



Drinking Water Monitoring Overview



for presentation to the

Citizens Advisory Board

U.S. Department of Energy
Los Alamos National Laboratory

Bob Beers, ESH-18

October 25, 2000



Water Quality and Hydrology Group, ESH-18
Environment, Safety and Health Division
Los Alamos National Laboratory

General

ML

13449



WATER QUALITY & HYDROLOGY GROUP (ESH-18)

LOS ALAMOS NATIONAL LABORATORY

DRINKING WATER MONITORING PROGRAMS

- **Annual Surveillance Monitoring**
 - Samples collected for radiochemicals and inorganics.
 - Analysis by independent, contract laboratories.
 - Results published in the Environmental Surveillance Report.
- **Annual SDWA Quality Assurance Monitoring**
 - Samples collected for radiochemicals, metals, inorganics, and organics.
 - Analysis by the New Mexico Department of Health Scientific Laboratory.
 - Results published in the Environmental Surveillance Report.
- **Special Drinking Water Monitoring**
 - Sampling for the four special contaminants of concern: perchlorate, tritium, high explosives, and strontium-90.
 - The frequency of monitoring varies from annual to monthly depending upon the contaminant and the sampling location.
 - Analysis by independent, contract laboratories.
 - Results reported to Los Alamos County and NMED.

DRINKING WATER MONITORING PROGRAMS

By LOS ALAMOS COUNTY AND NMED

- **SDWA Compliance Sampling by Los Alamos County and NMED**
 - Samples collected for microbiological, radiochemical, metals, inorganics, and organic constituents.
 - Results determine compliance with the Maximum Contaminant Levels (MCLs) of the SDWA.
 - This data is published in the Environmental Surveillance Report and in LA County's annual Consumer Confidence Report (CCR).

DRINKING WATER QUALITY - STRENGTHS

- Low concentrations of metals and inorganic constituents.
 - Arsenic in the Guaje wells is higher than other wells but are below the current interim SDWA MCL of 50 ppb.
 - For perspective, the average arsenic concentration in our wells in 1997 was 6 ppb while Albuquerque's was 40 ppb.
- Absence of microbiological contaminants
 - No microbiological violations since 1994.
 - Repeated testing has shown that tap water contains fewer bacteria than much of the bottled water used at the lab.
- Absence of organic contaminants.
 - Low Total Trihalomethanes in the drinking water.
 - For perspective, in 1997, the annual average for Total Trihalomethanes at Los Alamos was 6.3 ppb while Albuquerque's was 24.1 ppb. In 1999, Santa Fe's average was 24.9 ppb, ours was 5.2 ppb.
- Low concentrations of lead and copper.
 - Since our drinking water is non-corrosive we see very low concentrations of lead and copper leaching from piping or plumbing fixtures.
- Low levels of alpha emitting radionuclides.
 - For perspective, in 1999, the highest activity measured at a Los Alamos water supply well was 3.1 pCi/L while the SDWA MCL for alpha activity is 15 pCi/L.

DRINKING WATER QUALITY AREAS OF CONCERN

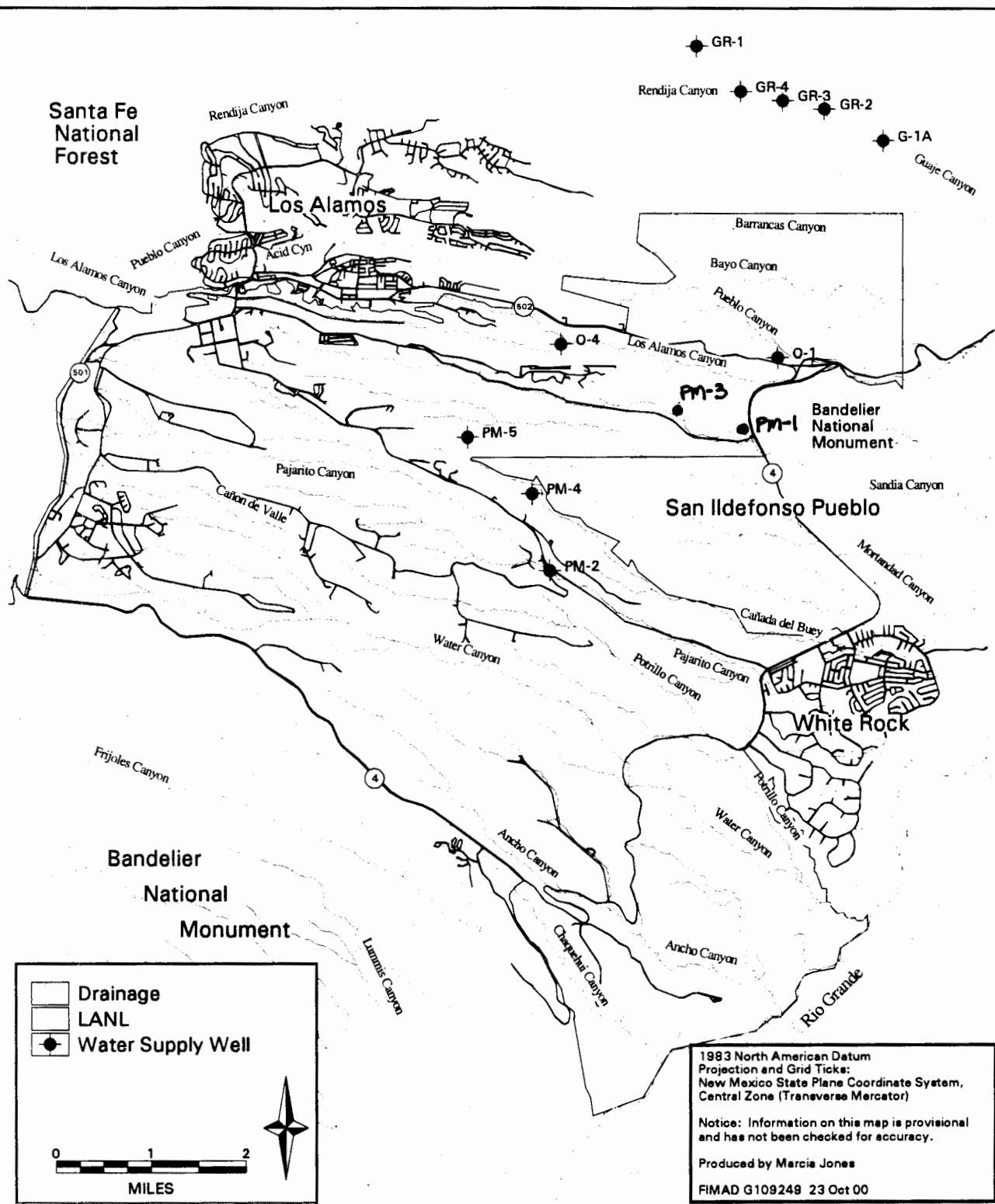
- In 1999, HE detected in R-25 (TA-16).
 - No HE has been detected in a drinking water well.
 - All water supply wells are sampled annually for HE.
 - PM-2, PM-4, and PM-5 are sampled quarterly for HE.

- In 2000, perchlorate was detected in Otowi-1.
 - Detected concentrations ranged from 1.9 ppb to 3.5 ppb.
 - Currently, there is no SDWA MCL for perchlorate.
 - California has established a provisional action level of 18 ppb.
 - Otowi-1 is sampled monthly for perchlorate.

- In 2000, tritium was detected in Otowi-1.
 - Detected activity was 38.0 pCi/L (+/- 1.3 pCi/L).
 - The SDWA MCL for tritium is 20,000 pCi/L.
 - Otowi-1 is sampled monthly for tritium.

- In 2000, Sr-90 was initially detected in O-1 and G-3A.
 - Reanalysis of the original samples and subsequent resampling at both wells has not confirmed either of these initial detections.
 - Initial results: 0.19 pCi/L +/-0.05 (MDA=0.15 pCi/L) at O-1;
0.17 pCi/L +/-0.045 (MDA= 0.13 pCi/L) at G-3A.
 - The SDWA MCL for Sr-90 is 8 pCi/L.

Los Alamos County Water Supply Wells



Sample Results
Test Wells #1 and #2
Los Alamos National Laboratory

Tritium (pCi/L)

Sample Date	TW-1	TW-2
Oct-92	348.04 +/- 12.77	0.70 +/- 0.29
May-93	360.81 +/- 11.81	2.71 +/- 0.32
Jun-95	277.15 +/- 9.26	16.83 +/- 0.57

Notes:

1. Analytical Laboratory: University of Miami
2. Test Well 1 (TW-1) is a regional aquifer test well (screened interval: 632'-642') located in Pueblo Canyon approx. 1/8 mi. east of Otowi-1.
3. Test Well 2 (TW-2) is a regional aquifer test well (screened interval: 768'-824') located in Pueblo Canyon above the Bayo treatment plant but below Acid Canyon.

CY2000 Sample Results
Special Drinking Water Monitoring Program
Los Alamos National Laboratory

Tritium (pCi/L)

Sample Date	PM-1	PM-2	PM-3	PM-4	PM-5	O-1	O-4	G-1A	G-2A (GR-2)	G-3A (GR-3)	G-4A (GR-4)	G-5A (GR-1)
2/14/00	ND	ND	OS	OS	ND	OS	OS					
3/7/00								ND	ND	ND	ND	OS
6/21/00			ND	ND		38.0 +/- 1.3	ND					OS
10/16/00						pending						

High Explosives (ppb)

Sample Date	PM-1	PM-2	PM-3	PM-4	PM-5	O-1	O-4	G-1A	G-2A (GR-2)	G-3A (GR-3)	G-4A (GR-4)	G-5A (GR-1)
2/14/00		ND		OS	ND							
6/20/00	ND	ND			ND			OS	ND	ND	ND	OS
6/21/00			ND	ND		ND	ND					
8/14/00		ND		ND	ND							

Strontium-90 (pCi/L)

Sample Date	PM-1	PM-2	PM-3	PM-4	PM-5	O-1	O-4	G-1A	G-2A (GR-2)	G-3A (GR-3)	G-4A (GR-4)	G-5A (GR-1)
2/14/00	ND	ND	OS	OS	ND							
3/7/00						OS	OS	ND	ND	ND	ND	OS
6/20/00 ¹	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.17+/-0.045 MDA=0.13	ND	OS
6/20/00 ²						0.19+/-0.05 MDA=0.15						
6/20/00 ³				ND		ND				ND		
8/3/00				ND		ND				ND		
8/3/00 ⁴						ND						
8/14/00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	OS

Notes:

¹ Original sample.

² A duplicate sample prepared by Paragon Analytics, Inc.

³ Reanalysis of the original sample.

⁴ A duplicate sample prepared by ESH-18.

"ND" means that the target analyte was not detected above the analytical laboratory's Minimum Detection Level (MDL)

"OS" means that the well was out-of-service on that date.

CY 2000 Sample Results
Special Drinking Water Monitoring Program
Los Alamos National Laboratory

Perchlorate (ppb)

Sample Date	Analytical Laboratory	PM-1	PM-2	PM-3	PM-4	PM-5	O-1	O-4	G-1A	G-2A (GR-2)	G-3A (GR-3)	G-4A (GR-4)	G-5A (GR-1)
2/14/00	Babcock	<4	<4	OS	OS	<4	OS	OS					OS
2/14/00	EES-1	<2	<2	OS	OS	<2	OS	OS					OS
3/7/00	Babcock			OS	OS		OS	OS	<4	<4	<4	<4	OS
3/7/00	EES-1			OS	OS		OS	OS	<2	<2	<2	<2	OS
6/21/00	Babcock			<1	<1		3.5J	<1					
6/21/00	EES-1			<2	<2		2	<2					
6/29/00	Babcock			<1	<1		3.3J						
6/29/00	EES-1						2						
7/6/00	Babcock						3.5J						
7/6/00	Babcock						2J						
7/6/00	EES-1						1.7						
7/6/00	EES-1						2.0						
8/3/00	Babcock				<1		2J				<1		
8/3/00	Babcock						2.3J						
8/14/00	Babcock						2.4J						
8/14/00	Babcock						<1						
9/12/00	Babcock						2.4J						
9/12/00	Babcock						1.9J						
10/10/00	Babcock						<1						

Notes:

"OS" means that the well was out-of-service on that date.

"J" means that the sample result is estimated because it is below the analytical laboratory's Reporting Limit of 4 ppb, but above the laboratory's Minimum Detection Limit of 1 ppb.

Analytical Laboratories

E.S. Babcock & Sons (Babcock) has a Reporting Limit of 4 ppb and a Minimum Detection Limit of 1 ppb.

Los Alamos National Laboratory's EES-1 analytical laboratory has a Minimum Detection Limit of 1 ppb.

Sampling Plan
Drinking Water Monitoring Programs
Los Alamos National Laboratory

Special Drinking Water Monitoring Program				4th Qtr 2000			1st Qtr 2001			2nd Qtr 2001			3rd Qtr 2001			4th Qtr 2001			Analytical Laboratory
Sampling Activity	Last Event	Sampling Locations	Sampling Frequency	Oct-00	Nov-00	Dec-00	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	
High Explosives (HE)	8/14/00	PM-2, PM-5, PM-4	quarterly		X			X			X			X			X		GEL
High Explosives (HE)	6/21/00	all water supply wells ¹	annual								X								GEL
Low-Level Tritium (³ H)	2/14/00	all water supply wells ¹	annual				X												U. of Miami
Low-Level Tritium (³ H)	10/16/00	O-1	monthly	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	U. of Miami
Strontium-90 (Sr-90)	8/14/00	all water supply wells ¹	quarterly		X			X			X			X			X		GEL
Low-Level Perchlorate (ClO ₄)	3/8/00	all water supply wells ¹	semi-annually		X			X						X					Babcock
Low-Level Perchlorate (ClO ₄)	10/10/00	O-1	monthly	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Babcock

SDWA Quality Assurance Monitoring Program				4th Qtr 2000			1st Qtr 2001			2nd Qtr 2001			3rd Qtr 2001			4th Qtr 2001			Analytical Laboratory
Sampling Activity	Last Event	Sampling Locations	Sampling Frequency	Oct-00	Nov-00	Dec-00	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	
CN, F, metals, nitrate, VOCs, Rad	9/27/00	all water supply wells ¹	annual												X				NM State Scientific Lab

¹ **Los Alamos Water Supply Wells:**

Guaje Well Field: G-1A, G-2A, G-3A, G-4A, and G-5A

Otowi Well Field: O-1, O-4

Pajarito Well Field: PM-1, PM-2, PM-3, PM-4, and PM-5.

Los Alamos News

CONTACT: Kevin Roark, camerahead@lanl.gov, 505-665-0582 (00-141)

Tritium found in drinking-water-supply well

LOS ALAMOS, N.M., Oct. 24, 2000 -- Hydrologists at the U.S. Department of Energy's Los Alamos National Laboratory have detected traces of tritium in a well that supplies drinking water to the county of Los Alamos, confirming an earlier reported detection of the radioactive element this year by state regulators.

The tritium was found in concentrations that are 500 times lower than the federal drinking water standard, but are above background concentrations that can be found in groundwater around the Laboratory.

All wells that supply drinking water to Los Alamos meet standards established by the federal Safe Drinking Water Act and by the New Mexico Environment Department. Laboratory hydrologists regularly monitor, and will continue to monitor, wells to ensure that water produced from them meets drinking water standards. In addition, the Laboratory is drilling a number of wells throughout the Los Alamos area to investigate whether any threats to drinking water quality exist, and to ensure the future safety of the water supply.

Tritium is an isotope of hydrogen that is produced naturally in the atmosphere when cosmic rays strike atoms and molecules. Man-made tritium is used for some Laboratory activities. Chemically, tritium's behavior is identical to hydrogen and it moves easily with water. Tritium is used in self-illuminating exit signs, gun sights, watch dials and other consumer products. The half life of tritium is about 12.5 years.

Hydrologists with the Laboratory's Water Quality and Hydrology Group took samples from the water-supply well - called Otowi-1, located in lower Pueblo Canyon several miles east-northeast of the Laboratory's main technical area - in late June as part of the Laboratory's on-going drinking water monitoring and surveillance program. Although Otowi-1 was constructed in 1990, it did not become operational until 1997. Major water production from the well began last spring.

The Laboratory's drinking water monitoring and surveillance program looks for the presence of Laboratory-derived chemicals in the aquifer that supplies Los Alamos with drinking water and in other underground water sources.

The Otowi-1 well-water sample was analyzed by an independent laboratory.

The sample showed tritium at a concentration of 38.5 picocuries per liter. Federal drinking water standards say water is safe to drink if it contains tritium in concentrations lower than 20,000 picocuries per liter.

Concentrations of tritium in the regional aquifer in other parts of the Laboratory can be found ranging between one and three picocuries per liter; tritium concentrations in Northern New Mexico surface water and rainwater range from 30 to 40 picocuries per liter. A curie is a measure of radioactivity; pico means one-trillionth of a unit.

Hydrologists with the New Mexico Environment Department in January reported that samples taken in June 1999 from the Otowi-1 supply well contained tritium in concentrations of 39.9 picocuries per liter.

"Our data match up pretty well with data obtained earlier by state of New Mexico hydrologists and it verifies their previous finding," said Bob Beers of the Laboratory's Water Quality and Hydrology Group. "We have detected tritium in the regional aquifer before in Test Well-1 in Lower Pueblo Canyon, but we haven't previously detected it in these concentrations in a community water-supply well. We will continue to monitor Otowi-1 to determine whether tritium concentrations are increasing or decreasing over time, and we will continue to monitor other drinking-water-supply wells to determine whether any other contaminants are making their way into the aquifer. That is part of the Laboratory's commitment to helping verify that the water is safe to drink - and it is safe to drink."

In earlier times at the Laboratory, contaminants were discharged into Acid Canyon. Those discharges ceased in the early 1960s. Acid Canyon drains into Pueblo Canyon, so the former Acid Canyon waste treatment plant could be a source of the tritium contamination. Laboratory hydrologists have known since the 1950s that surface water in Pueblo Canyon slowly seeps into deeper underground water bodies over time, although this seeping surface water has little effect on the chemistry of the deeper water. Higher tritium concentrations are regularly found farther upstream in Pueblo Canyon; in shallow water bodies some 100 feet below ground but well above the regional aquifer, tritium concentrations are about 2,200 picocuries per liter of water.

Tritium also has been seen in the deep aquifer in a test well several hundred yards downstream from the Otowi-1 supply well. The concentration of tritium in Test Well-1 was 360 picocuries per liter in 1993. The test well just penetrates the top of the regional aquifer about 600 feet beneath the canyon floor. In contrast, the area within the aquifer from which Otowi-1 draws its water begins at just about 1,000 feet below the canyon floor (and about 400 feet lower than the top of the aquifer and Test Well-1) and continues down an additional 1,460 feet.

Otowi-1 was in the news earlier this year when hydrologists detected trace concentrations of the chemical perchlorate. The non-radioactive chemical also was used in earlier nuclear-weapons-related activities, but was not found in concentrations that could present an increased risk to the safety and health of the public.

Hydrologists at the Laboratory will continue to regularly monitor area drinking-water-supply wells for the presence of perchlorate, tritium and other contaminants.

Los Alamos National Laboratory is operated by the University of California for the U.S. Department of Energy.

More news releases from the Environment, Safety and Health (ESH) Division

News releases

Public Affairs (PA)