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# FACSIMILE TRANSMITTAL SHEET

TO: Rich Mayer DATE 4/21/99

COMPANY/DEPARTMENT: EPA - Dallas

PHONE NUMBER: FAX NUMBER: 214-665-7263

FROM: Michael Dale

COMPANY/DEPARTMENT: NMED DOE OB

NUMBER OF PAGES (including cover page): 8

## MESSAGE OR INSTRUCTIONS

$^{90}Sr$ information + water level declines (see below)

as of '96

TW-1 ; Δ = +39.8' (Bayo discharges causing mound) maybe?

TW-2 ; Δ = -37.3'
TW-3 ; Δ = -38.1'
TW-4 ; Δ = -5.5'
TW-8 ; Δ = -26.6'
DT-5A ; Δ = -9.2'
DT-9 ; Δ = -11.1'
DT-10 ; Δ = -12.1'

(-) - decline
(+) - rise increase head

(DT-5A, DT-9, DT-10) no production wells in this area (TA-49)

3408

IF YOU DID NOT RECEIVE ALL THE PAGES OR IF ANY OF THE PAGES ARE ILLEGIBLE, PLEASE CALL OUR OFFICE BETWEEN 8:00 AM AND 4:00 P.M. MONDAY THROUGH FRIDAY AT (505)672-0443. THANK YOU.

0847 TA-10

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# MEMORANDUM

TO: File, DOE OB, White Rock Office

FROM: Michael R. Dale, Geologist III, DOE OB MRD
Steve Yanicak, Program Manager, DOE OB SY

DATE: December 30, 1998

SUBJECT: **Background information concerning the presence of $^{90}$Sr at G-1 and G1A and potential sources; relevant to the December 15, 1998, Albuquerque Journal news article titled "Presence of Strontium In LA Water Debated"**

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After reviewing the December 15, 1998, Albuquerque Journal news article (see attached), it was determined that clarification (via research of historical information/data and the subsequent interpretation of such information) of specific issues concerning the referenced article/written material should be made, and they include:

## HISTORICAL INFORMATION CONCERNING G-1 AND G-1A

### G-1 and G-1A Water Levels

- G-1 was completed in 1950, and depth to water below ground surface was measured at 192 ft; G-1A was completed in 1954, and depth to water below ground surface was measured at 250 ft (Purtymun, 1995). Capture-zone or drawdown-cone delineation at or near these wells has not be determined.

### $^{90}$Sr Data for G-1 and G-1A

- Most recently, $^{90}$Sr was detected at G-1A (3.9±0.7 pCi/L, duplicate at 7.4±3.5 pCi/L with a detection limit of 3 pCi/L ) in 1995; not detected in 1996 (-0.2±0.2 pCi/L, duplicate at -0.4±0.2 pCi/L) or 1997 (-1.1±2.7 pCi/L) (from LANL's Environmental Surveillance Reports 1996, 1997 and 1998).

- $^{90}$Sr results obtained at G-1, which is located approximately 0.5 mi down gradient or east of G-1A, showed less than detection values of 0.2±0.8 pCi/L in 1995 and 0.2±0.2 pCi/L in 1996; however, in 1997, $^{90}$Sr was detected at 5.2±1.4 pCi/L with a detection limit of 3 pCi/L (from LANL's Environmental Surveillance Reports 1996, 1997 and 1998).

- 1995 was the first year that $^{90}$Sr analyses were performed on LANL production wells except for PM-1 which was analyzed for the radionuclide in 1994. From 1991 through 1994, some deep test wells and the majority of the alluvial wells were tested for $^{90}$Sr; but it should be noted that LANL did not routinely perform $^{90}$Sr analyses on ground waters prior to 1991. Hence, we interpret the statement in the referenced news article "Scientists saw the metal just once before in 20 years of looking" as not being accurate.

## POTENTIAL SOURCE?: TA-10 RADIOCHEMISTRY LABORATORY LOCATED IN BAYO CANYON

### TA-10 Background Information

Operations at the TA-10 "Bayo Site" were directed at experiments relating to the development of nuclear weapons, which began in 1943 and ended in 1961. In 1963, the site was decontaminated and demolished, and the land was subsequently turned over to Los Alamos County by quitclaim deed in 1967 (Ferenbaugh et al., 1982). Specifically, open-denotation-explosive tests and radiochemical operations were conducted at the Bayo Site.

Radiochemical operations were conducted at the TA-10 Radiochemistry Laboratory (Lab), Building TA-10-1. The Lab was located in Bayo Canyon northwest of the Bayo Sewage Treatment Facility or at junction of the Los Alamos and Santa Fe County Line and Bayo Canyon (Figure 1). At the Lab, radiation sources for blast diagnostics were radiochemically prepared; $^{140}$La was separated from solution containing $^{140}$Ba which subsequently produced $^{90}$Sr as an impurity. From 1944 to 1950, separation, precipitation and encapsulation activities were performed at the Lab. After 1950, the separation procedures were performed at some unknown laboratory not associated with TA-10; precipitation and encapsulation work was continued at the TA-10 laboratory (Ferenbaugh et al., 1982).

The explosive detonation work dispersed (via aerosols and solid debris) uranium, $^{140}$La and $^{90}$Sr outward from shot pads (shot pads were located west of the Lab) up to 300 to 600 m away, and routine postshot surveys out to about 5 miles detected $^{140}$La contamination near State Road 4 and Otowi and Kwage Mesas. Apparently, on one occasion, an aircraft was able to track airborne $^{140}$La activity across the Rio Grande valley. Postshot contaminants were washed off the pads with water. Radiation levels were periodically measured around the pads, and measurements ranged from a few tenths to a few roentgens per hour (Ferenbaugh et al., 1982).

Liquid releases at TA-10 were apparently restricted to operations at the pad areas (wash-off water; see above), the Lab (sanitary and laboratory waste), and the personnel building (sanitary waste). Waste streams (assumed to be $^{90}$Sr contaminated) at the Lab were delivered through acid-waste lines to holding tanks, pits and a leaching field - an area known as the "disposal complex". Liquid waste entering the pits were drained at the bottom through an outlet pipe (Ferenbaugh et al., 1982). The liquid waste drained to what is assumed to be approximately 30 to 40 ft of alluvium and/or colluvium, which overlies approximately 5-15 ft of the Otowi Member, the Guaje Pumice(2-3 ft?) and the Puye Formation of an unknown thickness. Liquid wastes from the storage tanks were periodically discharged to the stream channel (Ferenbaugh et al., 1982). No information or data exist concerning active flows within the stream channel during the storage tank disposals. Sanitary waste at the Lab was delivered to the disposal complex and/or leach field via septic tank and drain lines.

Sanitary liquid waste from the personnel building (TA-10-21) located (Figure 1) approximately 1000 ft west of the Lab, was discharged to a 1060 gal septic tank which discharged to a pit (8 ft long x 12 ft deep). This septic system then discharged to a drain line and outfall located in a stream channel (LANL, 1996). No information or data exist concerning active flows within the stream channel during periods of sanitary release.

Some of the buildings at Bayo Site were decommissioned in 1960, and in 1963 the remaining buildings, sewer systems, disposal complex and surface debris (760 m radius from the detonation control buildings) were removed for disposal at TA-54. The highest level of contamination was detected during the excavation of the disposal complex (excavated to a depth of 6 m): 35 mrad/hr during the excavation to 1.5 mrad/hr at the bottom of the excavation pit (Ferenbaugh et al., 1982).

### Historical Investigations at TA-10

After the decommissioning activities, several investigations were performed at the Bayo Site and they include:

- In 1973, three boreholes were drilled near the Lab, and results from two of the three holes show elevated levels (20 and 3.3 pCi/g) of $^{90}$Sr at depth (both at 1.5 m bgs) (LANL, 1992).
- In 1974, 11 more holes were augered near the 1973 boreholes, and were analyzed for gross alpha and beta. Each hole detected gross beta at levels greater than 4 pCi/g (assumed background for Pajarito Plateau canyon sediments). Levels ranged from 1.0 pCi/g to 24,000 pCi/g. The maximum detectable level at depth was 1510 pCi/g at 9.1 m (LANL, 1992).
- As part of the FUSRAP program, a survey was performed at the Bayo Site in 1977. Sampling of surface and subsurface soils and sediments was performed at and near the Lab, as well as the firing site areas and the natural drainage from the firing site areas to approximately 600 ft east of the Lab. Elevated levels (maximum level of 132 pCi/g) of $^{90}$Sr were detected in the subsurface near the Lab during this survey (LANL, 1992).

- In 1992, LANL's Environmental Restoration (ER) Project produced a RCRA Facility Investigation Work Plan which included the characterization of many Potential Release Sites (PRSs) at Bayo Site. In 1994, some PRSs at or near the Lab underwent Phase 1 subsurface-radiological characterization, and they include: 10-002(a), 10-002(b), 10-003(a-o), 10-004(b), and 10-007; two additional PRSs (10-005, 10-004(a) west of the Lab were also investigated. Their characterization activities at or near the Lab included the drilling of seven four-armed sampling arrays which consisted of 5, 9 or 10 boreholes drilled to a total depth of 50 ft bgs. $^{90}$Sr data collected during this investigation show levels up to 41886 pCi/g at depth of 17-17.5 ft; an estimated value of 1.1 pCi/g was given to a sample collected a 49.3-50 ft (LANL, 1996). It appears that the disposal-complex leach field [PRS 10-003(n)], located 125 ft north-northeast of PRS 10-003(g) (Figure 2), was not characterized during this event; thus, additional work may be needed in order to determine rate and extent of contamination at this PRS.

## Conclusions and Interpretations Concerning Contaminant Migration from TA-10

Due to the large amounts of $^{90}$Sr historically managed and released to the environment, and its close proximity to wells G-1A and G-1, the old TA-10 facility ranks as the best candidate for a regional contamination source of this radionuclide. In general, the bulk of the water-lain $^{90}$Sr contamination within and near the Lab appears to be associated with the canyon-bottom alluvium; levels decrease rapidly at the sediment/tuff contact. The underlying weathered tuff probably perched the waste-stream fluids, and therefore, interflow/underflow became the principle mechanism for fluid transport during the life of the waste-stream (1944 to 1961). It is our interpretation that the fate and transport of $^{90}$Sr to greater vertical depths (including the regional water table or adjacent canyon systems to the north or south) from this site is unknown at this time, and may not be determined until future subsurface investigations are performed (e.g., Canyon Focus Group activities). In terms of contaminant migration through storm-water runoff, only one sample has ever been collected in the Bayo Canyon sub-basin: one sample was collected on August 22, 1957, in the mid-reach of the canyon. The sample was only analyzed for six non-radionuclide constituents (sodium, carbonate, bicarbonate, chloride, fluoride and nitrate) (Purtymun, 1975). Hence, because there are still many unanswered questions regarding the subsurface and hydrogeology in this region of the Pajarito Plateau, any LANL statements concerning past or present contaminant migration from this site should be made with caution so that not to give the public false impressions.

## REFERENCES:

Ferenbaugh, R. W., T.E. Buhl, A.K. Stoker, and W.R. Hansen, 1982. "Environmental Analysis of the Bayo Canyon (TA-10) Site, Los Alamos, New Mexico", Los Alamos National Laboratory Report LA-9252-MS, Los Alamos, New Mexico.

LANL (Los Alamos National Laboratory), June 1996. "Radiological Addendum to the RFI Report for Potential Release Sites 10-002(a,b), 10-003(a-o), 10-004(a,b), 10-005 and 10-007", Los Alamos National Laboratory Report LA-UR-96-1748, Los Alamos, New Mexico.

LANL (Los Alamos National Laboratory), May 1992. "RFI Work Plan for Operable Unit 1079", Los Alamos National Laboratory Report LA-UR-92-850, Los Alamos, New Mexico.

Purtymun, W.D., December 1975. "Geohydrology of the Pajarito Plateau with Reference to Quality of Water, 1949-197"", Informal Report.

cc w/ attachments:

J. Parker, Chief, DOE Oversight Bureau
J. Vozella, DOE, AIP POC, LAAO, MS A316

FIGURE 1.



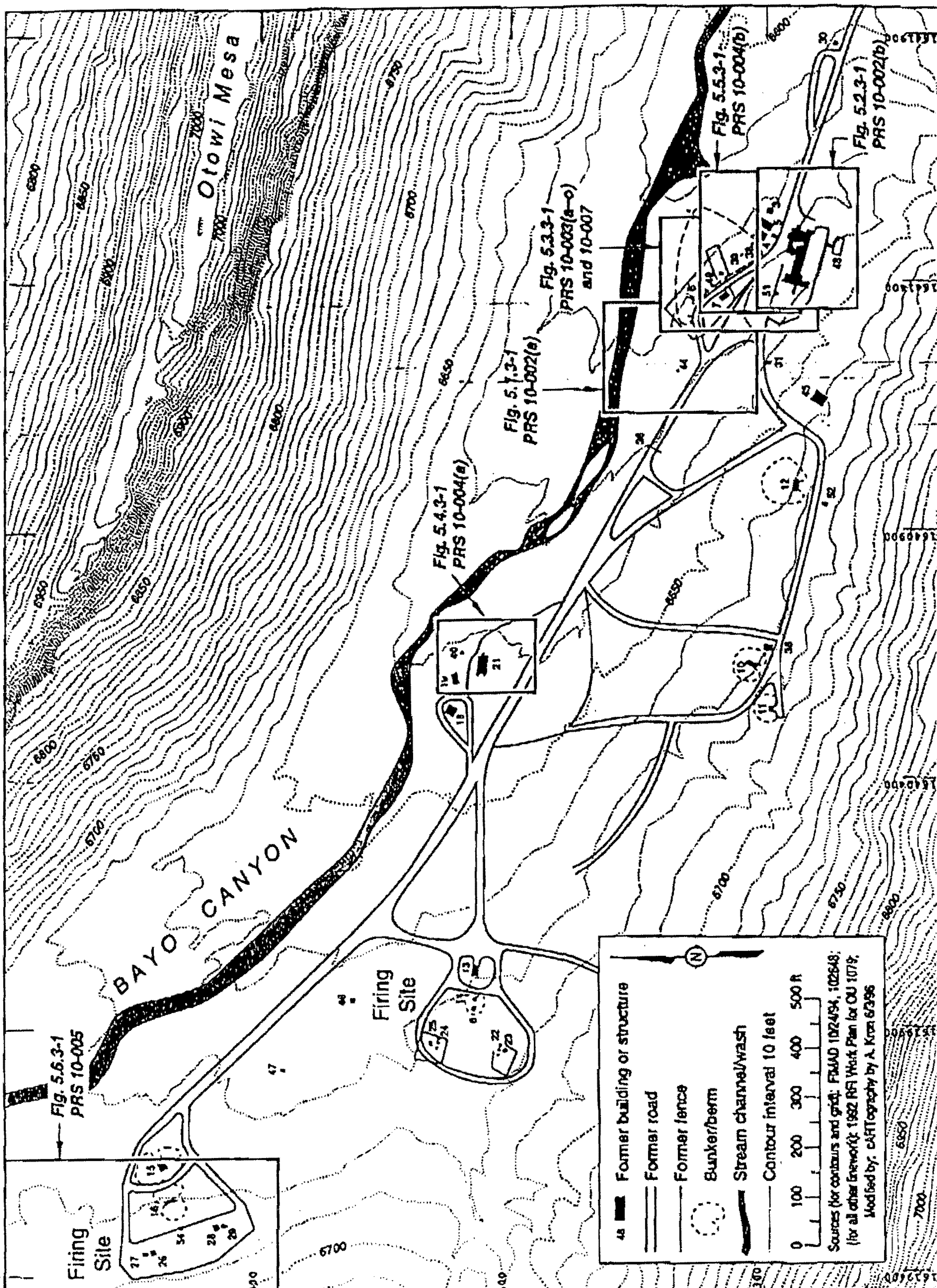
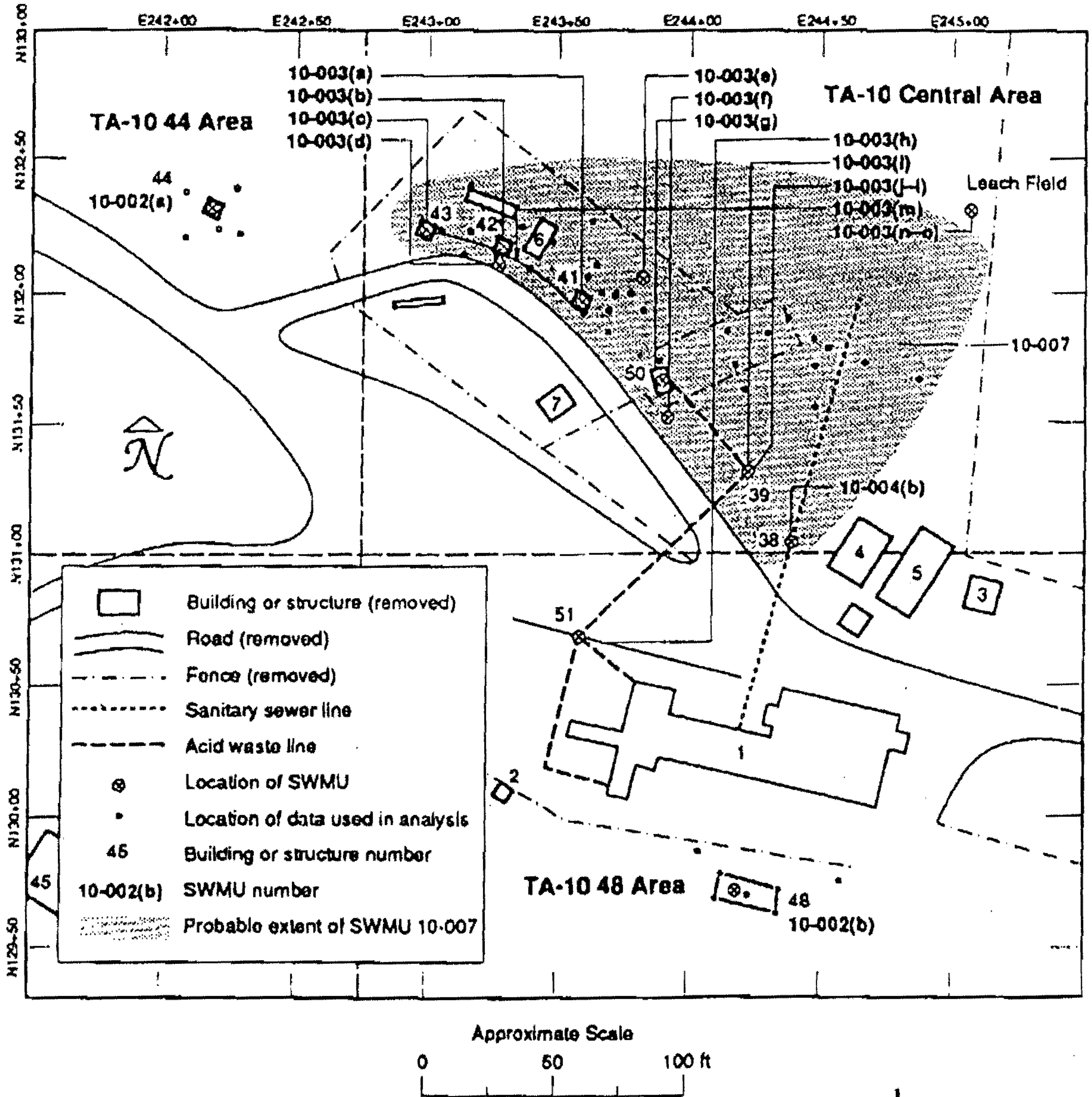



Fig. 1 1-1. Index map of investigation areas within the TA-10 Subsurface Aggregate.

FIGURE 2.






Addressed in Revision 1

**Figure 3.1-14.** Location of Subsurface Disposal SWMU Aggregate and samples used in data analysis (modified from Mayfield et al. 1979, 06-0041; LANL 1990, 0145).



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# Presence of Strontium-90 in Water Debated

By Ian Hoffman
*Journal Staff Writer*

A Los Alamos well caught a hint last year of radioactive strontium-90 in the county's drinking-water source, but scientists debate whether the pollutant was real or a laboratory figment.

If real, the strontium exists at more than half the federal drinking-water standard — the closest Los Alamos has come to a radioactive threat to its drinking-water aquifer, lying under 800 feet of rock and sand.

Yet a battery of tests this summer on neighboring wells in Guaje Canyon failed to detect any strontium. Scientists saw the metal just once before in 20 years of looking.

"Do I think there's strontium-90 in that well? The answer is no," said David B. Rogers, a water scientist at Los Alamos National Laboratory.

State environmental scientists aren't so sure. They speculate that the powerful Guaje Canyon wells could be pulling pollution a half-mile underground from Bayou Canyon to the south.

"The odds are pretty high it (strontium) was there" in the Guaje well, said hydrologist Michael Dale of the New Mexico Environment Department agency that oversees LANL.

Three bronze plaques in Bayou Canyon caution people not to dig there until at least 2024.

From 1944 to 1963, scientists built and blew up more than 200 pieces of radioactive lanthanum in the canyon to test their skills at implosion. Strontium-90 is a byproduct of those experiments.

Workers hauled off 90 truckloads of contaminated canyon dirt and debris in the mid-1960s. Later tests showed a pocket of strontium-90 contamination about 15 to 25 feet under the canyon floor. Some plants inside this fenced-off area of Bayou remain contaminated at low levels.

*See* **PRESENCE** *on* **PAGE 3**

# Presence of Strontium In LA Water Debated

*from* **PAGE 1**

Strontium-90 buried in the dry canyon hasn't moved in almost 20 years, lab cleanup officials say.

"It's shown no evidence of migration," said Danny Katzman, a lab geologist who studied Bayou for the cleanup program. "There's really nothing there to drive the contamination."

Two drinking-water wells in Guaje Canyon detected strontium in water roughly 800 feet down in 1995, but none in 1996. Then in 1997 one well got the strongest detection to date — just over 5 picoCuries per liter of water. Due to uncertainties in lab analyses, there is a 67 percent chance that the actual amount of strontium lies between 3.8 and 6.6 picoCuries per liter. Put another way, there's a one-third chance the strontium doesn't really exist.

The federal drinking-water standard, based on a lifetime of drinking contaminated water, is 8 picoCuries per liter — an amount so small as to be mind-boggling. But strontium-90 can be highly toxic: It mimics calcium in the body and so tends to settle in bone marrow where its powerful beta radiation can damage blood-producing cells.

The standard is challenging for water scientists because it is very close to the detection abilities of lab instruments.

"We're pushing our analytical techniques to the limit," said Ken Mullen, a LANL expert in contaminant testing.

"You don't accept all the information you get from the chemistry lab," Rogers added. "To be convinced we have strontium-90 in one of these wells, I'd like that measurement three years in a row."

The well where the strontium was detected has since been plugged and replaced by new drinking-water wells. State scientists may ask LANL to drill a new test well to look for strontium contamination.

"If they ever see anything close to the (drinking-water) standard, it will be a bad day up here," said NMED's Dale. "By far, the best thing for the lab to do is determine if this stuff really exists."

The lab's owner, the U.S. Department of Energy, plans no groundwater cleanup at Los Alamos. And the agency has resisted freeing Los Alamos County from contamination liability as the county takes control of the local water system.

"This could indicate very long-term and intractible problems from decades of lab operations. And nobody's got a handle on how to get it adequately cleaned up," said Jay Coghlan, who studies contamination at Los Alamos for the Santa Fe-based watchdog group, Concerned Citizens for Nuclear Safety.