TRITIUM ACTIVITIES IN SELECTED WELLS ON THE NEVADA TEST SITE

by

Brad F. Lyles

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May 1993

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Publication #45104

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Publication #45104

prepared for

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May 1993

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The work upon which this report is based was supported by the U.S. Department of Energy under Contract #DE-AC08-90NV10845.

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ABSTRACT

Literature and data were reviewed related to radionuclides in groundwater on and near the Nevada Test Site. No elevated tritium activities have been reported outside of the major testing regions of the Nevada Test Site. Three wells were identified as having water with above-background (>50 pCi/l) tritium activities: UE-15d Water Well; USGS Water Well A; and USGS Test Well B Ex. Although none of these wells have tritium activities greater than the Nevada State Drinking Water standard (20,000 pCi/l), their time-series tritium trends may be indicative to potential on-site radionuclide migration.

INTRODUCTION

The original intent of this study was to identify regions of tritium-contaminated groundwater at the Nevada Test Site (NTS). During the literature and data review phase of this project it was quickly determined that there were insufficient data available to develop tritium activity contour maps or cross sections. Therefore, the objectives were slightly modified to focus on monitoring wells that may be showing early indications of potential radionuclide migration. Monitoring wells with tritium activities above-background were considered elevated and were evaluated (above-background tritium activities are defined as values greater than 50 pCi/l, five times the analytical detection limit).

No elevated tritium levels in groundwater have been reported outside of the major testing regions of the NTS (Crow, 1976). Crow (1976) reported elevated tritium in groundwater near well UE-2aw; the elevated tritium was restricted to the immediate testing area near U-2aw. Radionuclide migration experiments performed at the Cambric, Nash, Bilby, Cheshire, and Bourbon sites (Buddemeier and Isherwood, 1985; Buddemeier, 1988) suggest that tritiated groundwater has not migrated great distances from the event cavity, but enhanced tritium migration was observed at the Cambric site due to groundwater pumping during a radionuclide migration experiment.

Upon review of data from the above-mentioned reports, from Desert Research Institute (DRI) reports (Lyles, 1990; Russell, 1991), and tritium analyses from the Long-Term Hydrologic Monitoring Program (LTHMP) database, there are two wells showing gradually increasing tritium trends (UE-15d Water Well and USGS Water Well A) and one well showing a steady trend (USGS Test Well B Ex.). All of these wells are well below the State of Nevada drinking water standards and are of no immediate threat to health or off-site migration; however, the trends indicate that the results of future water analysis should be monitored closely.

TRITIUM ANALYSIS

All tritium analyses for this study were performed by the U.S. Environmental Protection Agency (EPA) Environmental Isotope Laboratory, with the exception of one analysis from the DRI Environmental Isotope Laboratory for UE-15d Water Well (discussed later). Both laboratories follow the same procedures (Lyles, 1990), have the same lower limits of detection of 10 pCi/l, and both report $\pm$ counting errors for each analysis (based on the instrument counting efficiency, the sample enrichment factor, the background counts per minute, and the sample counts per minute). The reported tritium activities are computed from the mean of 10 or more measurements, and the counting errors are reported as two standard deviations (2 sigma). Therefore, tritium activities less than 10 pCi/l are below the analytical detection limits. Analyses with counting errors greater than the respective tritium activity are suspect and are thus flagged in this report.

DISCUSSION

Aside from wells used for radionuclide migration experiments, three wells were found to have slightly elevated tritium levels and exhibit time-series trends that may be indicative of radionuclide migration driven by natural or man-induced hydrologic gradients. Brief descriptions of the well completions (from Raytheon Services Nevada Hole Histories) are included for each site, as well as discussions of the time-series tritium activity trends, and recommendations related to future studies and data collection.

Well UE-15d Water Well

Well UE-15d Water Well is located in Area 15 at the EPA experimental farm (N895,708 ft; E682,084 ft; Figure 1). The well was drilled in April 1962 to a depth of 1,829 m. The well penetrates four lithologic units: alluvium (0 to 88 m), volcanic rocks (88 to 540 m), quartzite (540 to 1,622 m), and dolomite (1,622 to 1,829 m). The borehole was drilled to total depth with a 15.9-cm-diameter drill bit and was completed with a 11.4-cm-diameter liner. The bottom 792 m of liner was slotted and the bottom of the liner was left open. There are no annular cement seals in the well; therefore, water in the borehole may be produced from all transmissive lithologic units. An aquifer test was conducted on March 27, 1962, at a pumping rate of 430 m³/day, yielding 89.6 m of drawdown and a specific capacity of 4.7 m³/day/m (Claassen, 1973). The static water level was 209 m below land surface on January 13, 1983 (Arteaga et al., 1991).

This well has been monitored as part of the LTHMP from 1973 to 1990, when the pump failed in the well. Data from EPA's LTHMP database were used to develop a plot of tritium activity versus time (Figure 2). All data are plotted; however, it should be noted that nine data values had counting errors greater than the reported tritium activities. The last sample collected prior to the pump failure was on April 16, 1990. The last result from the EPA sampling showed an abrupt decrease from the previously observed trend. Coincidentally, DRI collected a sample at the same time for tritium interlaboratory comparison. The analysis from the DRI laboratory more closely followed the trend observed prior to April 1990; therefore, the DRI sample was used to establish the best fit line on Figure 2 (DRI analysis = 74 pCi/l $\pm$ 8). The long-term trend suggests that there is still an increasing trend over the past 10 years (from approximately 20 to 100 pCi/l in 10 years).

The source of this tritium is unknown, but is possibly from nearby underground tests or from infiltrating water contaminated at the EPA experimental farm. The well is approximately 2 km from an underground nuclear test area where three tests were conducted in the early to mid-1960s (Hard Hat, Tiny Tot, and Pile Driver). This small test area is hydrologically upgradient from Well UE-15d Water Well.

Alternatively, the EPA farm complex has several basins and sumps that were used to contain water during the 10 or so years that the facility was in operation. It may be possible that water in these ponds contained tritium; with the water table 210 m below the ponds and stock

Figure 1. Location Map of Selected Wells with Elevated Tritium Activity at the Nevada Test Site.

Figure 2. UE-15d Water Well Time-Series Plot of Tritium Activity versus Time.

yards of the EPA farm, it is possible that the experiments performed at the EPA farm are the point source of tritium observed in Well UE-15d Water Well.

Recommendations

1. Tritium data collection should resume to determine if the increasing tritium activity trend persists; therefore, the pump should either be replaced or, at a minimum, removed from the well so that bailed samples can be collected.
2. A literature review of the experiments carried out at the EPA complex should be conducted to identify isotopes used at the farm that may be detected in the well water.
3. Nitrogen isotope samples should be collected for analysis to determine if the well water has a significant component from the farming activities at the EPA site.

USGS Water Well A

USGS Water Well A is located in Area 3 near the Area 3 Support Facility (N833,000 ft; E684,000 ft; Figure 1) and was part of the NTS water supply network. The well was drilled in September 1960 to a total depth of 570 m. The well is completed in alluvium, with 27.3-cm-diameter casing below the water level; the bottom 78 m (492 to 570 m) of casing are gun perforated. An aquifer test was conducted on March 3, 1971, at a pumping rate of 698 m³/day, yielding 27.67 m of drawdown and a specific capacity of 25 m³/day/m (Claassen, 1973). The most recent depth to water was measured on April 10, 1969, and equaled 492 m below land surface (Arteaga et al., 1991).

This well has been part of the LTHMP from 1972 to 1988, when the well was taken off the water supply network. Data from EPA's LTHMP database were used to develop a plot of tritium activity versus time (Figure 3). None of the samples analyzed to date have been greater than the Nevada safe drinking water standard (nearly 20,000 pCi/l), however, the tritium trend increased sharply from 1985 to the termination of sampling in 1988. Assuming that the trend established in the late 1980s has continued into the 1990s, tritium concentrations could exceed 100 pCi/l by September 1992, however, this is only speculation since there are no data after 1988.

USGS Water Well A is downgradient from the major testing areas in Yucca Flat. The closest underground test to USGS Water Well A was Haymaker (approximately 500 m north-northwest of USGS Water Well A). Although Haymaker was detonated above the water table, it is likely that the cavity extended below the water table (cavity geometry data are classified, but the cavity is believed to extend below the water table). Along with Haymaker, there were about 14 underground tests within 1 km of Well A, most appearing to be hydrologically upgradient of USGS Water Well A.

Recommendations

1. Tritium data collection should resume to determine if the increasing tritium activity trend persists; therefore, the pump discharge line should be modified so that water samples can

Figure 3. USGS Water Well A Time-Series Plot of Tritium Activity versus Time.

be collected without being connected to the water-supply network or the pump should be removed from the well so that bailed samples can be collected.

2. Quarterly samples should be collected and their analyses should be reviewed in comparison with the pre-1988 samples to monitor the temporal variations.

USGS Test Well B Ex.

USGS Test Well B Ex. is located in northeast Area 6 (N812,044 ft; E690,713 ft; Figure 1). Information about the drilling and completion of the well is poor. The well was drilled to a depth of 510.5 m in 1961; 30.5-cm-ID casing was installed from land surface to 469.1 m, and a 25.4-cm-diameter liner was installed from 419.1 m to 510.5 m. The annular space from land surface to 510.5 m was apparently concreted. Therefore, the only water-producing zone is through the bottom of the casing. DRI personnel visited the site on August 20, 1991, and measured a fluid level of 458.7 m below land surface, a total depth of 505 m, and at the bottom of the hole, mud, metal shavings, and diesel fuel contamination was found. This well has been reviewed as a potential "recompletion well," but obstructions (drill collars and a drill bit) were left at the bottom of the hole possibly making it cost prohibitive to deepen the well.

USGS Test Well B Ex. was sampled monthly from 1976 to the present as part of the LTHMP. Discrete samples are bailed from the well at a depth of 501.4 m below land surface (approximately 43 m below the water level). Tritium levels have been somewhat constant over the last 10 years, averaging approximately 150 pCi/l (Figure 4). USGS Test Well B Ex. is downgradient from major underground testing areas in Areas 1 and 3. Elevated tritium levels in groundwater may be the source of tritium contamination in USGS Test Well B Ex., however, the complications encountered while completing this hole make it impossible to further speculate on the tritium source.

Recommendations

1. Continue sampling USGS Test Well B Ex. as part of the LTHMP on a quarterly to semi-annual basis; monthly sampling is not needed based on the observed time-series trends.
2. Install a low volume pump (1 to 10 l/min) in the well, pump fluid from the well until temperature, pH and EC stabilize (approximately 10 well volumes), and collect fluid samples for major cations and anions, tritium, carbon, oxygen, and hydrogen isotope analyses.

CONCLUSIONS

Elevated tritium activities in groundwater have been detected within the major underground nuclear testing areas of the NTS, and in one case radionuclide migration was

Figure 4. USGS Test Well B Ex. Time-Series Plot of Tritium Activity versus Time.

enhanced by pumping tritiated groundwater from the Cambrian site, as part of a radionuclide migration study. Only three wells were identified from the LTHMP as having water with above-background tritium activity (approximately 50 pCi/l): Well UE-15d Water Well, USGS Water Well A, and USGS Test Well B Ex. These three wells are each downgradient of underground testing areas. The time-series tritium activities from each well may indicate radionuclide migration is occurring in these areas; however, none of the analyses are above the Nevada drinking water standard for tritium of 20,000 pCi/l. Additional sampling of these three wells is recommended.

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APPENDIX

Time-Series Tritium Data

**(These data are as reported from the EPA
database and have not been filtered or modified)**

**(Values flagged with an asterisk have tritium
activities less than zero and/or have counting
errors greater than the respective tritium activities)**

UE-15d Water Well

Date (dmy)	Tritium (pCi/l)	counting error	Flag
18 JAN 73	7.70	0.00	
03 JUL 73	6.70	0.00	
08 JAN 74	13.00	0.00	
07 JUL 74	8.30	0.00	
15 JAN 75	6.40	0.00	
06 JUL 75	7.00	0.00	
08 JAN 76	6.70	0.00	
10 JUL 76	7.00	0.00	
04 JAN 77	44.00	8.20	
07 JUN 77	8.70	0.00	
03 FEB 78	12.20	15.40	*
17 JUL 78	1.98	22.00	*
05 FEB 80	6.50	8.07	*
08 JUL 80	10.00	5.87	
06 JAN 81	60.40	4.69	
06 JUL 83	41.50	4.89	
10 JAN 84	62.70	6.97	
11 JUL 84	4.06	8.51	*
06 AUG 84	28.50	4.42	
12 JAN 85	78.20	252.00	*
13 JUN 85	93.20	7.56	
08 JAN 86	88.20	284.00	*
05 FEB 87	84.60	326.00	*
09 JUN 87	-3.24	11.10	*
07 JUL 88	103.00	10.40	
10 FEB 89	99.70	7.20	
15 MAR 89	82.60	7.12	
09 SEP 89	78.90	6.87	
16 MAY 90	8.44	4.93	

USGS Water Well A

Date (dmy)	Tritium (pCi/l)	counting error	Flag
05 DEC 72	8.00	0.00	
23 JAN 73	5.70	0.00	
26 FEB 73	11.00	0.00	
06 MAR 73	6.70	0.00	
01 APR 73	7.00	0.00	
13 MAY 73	7.00	0.00	
03 JUL 73	9.30	0.00	
13 AUG 73	9.30	0.00	
05 SEP 73	8.00	0.00	
02 OCT 73	7.70	0.00	
13 NOV 73	6.10	0.00	
10 DEC 73	6.10	0.00	
08 JAN 74	6.10	0.00	
05 FEB 74	12.00	0.00	
19 MAR 74	7.00	0.00	
16 APR 74	8.90	0.00	
07 MAY 74	8.60	0.00	
10 JUN 74	7.30	0.00	
08 JUL 74	18.00	11.00	
13 AUG 74	6.40	0.00	
11 SEP 74	5.70	0.00	
07 OCT 74	7.70	0.00	
06 NOV 74	7.00	0.00	
02 DEC 74	6.70	0.00	
14 JAN 75	9.30	0.00	
13 FEB 75	6.40	0.00	
12 MAR 75	8.60	0.00	
14 APR 75	8.60	0.00	
04 MAY 75	8.30	0.00	
04 JUN 75	7.00	0.00	
11 AUG 75	7.30	0.00	
09 SEP 75	7.30	0.00	
07 OCT 75	7.30	0.00	
04 NOV 75	8.00	0.00	
01 DEC 75	8.30	0.00	
08 JAN 76	6.70	0.00	
05 FEB 76	7.70	0.00	
01 MAR 76	7.70	0.00	
05 APR 76	7.70	0.00	
09 MAY 76	8.30	0.00	
01 JUN 76	5.70	0.00	
11 JUL 76	7.70	0.00	
02 AUG 76	8.00	0.00	
07 SEP 76	7.30	0.00	
11 OCT 76	7.70	7.00	

USGS Water Well A (continued)

Date (dmy)	Tritium (pCi/l)	counting error	Flag
02 NOV 76	8.00	0.00	
01 DEC 76	8.60	0.00	
04 JAN 77	7.70	0.00	
02 FEB 77	8.00	0.00	
00 MAR 77	8.40	0.00	
19 APR 77	6.70	0.00	
08 MAY 77	8.00	0.00	
12 JUN 77	6.60	0.00	
04 JUL 77	6.60	0.00	
08 AUG 77	8.70	0.00	
08 SEP 77	7.50	0.00	
03 NOV 77	6.70	0.00	
05 DEC 77	6.60	0.00	
03 FEB 78	2.95	12.90	*
06 MAR 78	11.90	16.50	*
02 APR 78	14.90	18.70	*
01 MAY 78	3.96	15.20	*
06 JUN 78	5.23	13.10	*
17 JUL 78	-8.96	16.00	*
01 AUG 78	-0.67	16.80	*
19 SEP 78	0.44	8.48	*
19 OCT 78	9.40	10.40	*
22 NOV 78	1.83	8.59	*
19 DEC 78	20.60	7.39	*
17 JAN 79	-2.51	12.50	*
22 FEB 79	-4.74	9.14	*
27 MAR 79	10.90	5.72	*
25 APR 79	-0.92	9.41	*
21 MAY 79	8.21	9.00	*
23 JUL 79	2.45	11.10	*
22 AUG 79	30.50	6.22	
23 OCT 79	2.51	8.10	*
04 DEC 79	-5.88	9.71	*
16 JAN 80	-6.45	10.50	*
07 FEB 80	4.24	8.57	*
11 MAR 80	-12.00	10.30	*
05 MAY 80	-5.55	9.92	*
26 MAY 80	8.07	9.92	*
25 JUN 80	-4.60	10.50	*
07 JUL 80	-2.76	9.71	*
12 AUG 80	3.76	11.90	*
11 SEP 80	-12.30	10.50	*
29 OCT 80	-5.62	9.30	*
20 NOV 80	7.22	9.19	*
22 DEC 80	-0.91	8.13	*

USGS Water Well A (continued)

Date (dmy)	Tritium (pCi/l)	counting error	Flag
21 JAN 81	-13.00	7.34	*
28 APR 81	-2.20	7.49	*
18 MAY 81	-1.19	6.68	*
29 JUN 81	1.39	6.71	*
19 JUL 81	3.79	6.45	*
18 AUG 81	6.91	4.04	
15 SEP 81	-0.20	6.75	*
20 OCT 81	1.53	8.28	*
18 NOV 81	-7.07	9.02	*
08 DEC 81	5.17	6.16	*
20 JAN 82	-1.35	6.52	*
17 FEB 82	-0.36	7.44	*
24 MAR 82	0.56	8.72	*
19 APR 82	2.63	7.34	*
23 MAY 82	-8.76	8.00	*
21 JUN 82	-6.07	8.15	*
25 JUL 82	2.99	7.65	*
17 AUG 82	-6.32	7.28	*
15 SEP 82	-9.32	7.70	*
19 OCT 82	-18.60	10.40	*
17 NOV 82	-5.70	8.66	*
14 DEC 82	6.12	7.09	*
19 JAN 83	-1.14	7.37	*
15 FEB 83	8.20	4.75	
08 MAR 83	-2.37	7.14	*
25 APR 83	1.04	6.90	*
16 MAY 83	1.30	7.49	*
21 JUN 83	7.34	7.57	*
26 JUL 83	20.70	4.94	
22 AUG 83	2.03	7.37	*
13 SEP 83	23.10	4.56	
18 OCT 83	1.09	6.73	*
28 NOV 83	-1.51	7.52	*
04 DEC 83	-5.86	7.87	*
10 JAN 84	4.70	9.68	*
07 FEB 84	4.54	10.90	*
05 MAR 84	1.48	9.77	*
02 APR 84	20.00	7.48	
08 MAY 84	4.60	7.38	*
11 JUN 84	0.00	6.04	*
03 JUL 84	1.17	6.63	*
06 AUG 84	0.00	6.77	*
05 SEP 84	0.00	6.11	*
08 OCT 84	0.00	6.70	*
01 NOV 84	3.04	6.39	*

USGS Water Well A (continued)

Date (dmy)	Tritium (pCi/l)	counting error	Flag
26 DEC 84	6.53	6.62	*
17 JAN 85	9.34	3.83	
07 FEB 85	-1.61	11.80	*
04 MAR 85	3.42	7.31	*
10 APR 85	0.50	10.20	*
06 MAY 85	15.30	6.56	
13 JUN 85	-7.17	10.30	*
08 JUL 85	3.66	9.88	*
06 AUG 85	3.19	12.00	*
05 SEP 85	5.58	11.10	*
20 OCT 85	-0.81	11.00	*
04 NOV 85	8.03	11.40	*
08 DEC 85	9.14	10.70	*
05 FEB 86	6.23	11.60	*
03 MAR 86	5.94	11.90	*
15 APR 86	19.20	7.69	
06 MAY 86	11.40	11.50	*
02 JUN 86	4.06	11.70	*
01 JUL 86	13.00	7.78	
06 AUG 86	11.50	12.80	*
16 SEP 86	15.70	7.92	
08 OCT 86	11.50	6.85	
18 NOV 86	12.70	7.24	
02 DEC 86	15.20	7.29	
14 JAN 87	25.60	7.73	
05 FEB 87	39.40	8.46	
10 MAR 87	50.70	7.54	
07 APR 87	23.50	8.25	
10 MAY 87	24.20	8.05	
09 JUN 87	21.00	6.86	
06 JUL 87	29.40	7.42	
17 AUG 87	14.50	7.18	
14 SEP 87	19.60	8.04	
13 OCT 87	13.20	13.90	*
05 NOV 87	30.20	8.86	
08 DEC 87	36.70	8.23	
06 FEB 88	19.70	8.68	
03 MAR 88	22.10	8.35	
09 APR 88	40.50	9.81	
05 MAY 88	13.80	8.33	
17 JUN 88	46.90	10.20	
07 JUL 88	37.70	10.10	
19 AUG 88	50.80	9.61	
09 SEP 88	38.70	10.20	
14 OCT 88	49.20	10.30	

USGS Water Well A (continued)

Date (dmy)	Tritium (pCi/l)	counting error	Flag
05 NOV 88	52.30	9.59	

USGS Test Well B Ex.

Date (dmy)	Tritium (pCi/l)	counting error	Flag
04 FEB 76	260.00	12.00	
04 AUG 76	250.00	11.00	
25 JAN 77	240.00	9.90	
11 MAY 77	230.00	11.00	
06 JUN 77	150.00	11.00	
03 JUL 77	330.00	270.00	
02 NOV 77	220.00	11.00	
04 DEC 77	210.00	10.00	
16 JAN 78	172.00	10.20	
03 FEB 78	195.00	11.10	
18 JUL 78	248.00	21.50	
18 SEP 78	177.00	7.60	
18 OCT 78	172.00	7.56	
21 NOV 78	167.00	10.20	
18 DEC 78	191.00	9.79	
18 JAN 79	164.00	10.00	
21 FEB 79	148.00	7.54	
21 MAY 79	177.00	7.77	
10 DEC 79	135.00	7.47	
05 FEB 80	136.00	7.33	
10 MAR 80	143.00	8.10	
26 MAY 80	177.00	8.55	
24 JUN 80	134.00	8.09	
09 JUL 80	129.00	8.06	
14 AUG 80	147.00	8.92	
11 SEP 80	113.00	7.87	
27 OCT 80	145.00	7.34	
21 NOV 80	123.00	6.99	
22 DEC 80	198.00	11.90	
21 JAN 81	151.00	7.93	
10 FEB 81	107.00	7.25	
02 MAR 81	132.00	8.65	
17 MAY 81	188.00	8.29	
21 JUN 81	98.90	5.44	
20 JUL 81	122.00	5.78	
19 AUG 81	109.00	5.62	
16 SEP 81	118.00	6.10	
21 OCT 81	107.00	6.93	
20 NOV 81	106.00	7.31	
09 DEC 81	119.00	5.41	
19 JAN 82	109.00	5.33	
17 FEB 82	120.00	6.48	
02 MAR 82	144.00	6.60	
07 APR 82	124.00	6.62	
28 JUN 82	124.00	6.24	

USGS Test Well B Ex. (continued)

Date (dmy)	Tritium (pCi/l)	counting error	Flag
11 JUL 82	161.00	6.21	
18 AUG 82	140.00	6.37	
20 OCT 82	126.00	7.54	
18 NOV 82	136.00	5.99	
15 DEC 82	136.00	6.22	
20 JAN 83	155.00	6.40	
16 FEB 83	129.00	5.78	
09 MAR 83	177.00	6.63	
26 APR 83	150.00	6.18	
17 MAY 83	156.00	5.97	
22 JUN 83	111.00	5.74	
27 JUL 83	167.00	6.36	
28 AUG 83	175.00	6.52	
14 SEP 83	150.00	6.68	
19 OCT 83	150.00	7.06	
22 NOV 83	175.00	6.39	
19 DEC 83	184.00	6.74	
11 JAN 84	158.00	7.18	
08 FEB 84	188.00	8.66	
06 MAR 84	190.00	6.10	
03 APR 84	189.00	9.54	
05 MAY 84	5.62	6.75	
11 JUN 84	157.00	5.46	
04 JUL 84	151.00	5.24	
07 AUG 84	155.00	5.47	
06 SEP 84	161.00	5.00	
10 OCT 84	157.00	5.38	
05 NOV 84	161.00	6.20	
18 JAN 85	165.00	5.60	
14 FEB 85	160.00	5.64	
05 MAR 85	148.00	7.02	
10 APR 85	142.00	7.16	
05 MAY 85	172.00	7.68	
12 JUN 85	170.00	7.54	
08 JUL 85	159.00	7.43	
05 AUG 85	151.00	7.31	
05 SEP 85	150.00	8.27	
10 OCT 85	160.00	8.52	
05 NOV 85	156.00	8.08	
09 DEC 85	154.00	7.53	
07 JAN 86	145.00	7.73	
04 FEB 86	148.00	8.10	
02 MAR 86	146.00	7.91	
14 APR 86	146.00	8.44	
05 MAY 86	318.00	8.72	

USGS Test Well B Ex. (continued)

Date (dmy)	Tritium (pCi/l)	counting error	Flag
29 JUN 86	151.00	7.69	
29 JUN 86	135.00	8.07	
06 OCT 86	137.00	7.66	
18 NOV 86	142.00	8.34	
01 DEC 86	125.00	8.25	
13 JAN 87	143.00	8.08	
05 FEB 87	123.00	8.56	
06 APR 87	141.00	9.04	
09 JUN 87	117.00	7.98	
05 JUL 87	142.00	8.77	
16 AUG 87	128.00	8.47	
13 SEP 87	143.00	8.12	
13 OCT 87	151.00	9.28	
08 DEC 87	158.00	8.77	
06 JAN 88	149.00	9.61	
02 FEB 88	156.00	9.39	
08 MAR 88	126.00	9.13	
04 APR 88	130.00	11.30	
18 JUL 88	136.00	11.00	
08 AUG 88	130.00	10.80	
15 SEP 88	141.00	10.30	
21 OCT 88	152.00	11.70	
03 NOV 88	123.00	10.40	
05 JAN 89	116.00	7.72	
14 FEB 89	140.00	7.46	
22 MAR 89	135.00	7.40	
04 APR 89	133.00	8.27	
17 MAY 89	119.00	8.07	
29 JUN 89	128.00	8.11	
12 JUL 89	125.00	7.72	
07 AUG 89	67.30	6.90	
06 SEP 89	111.00	7.31	
04 OCT 89	118.00	12.20	
08 NOV 89	128.00	6.59	
12 DEC 89	153.00	6.63	
04 JAN 90	141.00	6.52	
05 FEB 90	136.00	6.44	
06 MAR 90	102.00	5.89	
14 MAY 90	105.00	6.39	
06 JUN 90	74.70	5.43	
19 JUL 90	106.00	8.82	
22 AUG 90	115.00	7.27	
13 SEP 90	56.90	7.16	
22 OCT 90	69.80	5.89	
19 NOV 90	126.00	6.41	

USGS Test Well B Ex. (continued)

Date (dmy)	Tritium (pCi/l)	counting error	Flag
13 DEC 90	106.00	6.62	
02 JAN 91	128.00	7.46	

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