or analysis); and
- Unfavorable analytical results for our quality control spiked samples.

The Analytical Chemistry Sciences Group responded with a draft Corrective Action Report dated August 10, 2000. The Corrective Action Report noted that the analytical method employs selective extraction resins. Possibly, a change in the formulation of the resin used in the filter disks may have resulted in strontium-90 false positives, because radon was present in samples. This change in the resin occurred after the initial method validation for the strontium-90 separation procedure.

By the time we submitted our portions of the annual report "Environmental Surveillance at Los Alamos during 1999" in August 2000, we did not have sufficient confidence in the strontium-90 results for 1999 runoff, surface water, groundwater, and sediment samples. For this reason the Laboratory and DOE concluded that our entire strontium-90 data set for 1999 would not be used.

For your reference, the report "Environmental Surveillance at Los Alamos during 1999" is now available on the web at http://lib-www.lanl.gov/pubs/la-13775.htm. This report contains a listing of the 1999 strontium-90 data along with NMED DOE Oversight Bureau data collected at the same stations, and a description of our quality control samples.

In an effort to improve the quality, timeliness, independence, and costs of analytical data, the Laboratory's Environmental Surveillance Program committed in early 2000 to outside analytical laboratories for analyzing most of our environmental surveillance samples.

You may wish to note that we are preparing a report that summarizes LANL's past disposal of strontium-90 and its impact on surface water and groundwater. This report will include summarized information on strontium-90 in the LANL environment.

We appreciate your concern regarding the quality of environmental samples collected at the Los Alamos National Laboratory. Your concern indicates the importance of effective communication by the Laboratory with public stakeholders regarding our findings and actions with respect to potential contamination of groundwater resources. I hope this letter helps to facilitate this communication.

Please contact me at 667-0313 if I can provide further information or if you have additional questions.

Sincerely,

(signature on file)

David B. Rogers, Ph.D.
Hydrologist
Water Quality and Hydrology Group

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