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October 25, 1996

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Los Alamos Area Office, MS A316
Los Alamos, New Mexico 87545

SUBJECT: Review of Environmental Surveillance at Los Alamos during 1994, Los Alamos National Laboratory, July 1996.

Dear Mr. Johansen:

The DOE Oversight Bureau (DOE OB) has reviewed several sections from the subject document. The following comments are provided for the purpose of communicating the results of the review. They are not provided or intended for the purpose of representing the regulatory position of the New Mexico Environment Department.

AIR MONITORING

General Comments:

- Attempting to measure a dose that is less than ten percent of the naturally occurring dose is an exceedingly difficult task, considering the variability in natural background radiation. NMED recognizes LANL's efforts in addressing this problem, and in general agrees with the methodology chosen by LANL. NMED's monitoring data, while very much more limited but using the same basic methodology, does not disagree to any major extent with LANL's, and cannot dispute LANL's findings of compliance with all applicable regulations.

- It is NMED's hope that LANL will continue to address air monitoring by evaluating all aspects of their program, and making improvements as new technology becomes available. For the public's sake, we would recommend that LANL expedite the process of releasing data for general review.

1. **Page 110, last paragraph, line 5, Technical Area (TA) 53 Network (LAMPFNET)**

13130

The stations are 800 m north, not 800 km.

2. Page 113, Table V-1 - Footnotes

It is confusing and perhaps misleading to list an annual dose, when the total is the sum of three quarters of data, even if there is a footnote explaining it. It would be better to take a mean of the three existing quarters and add it to make a fourth quarter, and place a footnote explaining that. That way all the stations would be comparable on a time basis.

3. Page 115, Table V-2

At stations TA-50, Area C and TA-33, Area E, the minimum values are greater than the maximum values and the means are less than the minimums. There appears to be some mistake in the listing of these values.

4. Page 120, Table V-5

Mercury-195 is listed twice, with different corresponding values. Probably one of these should be a different isotope.

5. Page 125, Table V-7

The number of samples taken at the Pojoaque station should be 24, not 42.

Several of the on-site stations have different volumes than what is listed in Table V-8, the gross beta analysis. This cannot be right, since the same filter is analyzed for both gross alpha and gross beta.

The total air volume column does not take into account the fact that the filters are cut in half before analysis, and for most stations only one half is analyzed. The other half is usually archived, although sometimes it is analyzed for quality assurance purposes. There should at least be a footnote explaining this fact.

6. Page 131, Table V-10

At some stations, it is indicated that there is at least one sample above the MDL, but the maximum value is less than the stated MDL of 4 aCi/m^3.

7. Page 182, first paragraph, d. Ingestion Dose

Corrections are made to Laboratory affected sites by subtracting

background concentrations plus two standard deviations. Mean background values should be subtracted, but not mean plus two standard deviations, because that assumes that every station is at a maximum background location. Also, this is not consistent with the procedures for inhalation dose calculations that are listed in Section c. (Inhalation Dose) on the same page, which specify subtracting average background concentrations.

8. Page 183, fourth paragraph, a. Doses from Natural Background

It is stated that doses from natural background are measured with TLDs at Los Alamos and White Rock. It is not stated which particular stations are used to obtain this background value. Are all stations in Los Alamos and White Rock used for background calculations? This would make the assumption that there is no contribution from Laboratory activities, which would not be consistent with the CAP-88 calculations shown later in the report.

9. Page 183, fourth paragraph, a. Doses from Natural Background

The national average for radon dose is used. Since radon concentrations can vary widely from location to location, it would be much better to use site specific data. Surely some data for the Los Alamos area exists. The New Mexico Environment Department conducted a state wide radon survey several years ago, in cooperation with the EPA. The University of Pittsburgh has compiled large amounts of radon data from around the country, very likely including northern New Mexico.

10. Page 183, second paragraph, b. Doses to Individuals from External Penetrating Radiation from Airborne Emissions

It is stated that "the resulting data could not be statistically proven accurate compared with data from a pressurized ion chamber gamma photon detector". Which data was compared with the PIC data, the HPGe or the TLD data? Since there are three different methods of data collection at East Gate, do at least two of them have comparable results?

11. Page 183, first paragraph, c. Doses to Individuals from Direct Penetrating Radiation

It is stated that no direct penetrating radiation was detected by TLDs

at off site locations, yet the data ranges from 101 to 165 mrem per year at perimeter stations. At what point would the TLDs measure Laboratory radiation as opposed to natural variation? If there is a variation of over 60 mrem between sites in the same general area and a variation of over 30 mrem between years at some stations, it would seem that it is not possible to verify by direct measurement whether the 10 mrem per year limit (NESHAPS) has been exceeded, and that even the 100 mrem public dose limit is doubtful.

12. Page 185, first paragraph, d. Doses to Individuals from Inhalation of Airborne Emissions

The fourth line from the top of page 185 reads "occurred at the White Rock Fire station and was 0.022 mrem (0.022 mSv) ...". It should read

"occurred at the White Rock Fire station and was 0.022 mrem (0.00022 mSv) ...".

The fifth line from the top reads "mrem/yr (1 mSv/yr), and 0.7% ...". It should read "mrem/yr (1 mSv/yr), and 0.22% ...".

13. Page 187, a. Maximum Individual Dose and Page 189, Figure V-23

The maximum individual EDE to a member of the public is 3.5 mrem per year, which incorporates some reduction factors for shielding. The maximum calculated dose from CAP-88 is 7.62 mrem, which does not incorporate the reduction factors. This is not consistent and it should be clearly defined when to use the reduction factors.

14. Page 192, third paragraph, 4. Risk from Natural Background Radiation and Medical and Dental Radiation

The third paragraph states that the risk is approximately 1 in 8000, which is not consistent with Table V-40, which lists values of 1 in 7000 and 1 in 6000 for Los Alamos and White Rock.

15. Page 193, Table V-40, Natural Radiation section

Since Los Alamos has a larger radiation dose than White Rock, it should have a greater associated risk. However, the stated risk of 1 in 7000 is less than the stated risk of 1 in 6000 for White Rock.

16. Page 197, Table VI-3

Precipitation is measured in centimeters, not microns.

17. Page 272, fifth paragraph, a. Ambient Air Monitoring

It is not specified that the rotameters on the iodine samplers are calibrated.

GROUND-WATER

General Comments:

- We recommend that LANL include all ER ground-water data into their annual ES reports.
- It is our understanding that LANL's reported pH values are fixed-laboratory derived, and therefore, probably do not represent true ground-water pH. pH and other field data such as specific conductance, temperature, etc., should be included in LANL's data tables.
- We recommend that LANL add total suspended solids to their analyte list.
- We recommend that pumps be set just below (10-15 ft) top of water at each deep aquifer test well, and pumped at a rate which is below the recharge capability of the aquifer.

1. Page 226, seventh paragraph, A. Introduction

What intermediate depth ground water is monitored in Sandia Canyon? It is true that perched ground water was encountered during the drilling of PM-1; however, to the best of our knowledge, no monitoring of this ground water exists.

2. Page 228, second paragraph, 1. Main Aquifer

LANL's deep aquifer test well TW-3 is located in Los Alamos Canyon downstream from the confluence with DP Canyon; not upstream as stated in the report.

3. Page 229, third paragraph, 2. Perched Groundwater in Canyon Alluvium.

Additional surface-water contributions to Los Alamos Canyon include: one spring which emanates from the Bandelier Tuff at approximately 3-5 gpm, and is located on the south facing slope of Los Alamos Canyon across from the skating rink (source may be a leaking pipe and/or tank located nearby or precipitation); and one outfall from the Los Alamos Medical Center. In addition, DOE OB's field observations at the mouth of DP Canyon show that a large amount of surface water enters Los Alamos Canyon via DP Canyon during rapid snow-melt and storm events. Discharge data obtained at the mouth of DP Canyon from May through September 1967, show total runoff equaling approximately 36 800 m^3 (Purtymun, 1974).

Infiltration of DP Spring water may enter Los Alamos Canyon via underflow or through saturated alluvium within DP Canyon. This suspected saturated zone may be entirely or intermittently connected to saturated alluvium in Los Alamos Canyon at LAO-2.

4. Page 230, sixth paragraph, 2. Perched Groundwater in Canyon Alluvium

We suggest that some recharge to Pajarito Canyon's shallow aquifer (alluvium) is from perennial springs located in the upper reaches (onsite) of Pajarito Canyon and its tributaries, and from TA-18 Spring (perennial) and Threemile Springs (A) and (B) (ephemeral) located in Threemile Canyon. TA-18 Spring is located approximately 300 ft northwest of Kiva #2 at TA-18. Threemile Spring (A) and (B) are located approximately 0.5 mi west of Kiva #2. The shallow aquifer may extend from the upper perennial springs eastward to approximately PCO-3. Characterization and monitoring of this suspected aquifer is recommended.

5. Page 230, first paragraph, 3. Intermediate-Depth Perched Groundwater

What data exist to support the statement that perched intermediate ground water is of limited extent?

It should be noted that perched ground water was also encountered during the drilling of SHB-4 (Gardner et al., 1993) and supply well PM-2 (Cooper, 1965) in Pajarito Canyon.

It should be noted that perched ground water was also encountered during the drilling of SHB-4 (Garner et al., 1993) and supply well PM-2 (Cooper, 1965) in Pajarito Canyon.

6. Page 231, second paragraph, 3. Intermediate-Depth Perched Groundwater

The following statement was taken from a letter dated May 6, 1996, to DOE from DOE OB concerning LANL's ER OU-1049 Canyons Workplan:

"Several lines of evidence suggest that some recharge to Basalt Spring may be from near-by (< 0.25 mi) surface-water infiltration in Los Alamos Canyon downstream from the Pueblo confluence, and that Basalt Spring may not entirely represent intermediate ground water:

At approximately 7:30 a.m. on April 17, 1996, DOE OB personnel observed surface-water (effluent water from Los Alamos County Sewage Treatment Facility) flow in Los Alamos Canyon confluence at <1 gpm, and at 8:25 a.m., observed little or no flow in the active channel above Basalt Spring, suggesting that the outfall at the treatment facility had been temporarily turned off. Basalt Spring was flowing; however, DOE OB noted that flow had decreased due to the presence of high-water marks (still wet) on structures (boulders, sticks, etc.) within the surface-water flow path downstream from the spring discharge point. The sewage treatment facility was contacted that day, and confirmed that the outfall had been turned off at approximately 9:00 p.m. on April 16, 1996 and turned back on at approximately 9:00 a.m. on April 17, 1996.

Temperature of Basalt Spring water was 7.2° C on April 17, 1996, and does not correlate with that of intermediate ground-water at TW-1A, which has a temperature of approximately 16.3° C (measured by DOE OB on June 6, 1995). This abnormally low temperature of Basalt Spring water suggests nearby recharge.

On May 25, 1995, LANL's ESH-18 and DOE OB sampled Basalt Spring at a location considered to be the spring source; however, on November 15, 1995, DOE OB observed that flow had completely ceased at this particular location. Basalt Spring may have discharged greater volumes of water in May due to an increase in surface-water flow due to the mixing of snow-melt runoff in Los Alamos Canyon with sewage-treatment-plant outfall water.

Therefore, DOE OB cautions against the use of Basalt Spring as an intermediate ground-water monitoring location. LANL may want to utilize Los Alamos Spring, which is located approximately 0.2 mi east of Basalt Spring. This spring issues from the north-facing side of Los Alamos Canyon at an elevation approximately 40 ft directly above the active channel. Hydrochemical data obtained by DOE OB during 1994 and 1995 and general observations suggest that this spring may represent some type of intermediate ground water. Data concerning Basalt and Los Alamos Springs

were submitted to DOE and LANL in a letter dated July 28, 1995."

7. Page 231, third paragraph, 3. Intermediate-Depth Perched Groundwater

It should be noted that the hydrologic flow regime within Pueblo Canyon may have changed dramatically due to the discontinuation of discharge from several facilities: the Pueblo industrial-waste treatment plant which discharged into upper Pueblo Canyon; the Pueblo Sanitary Treatment Plant which discharged in upper Pueblo Canyon; and the Central Sanitary Treatment Plant which discharged into Pueblo Canyon approximately 0.5 mi west of TW-2. Hence, recharge mechanisms, flow paths, etc., in current-day Pueblo Canyon need to be characterized. We caution against the use of assumptions or conclusions about recharge based on historical data/information.

8. Page 231, fourth paragraph, 3. Intermediate-Depth Perched Groundwater

The Water Canyon Gallery spring and many other perennial springs which emanate from the Bandelier Tuff, such as Burning Ground and Homestead Springs, should be grouped into a fourth ground-water zone or mode of occurrence as noted by Dale et al. (in press, 1996).

9. Page 231, fifth paragraph, 4. Vadose Zone

Monitoring well SCO-1 is located near PM-3; not PM-2 as stated in the report. Field observations concerning surface-water flow from its source at TA-3 (outfalls) to approximately 2.0 mi west of PM-3 in Sandia Canyon suggest that saturated alluvium may exist within this portion of the canyon. Characterization and monitoring of this suspected aquifer is recommended.

10. Page 232, sixth paragraph, 4. Vadose Zone

How often are these wells checked for water? On August 31, 1995, DOE OB observed (mirror reflection technique) water in one well located at the northeast toe of the landfill.

Perennial flow in Canon de Valle exists, and we suggest that saturated alluvium is present within the canyon from SWSC Spring to some unknown distance downstream past MDA-P. Characterization and monitoring of this suspected aquifer is recommended.

11. Page 232, fourth paragraph, a. Radiochemical Constituents in the Main Aquifer

DOE OB's detection of ^{90}Sr at 6.6 pCi/L at TW-4 confirms LANL's detection of 6.2 pCi/L. It is the interpretation of the DOE OB that these data support the presence of ^{90}Sr in the regional aquifer at that time of sampling.

12. Page 236, third paragraph, b. Radiochemical Constituents in Alluvium Groundwater

DOE OB is curious as to what method was used to determine the high suspended sediment in samples from LAO-2?

DOE OB historical and current data show that most radionuclides such as Pu and Cs appear to be virtually insoluble in water; however, ^{90}Sr is soluble to some degree. DOE OB surface-water and associated suspended-sediment data show that the average ratio of ^{90}Sr in solution to suspended sediment is 2.81. Hence, ^{90}Sr is soluble; therefore, the unusually high ^{90}Sr detected in 1993 may not be entirely associated with suspended sediment concentrations. This report shows ^{90}Sr at 0.0 pCi/L for LAO-2, which is not typical of recent years: in 1991 and 1992, ^{90}Sr was detected at 42.0 and 23.2 pCi/L. DOE OB 1994 split-sample data for LAO-2 show ^{90}Sr at 39.23 (+/-4.30) pCi/L, and a duplicate-sample result of 35.85 (+/-3.94) pCi/L; hence, a problem concerning the LANL data may exist.

13. Page 236, fifth paragraph, b. Radiochemical Constituents in Alluvium Groundwater

The high gross alpha/beta values may be attributed to the presence of specific uranium isotopes (e.g., ^{235}U). LANL's data (Table VII-1) do show some correlation between high total-uranium concentrations and high gross alpha/beta activity concentrations.

14. Page 236, second paragraph, c. Radiochemical Constituents in Intermediate Perched Groundwater

DOE OB is curious whether Water Canyon Gallery ground-water samples were collected at the holding tanks along State Route 501 or at the actual spring which discharges to the gallery?

15. Page 248, third paragraph, 1. Main Aquifer

O-4 is the nearest supply well to TW-3; not PM-5 and PM-3 as stated in the report.

16. Page 249, third paragraph, a. Lead Evaluation in Test Well DT-5A

In addition to Pb, historical data show tritium activity concentrations (pCi/L) at 3400 in 1985 at DT-5A, 5300 in 1982 at DT-9, and 2600 in 1984 at DT-10 (LANL ES Reports); and 1994 DOE OB data show gross alpha at 9.55 pCi/L and gross beta at 14.19 pCi/L at DT-9.

17. Pages 250 through 254, b. Recharge Age of Water in Main Aquifer

All age-dating and monitoring data by both LANL and DOE OB, are extremely questionable due to the fact that most of LANL's regional aquifer test wells have screen lengths which extend deep into the aquifer, and hydrochemical data do not represent the top of water within the regional aquifer. Hence, age-dating data may be from samples retrieved from isolated or multiple zones deep within the aquifer which may be characteristically different from that of the top of saturation within the regional aquifer (recharge pathways, age, hydrochemistry, etc.).

18. Page 257, second paragraph, Test Well 4

In order to eliminate problems concerning the validity of analytical data (e.g., TW-4), DOE OB recommends that LANL purge three well volumes (only if flow rates are constant) and until geochemical parameters (turbidity, temperature, redox potential, etc.) have stabilized. On July 23, 1996, DOE OB split sampled with ESH-18 at LANL's deep test well TW-8, and data suggest that the quality of the sampled water may have not represented that of in-situ ground-water: at 17:22 ground-water temperature was 16.4° C, at the time of sampling (17:55) ground-water temperature was at 17.3° C, and at 18:05 ground-water temperature was at 18.2° C. Hence, the temperature had not stabilized. DOE OB purge test data, obtained on July 17, 1995 at TW-8, show that the well probably stabilizes at approximately 18.8° C.

We recommend that test wells TW-1, TW-1A, TW-2, TW-2A and TW-4 be purged at a rate which is below the recharge capability of the aquifer so that flow is not lost, and geochemical parameters can be monitored and documented throughout the purge event.

SURFACE-WATER

General Comment:

- We recommend that LANL present the date and time of sampling for each surface-water sample collected so that one can correlate results with other data such as discharge or precipitation data.

1. **Page 148, first paragraph, 3. Surface Water Monitoring, On-Site Stations, Other Areas**

Several outfalls that discharge to Sandia Canyon appear to be missing. There are approximately five other outfalls from the TA-3 area and eight outfalls from the TA-53 area which are not listed. Outfalls which discharge into Sandia Canyon may contribute to either perennial stream flow in certain segments of the stream or possible recharge to shallow ground water within canyon alluvium.

2. **Page 148, first paragraph, 3. Surface Water Monitoring, d. Long Term Trends**

Analysis of radionuclides in solution is justified; however, DOE OB has observed that analytical data from the suspended sediment fraction of the sample provides valuable information concerning the total amount of contaminant transported. This is especially important in storm events where large amounts of suspended sediment is transported. We recommend that LANL analyze storm-water samples for contaminants in the dissolved phase and suspended sediment phase, and present data in the ES reports.

3. **Page 198, second paragraph, 2. Water and Effluent Monitoring, a. Surface Water Monitoring and Page 199, Table VI-6**

In order to adequately compare data with regulatory standards such as the New Mexico General Stream Standards for Livestock and Wildlife, analyses should be the same as prescribed by the standard (i.e., total analysis if the standard is totals or dissolved if the standard is dissolved).

What are the units of measure for the data presented in table VI-6?

If there are any questions concerning the review of these sections, please contact me at 672-0448.

Sincerely,

Stephen Yanicak

Steve Yanicak, LANL POC
Department of Energy Oversight Bureau

Attachment

SY:sy
cc: Neil Weber, NMED, Chief, DOE OB
Benito Garcia, NMED, Chief, HRMB
Jim Piatt, NMED, Chief, SWQB
Marcy Leavitt, NMED, Chief, GWQB
Steve Rae, LANL ESH-18, MS K497

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REFERENCES

Cooper, J.B., W.D. Purtymun, and E.C. John, 1965, Records of Water Supply Wells Guaje Canyon 6, Pajarito Mesa 1, and Pajarito Mesa 2, Los Alamos, New Mexico

Gardner, J.N., Kolbe, T., and Chang, S., 1993, Geology, drilling, and some hydrologic aspects of Seismic Hazards Program core holes, Los Alamos National Laboratory, New Mexico, Los Alamos National Laboratory report LA-12460-MS, 19p.

Purtymun, W.D., 1974, Storm Runoff and Transport of Radionuclides in DP Canyon, Los Alamos County, New Mexico