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Environmental Monitoring Report

Radiation Monitoring On and Around the Tatum Dome Test Area, Lamar County, Mississippi April 1992

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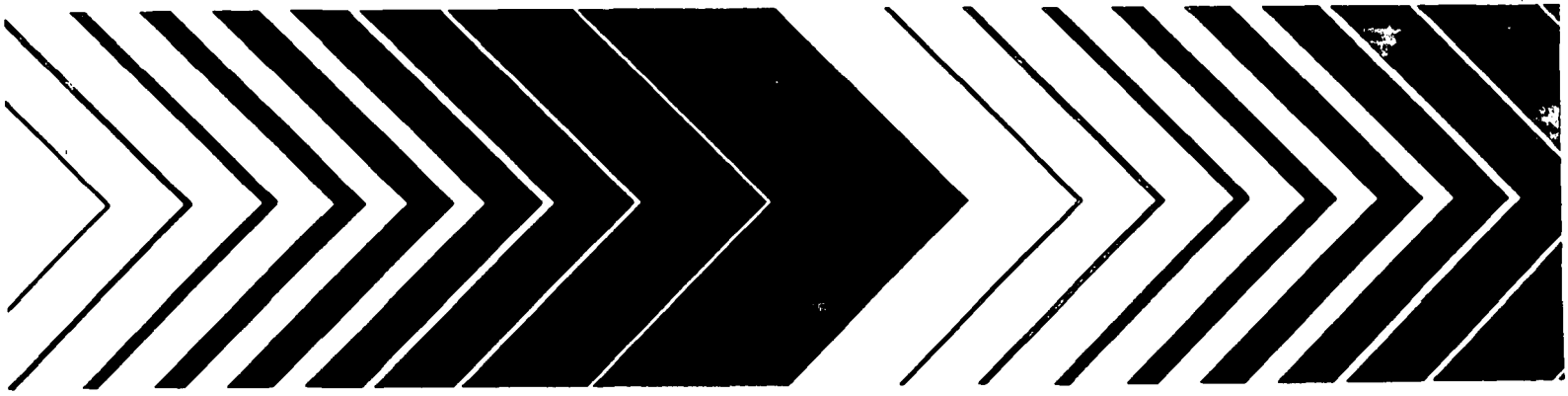

Radiation Monitoring On and Around the Tatum Dome Test Area, Lamar County, Mississippi April 1992

by

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NOTICE

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ABSTRACT

In 1964, and again in 1966 a nuclear explosive was detonated approximately 2700 feet underground in the Tatum Salt Dome located in Lamar County, Mississippi. Drilling and clean-up activities have resulted in tritium contamination in close proximity to the surface ground zero. The Long-Term Hydrological Monitoring Program conducted by the U.S. Environmental Protection Agency consists of annual water sampling on and around the Tatum Salt Dome.

As in past years no radioactive materials from the Tatum Salt Dome were detected in any water samples collected offsite. The highest tritium concentration found in water collected in the offsite area was 59 pCi/L. This is from natural sources and is 0.30 percent of the National Interim Primary Drinking Water Regulations (40CFR141) which places the maximum level of tritium in drinking water to be 20,000 pCi/L. The highest tritium concentration found onsite was 14,000 pCi/L. This concentration was detected in a water sample collected from Well HMH-1. This well is less than 10 feet deep and it is located very near the surface ground zero. The water from this well is not available to the public nor is it suitable for drinking due to its brackishness.

CONTENTS

FIGURES

ACRONYMS AND ABBREVIATIONS

DOE	U.S. Department of Energy
EMSL-LV	Environmental Monitoring Systems Laboratory - Las Vegas
EPA	U.S. Environmental Protection Agency
g	gram
Ge(Li)	lithium-drifted germanium gamma detector
Ge(Hp)	High purity germanium gamma detector
keV	kilo electron volts = thousand electron volts
kg	kilogram, 1000 grams
kt	kiloton (TNT equivalent)
LTHMP	Long-Term Hydrological Monitoring Program
L	liter
m	meter
min	minute
MDC	minimum detectable concentration
MeV	million electron volts
mL	milliliter = one thousandth of a liter
pCi/L	picocuries per liter = 10^{-12} curies per liter = 1/1,000,000,000,000 curies per liter
PHS	U.S. Public Health Service
SGZ	surface ground zero
^{3}H	tritium
$^{3}H+$	enriched tritium
^{90}Sr	strontium-90
^{238}Pu	plutonium-238
$^{239+240}Pu$	plutonium-239 and plutonium-240 (individual isotope not distinguished in analysis)
HMH-1 thru 16	Hydrological Monitoring Hole
HM-L, HM-L2	Hydrological Monitoring Well - Local Aquifer
HM-S	Hydrological Monitoring Well - Surficial Aquifer
HM-1	Hydrological Monitoring Well - Aquifer 1
HM-2a	Hydrological Monitoring Well - Aquifer 2a
HM-2b	Hydrological Monitoring Well - Aquifer 2b
HM-3	Hydrological Monitoring Well - Aquifer 3
HT-2c, 4, 5	Hydrological Test Hole

ACKNOWLEDGMENTS

The authors would like to acknowledge Mr. M.G. Davis and the staff of the hydrological monitoring group for their dedication to quality and their tireless work in the design and execution of the sampling effort. Also, we wish to thank Mr. Richard Deshler, International Technologies Corp., for the use of his figure of the Tatum Dome aquifers, water wells and text cavity (Figure 3).

INTRODUCTION

Under an Interagency Agreement with the U.S. Department of Energy (DOE), the Environmental Monitoring Systems Laboratory (EMSL-LV) of the U.S. Environmental Protection Agency (EPA) located in Las Vegas, NV, conducts a Long-Term Hydrological Monitoring Program (LTHMP) to measure radioactivity concentrations in water sources near the sites of underground nuclear explosions. The results of the LTHMP provide assurance that radioactive materials from the tests have not migrated into drinking water supplies. This report presents the results for the samples collected in April 1992, on and around the Tatum Salt Dome, in Lamar County, Mississippi.

History

Project Dribble, consisting of two nuclear explosions, and Project Miracle Play, consisting of two non-nuclear gas explosions, were conducted in the Tatum Salt Dome, near Baxterville, Lamar County, Mississippi, between 1964 and 1970. The general area is depicted in Figure 1. This area is called the Tatum Dome Test Area (Figure 2) and contains approximately 1,470 acres located in Sections 11, 12, 13 and 14, Township 2 North, Range 16 West.

Event Date	Name	Type	Yield (kt)
10-22-64	Salmon	Nuclear	5.3
12-03-66	Sterling	Nuclear	0.38
02-02-69	Diode Tube	Gas	0.32
04-19-70	Humid Water	Gas	0.32

These tests were part of the Vela Uniform program of the U.S. Atomic Energy Commission (now the DOE). The purpose of the tests was to measure and evaluate the phenomena of seismic waves that are induced from the explosions as compared to those that occur naturally from earthquakes.

The first explosion, the Salmon Event, created a cavity in the Tatum Salt Dome that was used for the other three explosions. The top of the cavity is 1,160 feet (360 m) below the top of the salt dome. The top of the salt dome is another 1,500 feet (460 m) below the land surface (Figure 3).

At the Project Dribble site, disposal of drilling muds and fluids near surface ground zero (SGZ) resulted in onsite tritium (^3H) contamination of shallow ground water and the surficial aquifer. The shallow ground water, between 4 and 10 feet (1.2 and 3 m) deep, and the surficial aquifer that is approximately 30 feet (9 m) below the surface both consist of non-potable water.

Tritium contamination has also been detected in the potable water Local Aquifer which is at a depth of 200 feet (62 m). The ^3H appears to be migrating down the exterior of the sampling well (HM-L) casing from the surficial aquifer above. Well HM-L is located very close to the SGZ and the well casing penetrates the contaminated surficial aquifer. No contamination has been detected in a second Local Aquifer sampling well (HM-L2), located approximately 1600 feet (480 m) from HM-L. All ^3H contamination is less than the concentration specified in the National Interim Primary Drinking Water Regulations (40CFR141). There is no indication from ground and surface water monitoring that any radioactivity is presently escaping from the test cavity.

Following each explosion event, the near-offsite area was closely monitored by the U.S. Public Health Service (PHS). The radiological monitoring became the responsibility of EPA at its inception in 1970. The EPA radiological monitoring is a continuing responsibility. From 1964 to the present, neither the EPA nor the PHS has detected any contamination offsite resulting from the Tatum Dome experiments.

Monitoring Results: Historical Summary

After site cleanup activities in 1971-72, the LTHMP was instituted. In this program, all potable aquifers, many individual wells, public water supplies, and some surface waters in the Tatum Salt Dome area have been sampled and analyzed for

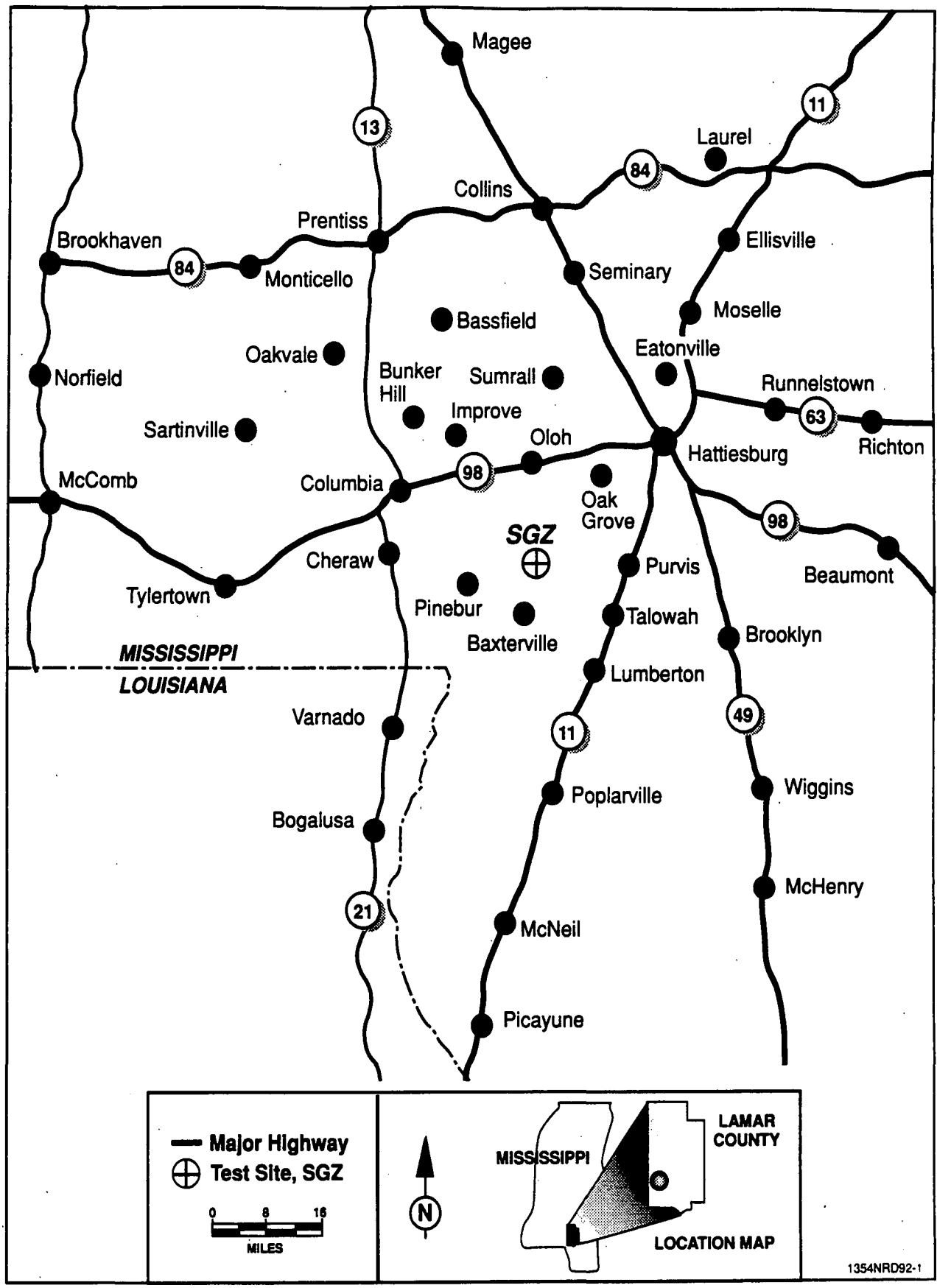


Figure 1. General site location of Project Dribble.

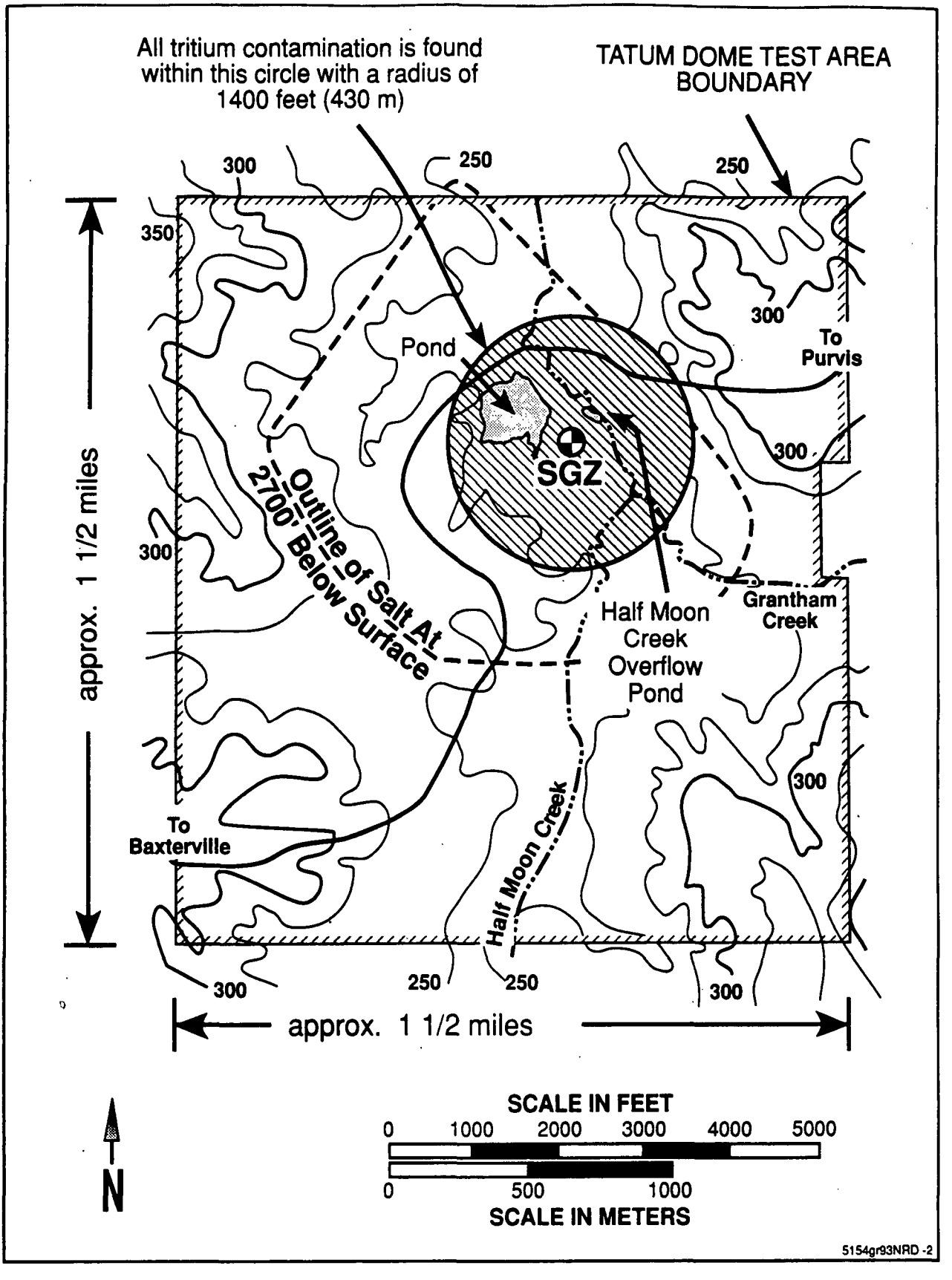


Figure 2. Topographic map of the Tatum Dome Test Area showing the Surface Ground Zero and outline of Salt Dome at 2,700 feet (830 m) below land surface.

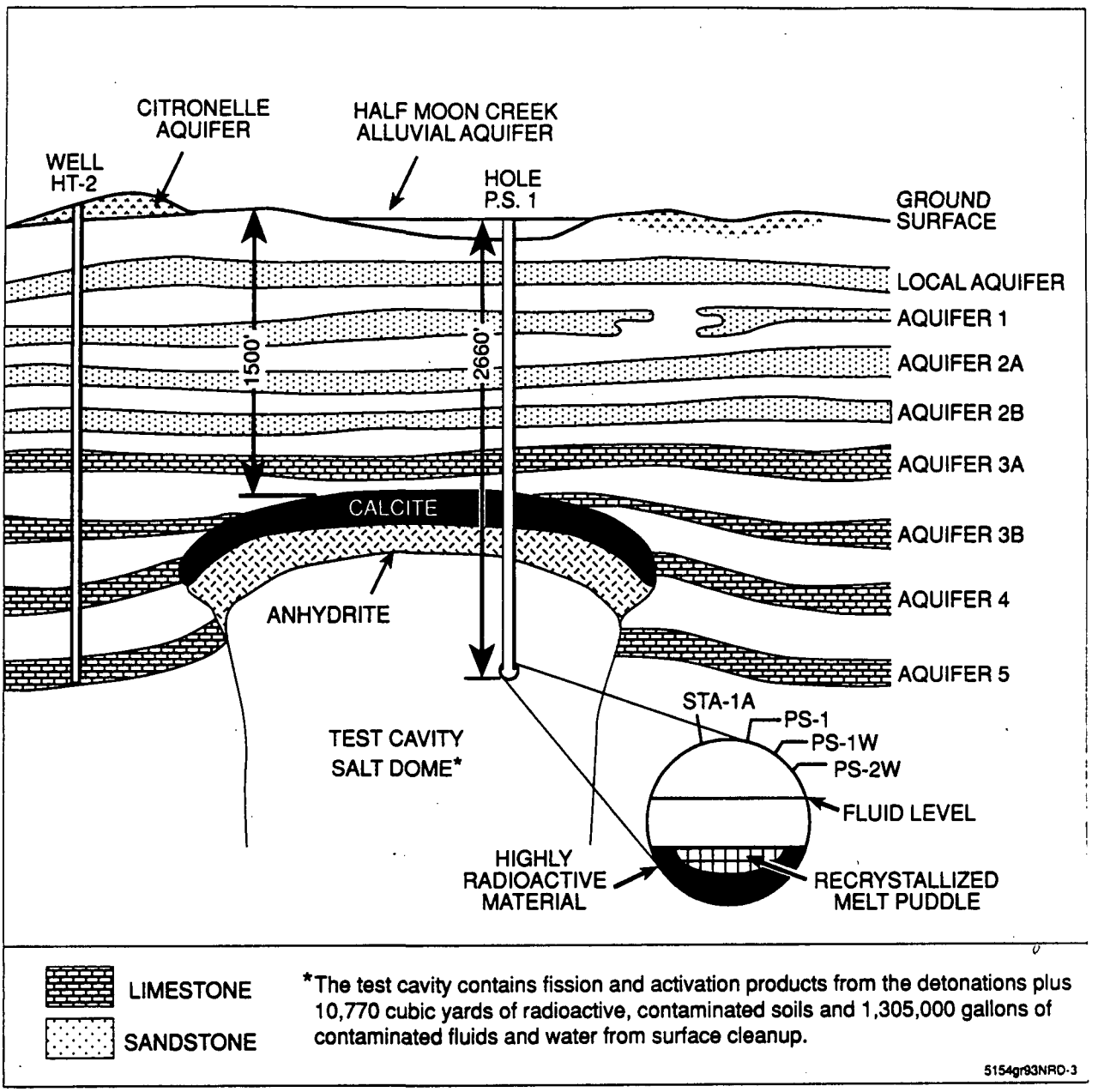


Figure 3. Test cavity and aquifers.

tritium and for any detectable gamma-emitting radioisotopes.

A special study was conducted in 1977-78 because of irregularities in tritium results in onsite samplings from a pond near SGZ (Half Moon Creek Overflow). To determine the source and extent of contamination, a grid design was used to locate 171 shallow holes that were drilled into the Surficial Aquifer ground water. From the tritium results of the samples collected from these holes, a set of LTHMP holes was selected and added to the LTHMP sampling design. Tritium levels in the Surficial Aquifer ground water have shown large fluctuations due to local rainfall. In general, the concentrations continue to decrease. Decreasing trends, representative of those sampling wells with the highest tritium concentrations from the Local Aquifer (HM-L), the Surficial Aquifer (HM-S) and the surface ground water (HMH-1, HMH-2, HMH-5) are shown in Figure 4.

Concern regarding possible health effects attributable to the two nuclear detonations conducted in the Tatum Salt Dome caused EPA to increase the scope of the radiological monitoring activities in 1990 to include the following:

a. Urine samples from nearby residents.
b. Vegetables and soil samples from local gardens.
c. Water samples from additional residential wells.
d. Milk samples from goats and cows.
e. Atmospheric moisture monitoring.
f. Atmospheric particulate monitoring.
g. Deer, turkey, catfish, and turtle tissue samples from the vicinity of SGZ.
h. Soil, sediment, and vegetation sampling in the vicinity of SGZ.
i. Water samples for non-radiological analysis (volatile organics, semi-volatile organics, pesticides, and heavy metals).
j. Cow tissue samples.
k. Goat tissue samples.
l. Five additional onsite shallow ground-water monitoring holes.

In all of the 1990 offsite samples, including the human bioassay, no radioactive materials from the Tatum Dome Test Area were detected. Tritium contamination was detected in some water samples taken close to SGZ. Although the water samples were collected from non-potable sources, the concentrations met the EPA radionuclide criteria for drinking water. No other radioactive material above background was detected in any sample. All tritium contamination was detected within a 1,400-foot (430 m) radius of SGZ. The analysis of water samples taken in the vicinity of SGZ for nonradioactive hazardous materials revealed very low-level concentrations of a few organic chemical contaminants of unknown origin. No health effects would be expected from the contaminants at the concentrations found.

The 1990 study is described in the EPA report, "Onsite and Offsite Environmental Monitoring Report: Radiation Monitoring Around Tatum Salt Dome, Lamar County, Mississippi, April 1990" (Thomé et al., 1990). All analytical data resulting from the LTHMP and other radiological monitoring programs are published annually in EPA's "Offsite Environmental Monitoring Report: Radiation Monitoring Around United States Nuclear Test Areas,...." These reports have been published each calendar year since the tests were conducted.

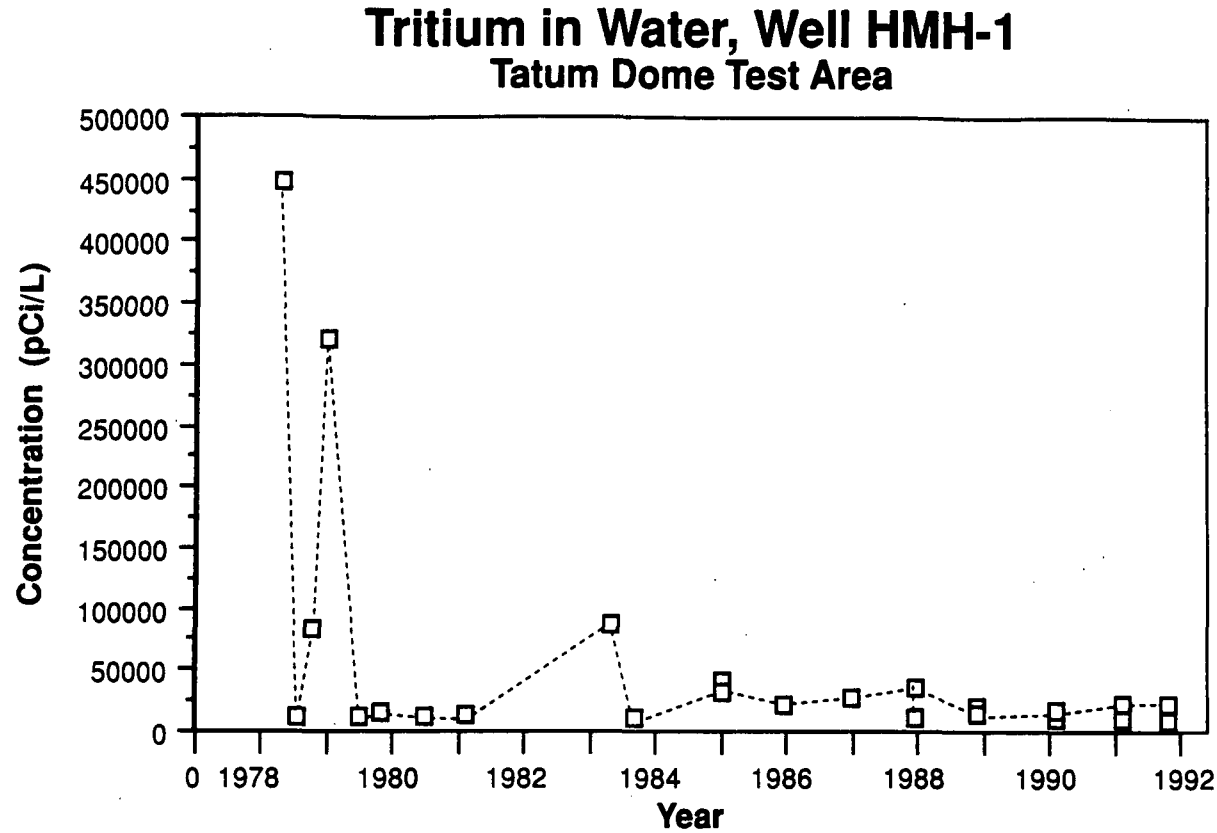
Calendar Year 1992 Monitoring Results

In April 1992, EMSL-LV conducted environmental sampling on and around the Tatum Dome Test Area. The locations of all sampling sites are shown in Figures 5 and 6. Sampling also included three locations in Columbia, MS, not shown in Figure 6. The sampling results are discussed in the following sections.

Water

Much emphasis is placed on tritium analysis of ground-water samples. Following an underground nuclear test, most of the radioactive materials that are created decay very quickly. Most of those remaining are captured in the molten rock created by the explosion and in the surrounding rock itself. Tritium, which is naturally occurring and is also a product of nuclear explosions, is a radioactive form of hydrogen. It becomes incorporated into water molecules and moves with the ground water flow. For this reason, tritium is used as an indicator of the possible migration of radioactive materials created from nuclear explosions.

In April 1992, the HMH holes were sampled and then pumped dry. On the following day tritium samples were again collected. Also, according to standard procedure, the HM wells were pumped steadily with a sample being collected at the initiation of pumping and then at one-half hour intervals until the pH and conductivity stabilized. One-half hour after reaching stability, one additional sample was collected. Two samples were taken on successive days from Half Moon Creek, Half Moon Creek Overflow, and the Pond West of SGZ. All other locations were sampled once. Additional residential water samples were collected at the request of five residents.



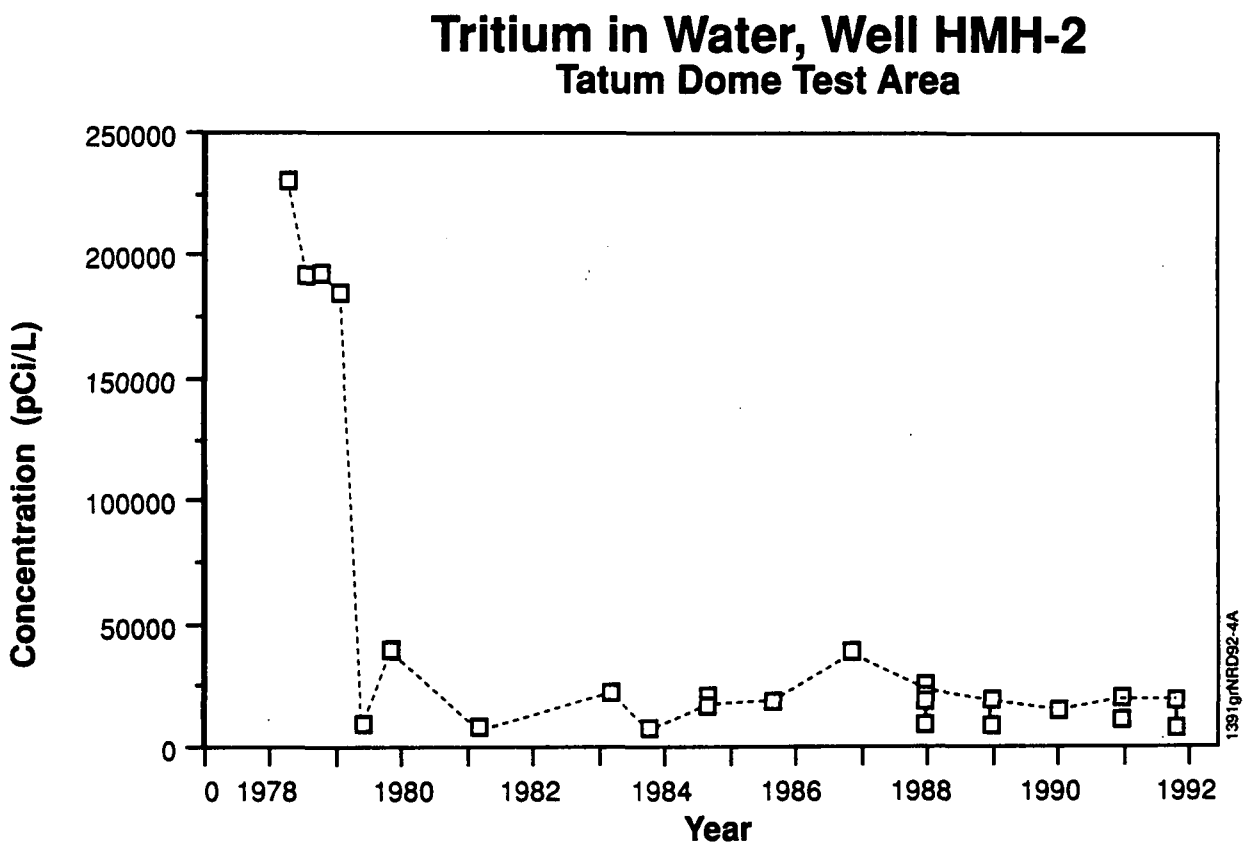
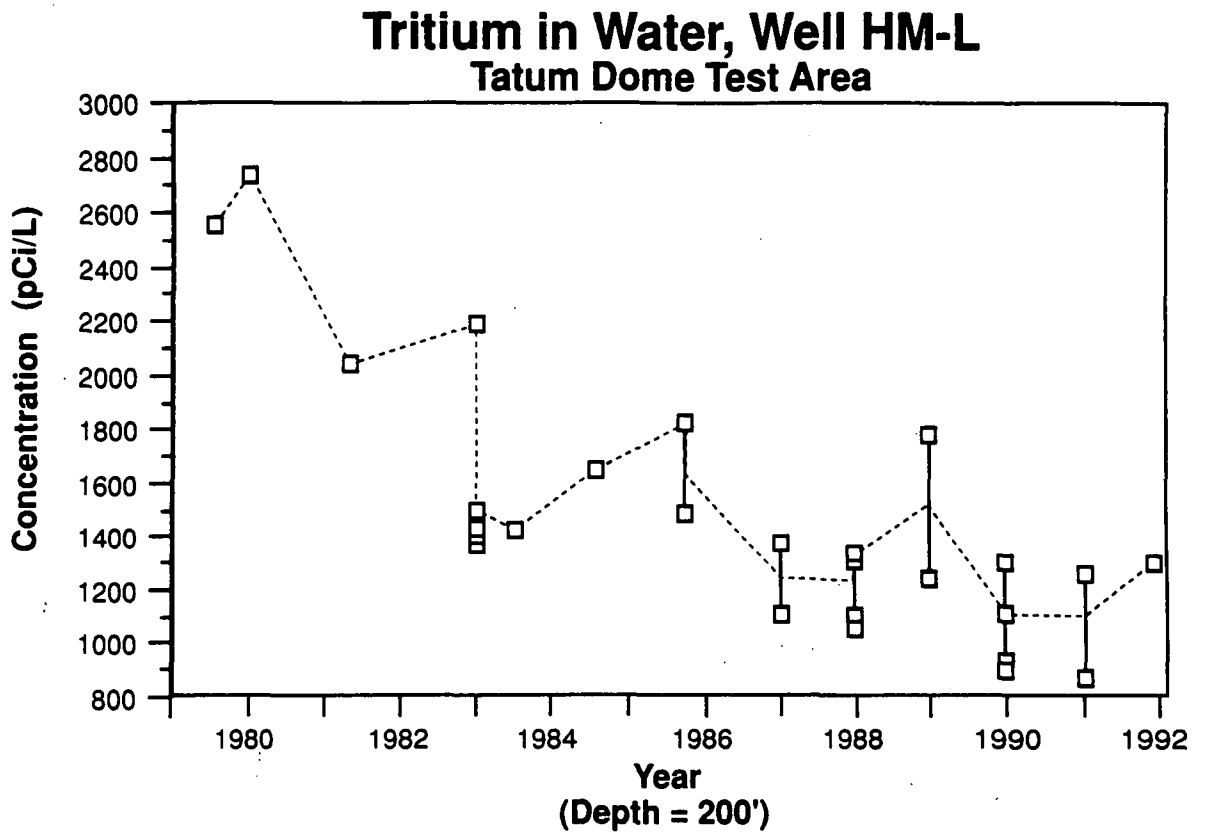


Figure 4. Plots of tritium concentrations vs. time. (Replicate sampling in a given year is represented by multiple squares.)



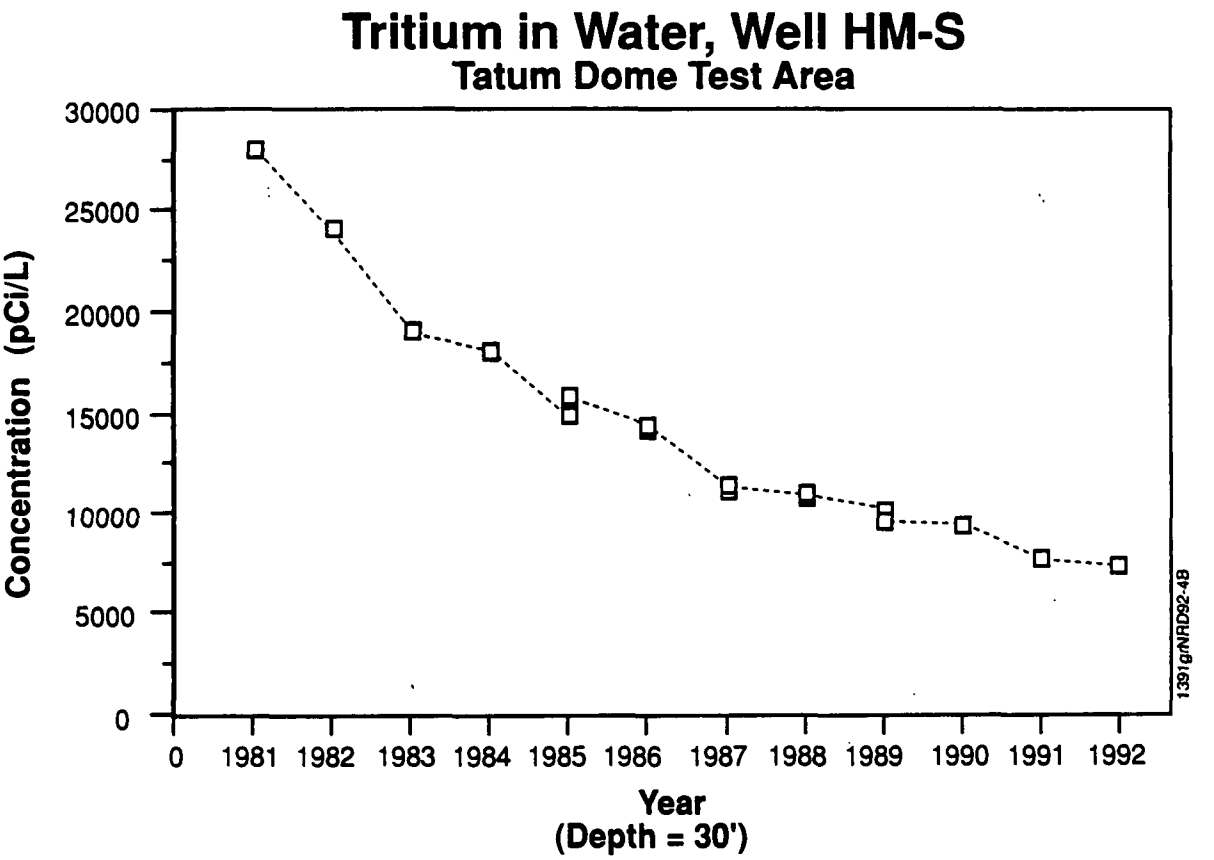


Figure 4. (Continued)

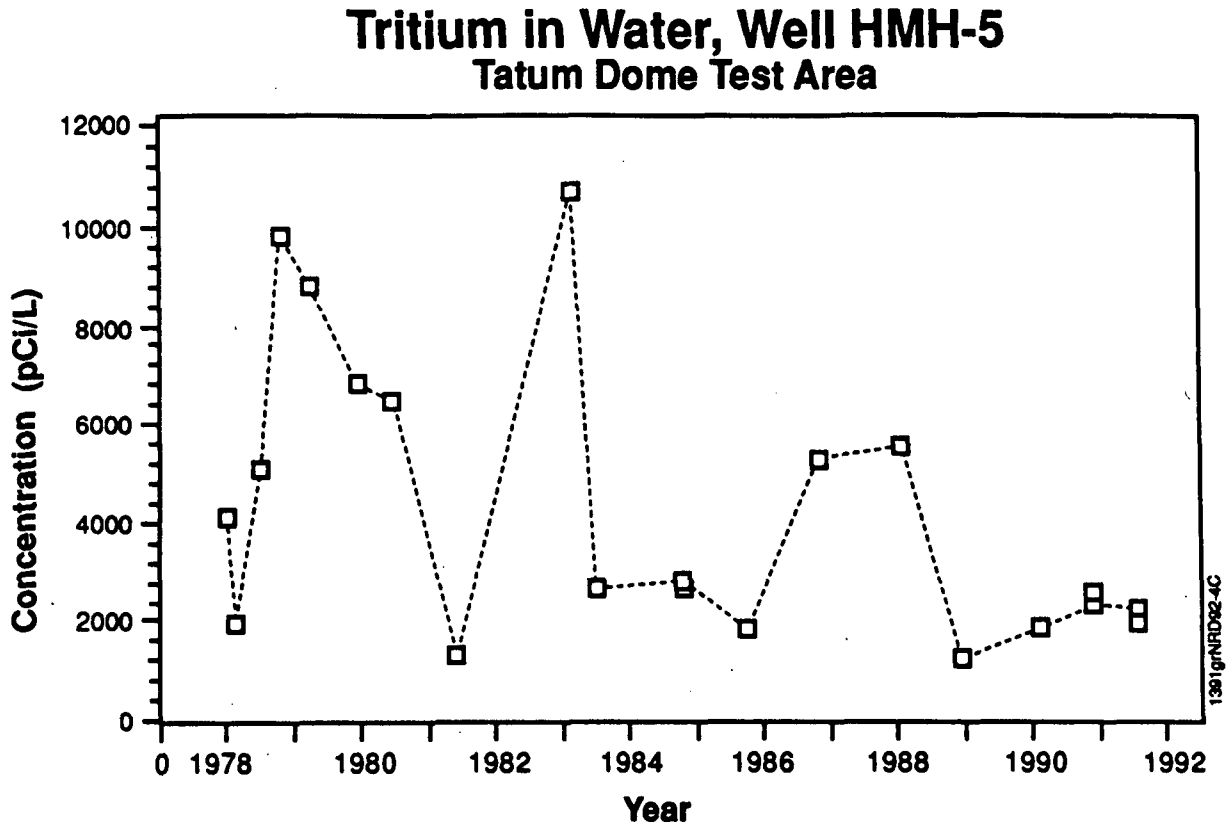


Figure 4. (Continued)

Sample Analysis Procedures

The procedures for analyzing samples collected for this report were described by Johns et al. (EPA 1979) and are summarized in Appendix A. These include gamma spectral analysis and radiochemical analysis for strontium, tritium, and plutonium and uranium. The procedures are based on standard methodology for given analytical procedures. Two methods for tritium analysis were performed—conventional and electrolytic enrichment. The samples were initially analyzed by the conventional method. If the tritium result was less than 700 pCi/L, the sample was then analyzed by the electrolytic enrichment method which lowers the minimum detectable concentration (MDC) from approximately 300 pCi/L to 10 pCi/L. In the data tables (Appendix 4), results obtained using the conventional method are denoted by "^{3}H" and results obtained by electrolytic enrichment are denoted by "^{3}H+". Sample results are corrected for the background radioactivity in the laboratory. Occasionally, negative results are obtained for extremely low-level samples due to statistical fluctuations in the background and/or analytical variability.

Water Analysis Results

No gamma-emitting radioactive materials were detected. The highest tritium concentration above the MDC in water collected from the offsite area was 59 pCi/L. This is typical of natural sources and it is 0.30 percent of the National Interim Primary Drinking Water Regulations (40CFR141) which places the maximum level of tritium in drinking water to be 20,000 pCi/L. The onsite water sample from Well HMH-1 had the highest tritium concentration, 14,000 pCi/L, which is 70 percent of the drinking water regulation. Well HMH-1 is less than 10 feet (3.6 m) in depth and it is located approximately 20 feet (6.3 m) north of SGZ. The water is not accessible to the public nor suitable for drinking due to its brackishness. In addition to the tritium and gamma spectroscopy analyses, water samples from locations sampled for the first time were analyzed for ^{90}Sr, ^{234}U, ^{235}U, ^{238}U, ^{238}Pu and $^{239+240}$Pu. Small amounts of ^{234}U, ^{235}U and ^{238}U were detected in some of the water samples. The concentrations were typical of those found in nature. All of the water sample results are shown in Appendix B. Strontium-90, ^{238}Pu, and $^{239+240}$Pu were not detected at levels above the MDCs of approximately 2 pCi/L, 0.08 pCi/L and 0.05 pCi/L, respectively.

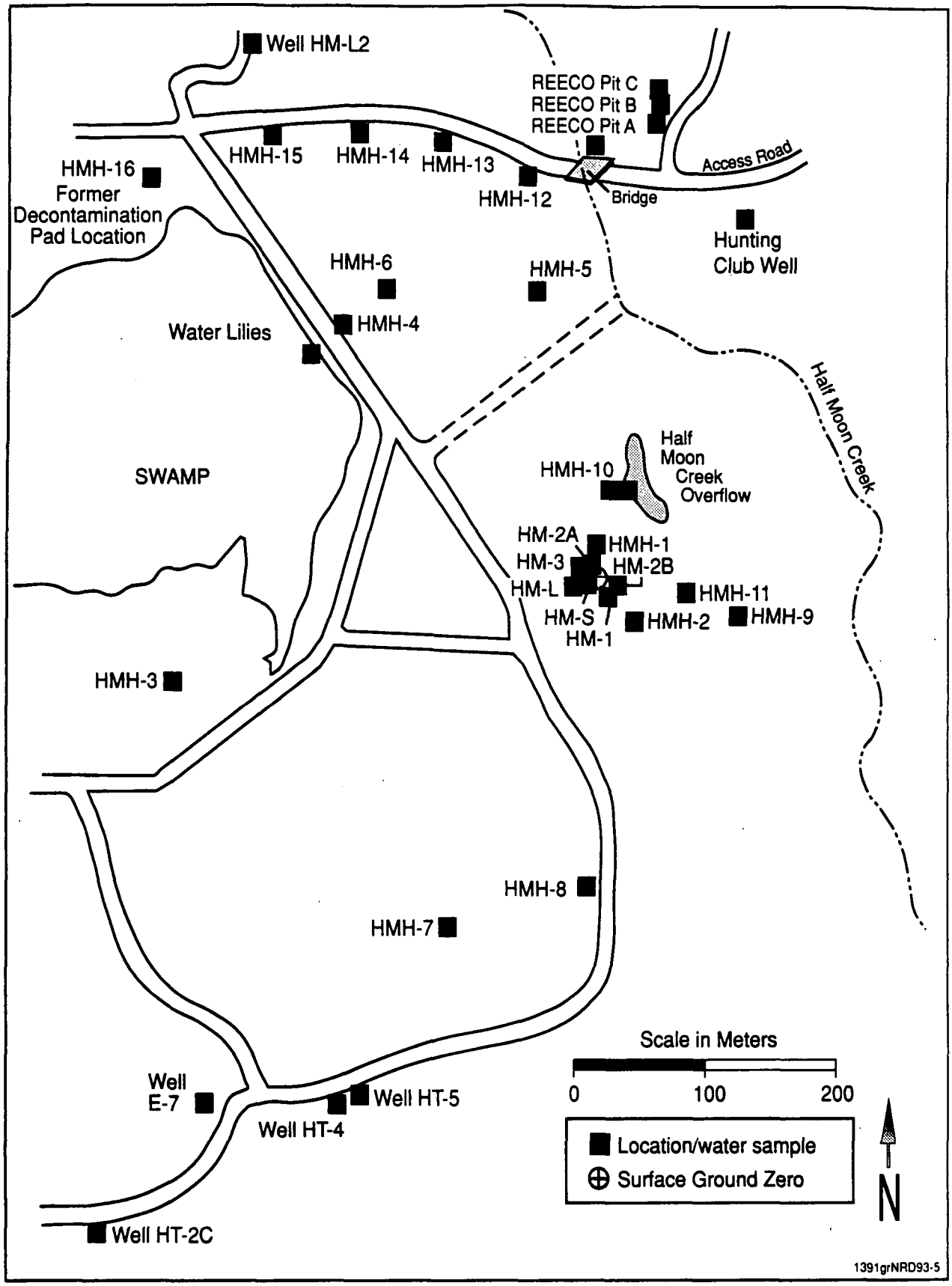


Figure 5. Locations on the Tatum Dome Test Area sampled in 1992.

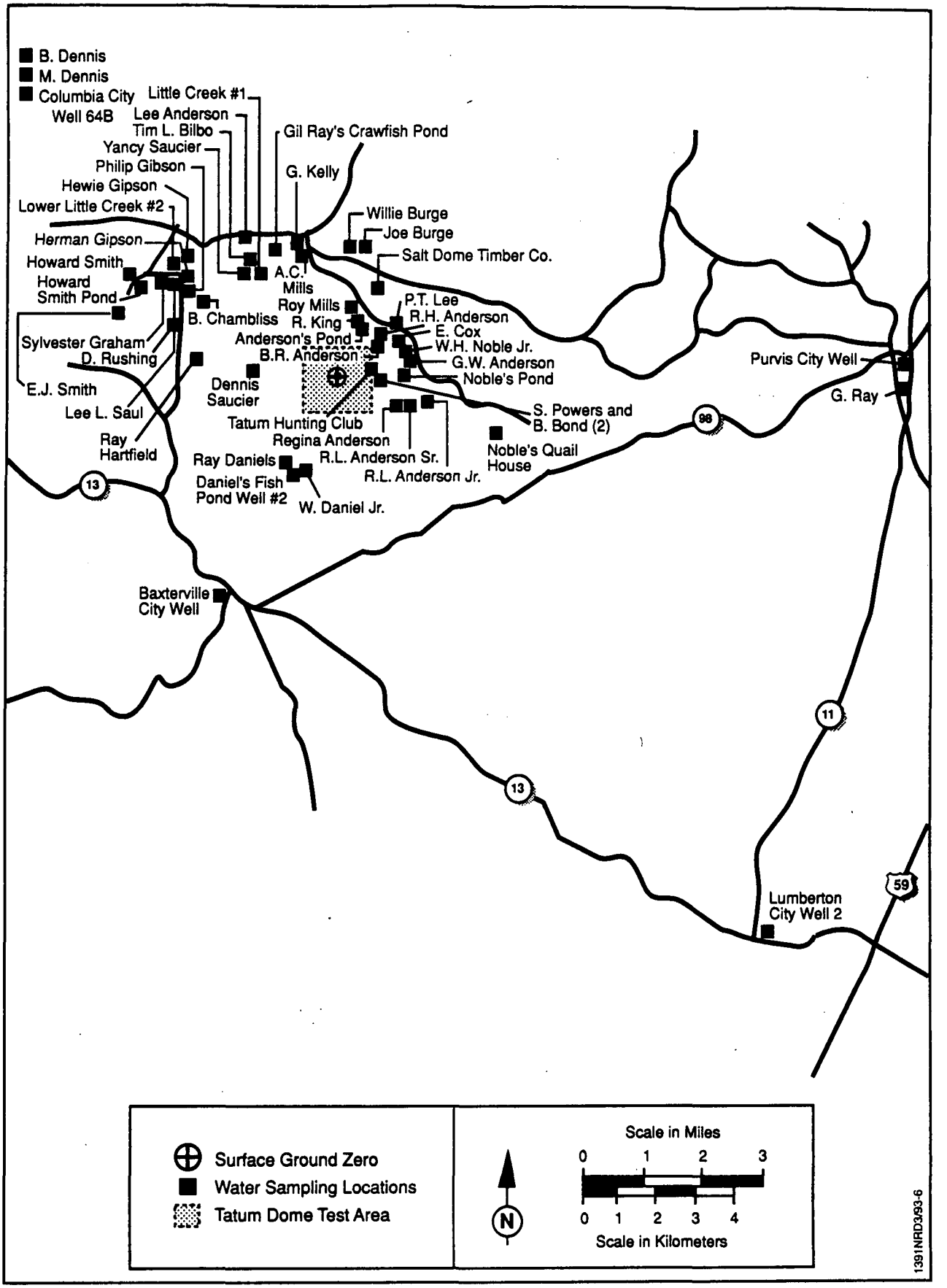


Figure 6. Offsite locations sampled in 1992.

CONCLUSION

No radioactive materials from the Tatum Dome Test Area were detected in any of the offsite water samples. Onsite, tritium was the only radioactive contaminant detected. The tritium contamination was found in brackish water collected from shallow wells located near SGZ. Although this water is not available to the public nor is it fit for human consumption because of its brackishness, the tritium concentrations are well below those defined in the EPA National Interim Primary Drinking Water Regulations (40CFR141).

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GLOSSARY OF TERMS

Background Radiation

The radiation in man's natural environment, including cosmic rays and radiation from naturally-occurring radioactive elements, both outside and inside the bodies of humans and animals. It is also called natural radiation. The usually quoted average individual exposure from background radiation is 125 millirem per year in mid-latitudes at sea level (Shleien and Terpilak 1984).

Curie (Ci)

The basic unit used to describe the rate of radioactive disintegration. The curie is equal to 37 billion disintegrations per second, which is approximately the rate of decay of 1 gram of radium; named for Marie and Pierre Curie, who discovered radium in 1898.

Isotope

One of two or more atoms with the same number of protons, but different numbers of neutrons in their nuclei. Thus ^{12}C, ^{13}C, and ^{14}C are isotopes of the element carbon, the numbers denoting the approximate atomic weights. Isotopes have very nearly the same chemical properties, but often different physical properties (for example ^{12}C and ^{13}C are stable, ^{14}C is radioactive).

Minimum Detectable Concentration (MDC)

The smallest amount of radioactivity that can be reliably detected with a probability of Type I and Type II errors at 5 percent each (DOE 1981).

Offsite

All areas exclusive of the Tatum Dome Test Area.

Onsite

In this report refers to the area within the Tatum Dome Test Area.

Shallow ground water

Water found near the soil surface, caused by precipitation infiltration of the soil. This shallow ground water is not an aquifer.

Surficial Aquifer

The ground water layer located closest to the surface, generally at a depth of approximately 30 feet at SGZ.

Tritium

A radioactive isotope of hydrogen that decays by beta emission. Its half-life is about 12.5 years.

Type I Error

The statistical error of accepting the presence of radioactivity when none is present. Sometimes called alpha error.

Type II Error

The statistical error of failing to recognize the presence of radioactivity when it is present. Sometimes called beta error.

APPENDIX A

SUMMARY OF ANALYTICAL PROCEDURES

TYPE OF ANALYSIS	ANALYTICAL EQUIPMENT	COUNTING PERIOD (MIN)	ANALYTICAL PROCEDURES	SAMPLE SIZE	APPROXIMATE DETECTION LIMIT[a]
Ge(Hp) or Ge(Li) Gamma Spectrometry[b]	IG or GE(Li) detector calibrated at 0.5 keV/ channel (0.04 to 2 MeV range).	Individual air filters, 30 min; 100 min for milk, water, suspended solids.	Radionuclide concentration quantified from gamma spectral data by on-line computer program. Radionuclides in air filter composite samples are identified only.	3.5 L for liquids and vegetables.	Generally 5 pCi/L for most common fallout radionuclides in routine milk and water samples in a simple spectrum.
^{90}Sr	Low background thin-window, gas-flow, proportional counter.	50	Chemical separation by ion exchange. Separated sample counted successively; activity calculated by simultaneous solution of equations.	1.0 L for milk or water; 0.1 to 1 kg for tissue.	2 pCi/L
^{3}H	Automatic liquid scintillation counter with output printer.	300	Sample prepared by distillation.	4 mL for water; 10 mL for urine; 50 g for tissue.	300 to 700 pCi/L
^{3}H+ (Enrichment)	Automatic liquid scintillation counter with output printer.	300	Sample concentrated by electrolysis followed by distillation.	250 mL for water.	10 pCi/L
$^{234,235,238}U$ $^{238,239+240}Pu$	Alpha spectrometer with silicon surface barrier detectors operated in vacuum chambers.	1000 to 4000	Water sample or acid-digested filter or tissue samples separated by ion exchange, electroplated on stainless steel planchet.	1.0 L for water; 0.1 to 1 kg for tissue.	In water samples 0.08 pCi/L for ^{238}Pu, and 0.05 pCi/L for $^{234,235,238}U$ and $^{239+240}PU$.

[a] The detection limit is defined as the smallest amount of radioactivity that can be reliably detected, i.e., probability of Type I and Type II error at 5% each.

[b] Gamma spectrometry using either an intrinsic germanium (Ge(Hp)), or lithium-drifted germanium diode (Ge(Li)) detector.

APPENDIX B

RESULTS FOR WATER SAMPLES COLLECTED IN APRIL, 1992

SAMPLE LOCATION	COLLECTION DATE 1992	CONCENTRATION ± 2 S.D. IN pCi/L (MINIMUM DETECTABLE CONCENTRATION [MDC])				
		^{3}H	$^{3}H+$	^{90}Sr	^{238}Pu	$^{239+240}Pu$
			Baxterville, MS			
Anderson, Billy Ray	04/27		16 ± 3* (5)			
Anderson Pond	04/27		9 ± 3* (4)			
Anderson, Regina	04/27		Not Sampled - no one home			
Anderson, Robert Harvey	04/27		17 ± 4* (6)			
Anderson, Robert Lowell, Sr	04/27		20 ± 3* (5)			
Anderson, Robert Lowell, Jr	04/27		17 ± 3* (4)			
Bilbo, Timothy L.	04/28		24 ± 4* (6)			
Burge, Joe	04/27		18 ± 4* (6)			
Chambliss, B.	04/28		-1 ± 3 (5)			
Daniels, Ray	04/29		15 ± 5* (7)			
Daniels, Webster, Jr.	04/29		18 ± 3* (5)			
Daniels - Well #2 Fish Pond	04/29		19 ± 4* (5)			
Half Moon Creek	04/26		15 ± 3* (4)			
	04/27		27 ± 4* (6)			
Half Moon Creek Overflow	04/26		690 ± 10* (5)			
	04/27		587 ± 9* (5)			
Kelly Gertrude	04/27		-1 ± 3 (5)			
King, Rhonda	04/27		20 ± 4* (6)			

(Continued)

APPENDIX B Continued

RESULTS FOR WATER SAMPLES COLLECTED IN APRIL, 1992

SAMPLE LOCATION	COLLECTION DATE 1992	CONCENTRATION ± 2 S.D. IN pCi/L (MINIMUM DETECTABLE CONCENTRATION [MDC])				
		^{3}H	$^{3}H+$	^{90}Sr	^{238}Pu	$^{239+240}Pu$
			Baxterville, MS (Cont.)			
Lee, P. T.	04/27		45 ± 4* (6)			
Little Creek #1	04/28		20 ± 3* (5)			
Lower Little Creek #2	04/28		18 ± 3* (4)			
Mills, A. C.	04/27		-1 ± 3 (5)			
Mills, Roy	04/29		18 ± 4* (6)			
Nobles Pond	04/27		18 ± 4* (6)			
Nobles Quail House	04/27		59 ± 11* (17)			
Noble, W. H., Jr.	04/27		37 ± 4* (5)			
Pond West of GZ	04/26		14 ± 4* (6)			
	04/27		16 ± 4* (6)			
REECo Pit Drainage-A	04/26		31 ± 3* (5)			
REECo Pit Drainage-B	04/26	1320 ± 230* (350)				
REECo Pit Drainage-C	04/26		556 ± 8* (5)			
Salt Dome Hunting Club	04/29		24 ± 3* (5)			
Salt Dome Timber Co.	04/27		27 ± 4* (5)			
Saucier, Dennis	04/28		41± 5* (7)			

(Continued)

APPENDIX B Continued

RESULTS FOR WATER SAMPLES COLLECTED IN APRIL, 1992

SAMPLE LOCATION	COLLECTION DATE 1992	CONCENTRATION ± 2 S.D. IN pCi/L (MINIMUM DETECTABLE CONCENTRATION [MDC])				
		^{3}H	$^{3}H+$	^{90}Sr	^{238}Pu	$^{239+240}Pu$
			Baxterville, MS (Cont.)			
Saucier, Wilma & Yancy	04/28		3 ± 3 (6)			
Well Ascot 2	04/28		Not Sampled - No Access			
Well City	04/29		26 ± 5* (7)			
Well E-7	04/28		6 ± 4* (6)			
Well HM-1	04/27		2 ± 3 (5)			
	04/27		0 ± 3 (5)			
Well HM-2A	04/27		-2 ± 4 (7)			
	04/27		-2 ± 3 (5)			
Well HM-2B	04/27		2 ± 4 (6)			
	04/27		-4 ± 3 (5)			
Well HM-3	04/27		3 ± 4 (6)			
	04/27		3 ± 3 (6)			
	04/27		-1 ± 3 (5)			
	04/27		-1 ± 3 (5)			
Well HM-L	04/27	1310 ± 230* (350)				
	04/27		611 ± 9* (5)			
	04/27		733 ± 10* (6)			
	04/27		727 ± 11* (7)			

(Continued)

APPENDIX B Continued

RESULTS FOR WATER SAMPLES COLLECTED IN APRIL, 1992

SAMPLE LOCATION	COLLECTION DATE 1992	CONCENTRATION ± 2 S.D. IN pCi/L (MINIMUM DETECTABLE CONCENTRATION [MDC])				
		^{3}H	$^{3}H+$	^{90}Sr	^{238}Pu	$^{239+240}Pu$
			Baxterville, MS (Cont.)			
Well HM-L2	04/27		2 ± 4 (7)			
	04/27		-3 ± 4 (6)			
Well HM-S	04/26	7070 ± 290* (350)				
	04/27	6720 ± 280* (350)				
Well HMH-1	04/26	5830 ± 280* (350)				
	04/27	14,400 ± 350* (350)				
Well HMH-2	04/26	5120 ± 270* (350)				
	04/27	12,800 ± 340* (350)				
Well HMH-3	04/26		11 ± 3* (4)			
	04/27		27 ± 4* (5)			
Well HMH-4	04/26		13 ± 3* (5)			
	04/27		15 ± 3* (4)			
Well HMH-5	04/26	1860 ± 230* (350)				
	04/27	2060 ± 240* (350)				
Well HMH-6	04/26		72 ± 4* (4)			
	04/27		57 ± 5* (6)			
Well HMH-7	04/26	Not Sampled - Under Water				
	04/27					
Well HMH-8	04/26		13 ± 3* (5)			
	04/27		20 ± 4* (6)			

(Continued)

APPENDIX B Continued

RESULTS FOR WATER SAMPLES COLLECTED IN APRIL, 1992

SAMPLE LOCATION	COLLECTION DATE 1992	^{3}H	CONCENTRATION ± 2 S.D. IN pCi/L (MINIMUM DETECTABLE CONCENTRATION [MDC]) $^{3}H+$	^{90}Sr	^{238}Pu	$^{239+240}Pu$
			Baxterville, MS, (Cont.)			
Well HMH-9	04/26		87 ± 4* (5)			
	04/27		91 ± 5* (6)			
Well HMH-10	04/26		298 ± 7* (5)			
	04/27		256 ± 8* (7)			
Well HMH-11	04/26		23 ± 4* (6)			
	04/27		28 ± 4* (6)			
Well HMH-12	04/26		12 ± 3* (5)			
	04/27		12 ± 5* (8)			
Well HMH-13	04/26		11 ± 3* (5)			
	04/27		8 ± 4* (6)			
Well HMH-14	04/26		Not Sampled - Well Dry			
	04/27					
Well HMH-15	04/26		12 ± 4* (6)			
	04/27		9 ± 5* (7)			
Well HMH-16	04/26		75 ± 5* (6)			
	04/27		117 ± 6* (6)			
Well HT-2C	04/28		9 ± 3* (5)			
Well HT-4	04/28		6 ± 5 (8)			
Well HT-5	04/28		1 ± 3 (6)			

(Continued)

APPENDIX B Continued

RESULTS FOR WATER SAMPLES COLLECTED IN APRIL, 1992

SAMPLE LOCATION	COLLECTION DATE 1992	^{3}H	CONCENTRATION ± 2 S.D. IN pCi/L (MINIMUM DETECTABLE CONCENTRATION [MDC]) $^{3}H+$	^{90}Sr	^{238}Pu	$^{239+240}Pu$
			Columbia, MS			
Dennis, Buddy	04/28		21 ± 5* (9)			
Dennis, Marvin	04/28		14 ± 6* (9)			
Well 64B City	04/28		7 ± 4* (7)			
			Lumberton, MS			
Anderson, G. W.	04/27		19 ± 5* (8)			
Anderson, Lee L.	04/29		20 ± 3* (4)			
Bond, Bradley K.	04/29		16 ± 5* (8)			
Cox, Eddie	04/27		28 ± 4* (5)			
Gil Ray's Crawfish Pond	04/27		7 ± 3* (5)			
Gipson, Herman	04/28		-2 ± 3 (5)			
Gipson, Hewie[a]	04/27		23 ± 5* (8)	-0.12 ± 0.56 (1.27)	-0.0067 ± 0.0135 (0.0271)	-0.0034 ± 0.0067 (0.0157)
Gipson, Phillip[a]	04/27		21 ± 7* (11)	-0.26 ± 0.66 (1.44)	-0.0107 ± 0.0129 (0.0265)	-0.0022 ± 0.0043 (0.0100)
Graham, Sylvester	04/28		-2 ± 4 (6)			
Hartfield, Ray[a]	04/28		-3 ± 8 (13)	0.89 ± 0.65 (1.37)	-0.0020 ± 0.0070 (0.0094)	0.0040 ± 0.0081 (0.0094)
Powers, Sharon	04/29		13 ± 5* (8)			
Rushing, Debra	04/28		27 ± 4* (5)			
Saul, Lee L.	04/28		0 ± 3 (6)			

(Continued)

APPENDIX B Continued

RESULTS FOR WATER SAMPLES COLLECTED IN APRIL, 1992

SAMPLE LOCATION	COLLECTION DATE 1992	CONCENTRATION ± 2 S.D. IN pCi/L (MINIMUM DETECTABLE CONCENTRATION [MDC])				
		^{3}H	$^{3}H+$	^{90}Sr	^{238}Pu	$^{239+240}Pu$
Lumberton, MS, (Cont.)						
Smith, E. J.[a]	04/28		18 ± 8* (13)	0.38 ± 0.67 (1.42)	-0.0044 ± 0.0152 (0.0270)	0 ± 0.0062 (0.0102)
Smith, Howard	04/28		2 ± 4 (7)			
Smith, Howard - Pond	04/29		12 ± 6* (10)			
Thompson, Roswell[a]	04/28		28 ± 9* (15)	0.29 ± 0.70 (1.34)	0.0034 ± 0.0116 (0.0156)	0.0070 ± 0.0164 (0.0221)
Well 2 City	04/29		2 ± 4 (6)			
Purvis, MS						
Burge, Willie Ray & Graco	04/27		15 ± 5* (8)			
City Supply	04/27		3 ± 4 (6)			
Gil, Ray - House Well	04/27		-3 ± 3 (5)			

** Concentration is greater than the minimum detectable concentration (MDC).*

[a] Uranium analysis results were as follows:

SAMPLE LOCATION	COLLECTION DATE 1992	CONCENTRATION ± 2 S.D. IN pCi/L (MINIMUM DETECTABLE CONCENTRATION [MDC])		
		^{234}U	^{235}U	^{238}U
Gipson, Hewie	04/27 (0.0257)	0.038 ± 0.0237* (0.0217) (0.0097)	-0.0021 ± 0.0125	0.0209 ± 0.0145*
Gipson, Phillip	04/27 (0.0542)	-0.0030 ± 0.0324 (0.0243) (0.0140)	0.0150 ± 0.0200	0.0180 ± 0.0171*
Hartfield, Ray	04/28 (0.0357)	0.0989 ± 0.0358* (0.0160) (0.0092)	-0.0020 ± 0.0088	0.0573 ± 0.0223*
Smith, E. J.	04/28 (0.0313)	0.0234 ± 0.0237 (0.0222) (0.0172)	-0.0085 ± 0.0104	0.0170 ± 0.0159
Thompson, Roswell	04/28 (0.0096)	0.1380 ± 0.0352* (0.0096) (0.0096)	0.0041 ± 0.0083	0.1170 ± 0.0324*