MINNESOTA GEOLOGICAL SURVEY

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RADON ACTIVITY IN GROUND WATERS OF SEVEN TEST AREAS IN MINNESOTA

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RADON ACTIVITY IN GROUND WATERS OF SEVEN TEST AREAS IN MINNESOTA

by

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INTRODUCTION

Radon is a naturally occurring, radioactive, chemically inert gas that aroused almost immediate interest among scientists following its discovery in 1900. Shortly after 1900, hot springs in both Europe and America that were known to be high in radium were also found to emanate quantities of radon, and an association between uranium ores and radon-rich ground and surface water was recognized at about the same time. Radon was initially termed "radium emanation" and it was not until 1908 that the element was isolated and its density determined.

Radon is produced as an intermediate member in the radioactive decay series of uranium and thorium. Because uranium and thorium are widely distributed in nature, occurring in trace amounts in virtually all rocks, radon gas also is widely distributed, being found in rock fractures, soils, natural waters, and the atmosphere. The natural abundance of radon is a function of physical and geochemical factors involving the behavior of the parent element, radium-226, the ability of the gas to diffuse out of material (the emanation coefficient), and the half-lives of the radon isotopes. Because of these factors, there need not be a one-to-one correspondence between measured radon values and concentrations of uranium or thorium.

Although not every radon anomaly is caused by a uranium concentration at the same locality, there is sufficient correlation between radon anomalies and uranium anomalies to make radon surveying a useful technique in exploring for uranium. The technique has been employed recently by several uranium exploration companies in Minnesota. Most commonly, groundwater samples are collected from domestic wells and measured for radon; in some situations the radon content of soil gas may be measured as well, but soil gas methods are more time-consuming and subject to considerable fluctuations in the data.

The conventional unit for expressing the activity or concentration of radon in water, picoCuries per liter (pCi/l), is explained in further detail in Appendices A and B. The following examples are by way of illustration. A fairly typical activity range from 0 to 30,000 pCi/l was reported by the U.S. Environmental Protection Agency (Feldman, 1977) for 507 determinations of radon in ground waters for various parts of the United States. Seventy-five percent of the waters analyzed in the EPA study had radon activities of less than 2,000 pCi/l, 20 percent were between 2,000 and 10,000 pCi/l, and only 5 percent exceeded 10,000 pCi/l. By contrast, some ground waters in Maine, New Hampshire, and Rhode Island have measured radon activities in excess of 200,000 pCi/l, or more than 100 times typical background levels. Some water wells in Helsinki, Finland produce water with more than 800,000 pCi/l of radon and the median radon level for ground water in the Helsinki area is about 25,000 pCi/l; no uranium deposits in or near Helsinki are known, and the cause of the high radon activity is not well understood (Asikainen and Kahlos, 1979).

The Minnesota Geological Survey collected and analyzed a total of 1,975 water samples from seven areas in Minnesota (fig. 1) with a combined area of 9,467 km^2 (3,655 mi^2) for radon activity during 1978-79, under a contract with the U.S. Department of Energy. Of these samples, about 90 percent contained less than 2,000 pCi/l radon, about 10 percent contained between 2,000 and 10,000 pCi/l, and less than 1 percent exceeded 10,000 pCi/l. The data base obtained from this sampling program is presented in the tables and figures of this report.

The radon sampling program was designed to investigate radon activity in areas of Minnesota where geologic factors are known to be similar to those in producing uranium mining districts, to acquire independent data on radon in areas of Minnesota actively being explored for uranium by private companies, and in addition, to test the usefulness in Minnesota of radon mapping for locating buried faults and other geologic structures without regard to uranium potential. The geological and geochemical implications of the sampling results are published elsewhere in detail, as components of larger geochemical studies (Morey and Lively, 1980; Morey and others, 1981; Southwick and others, 1981).

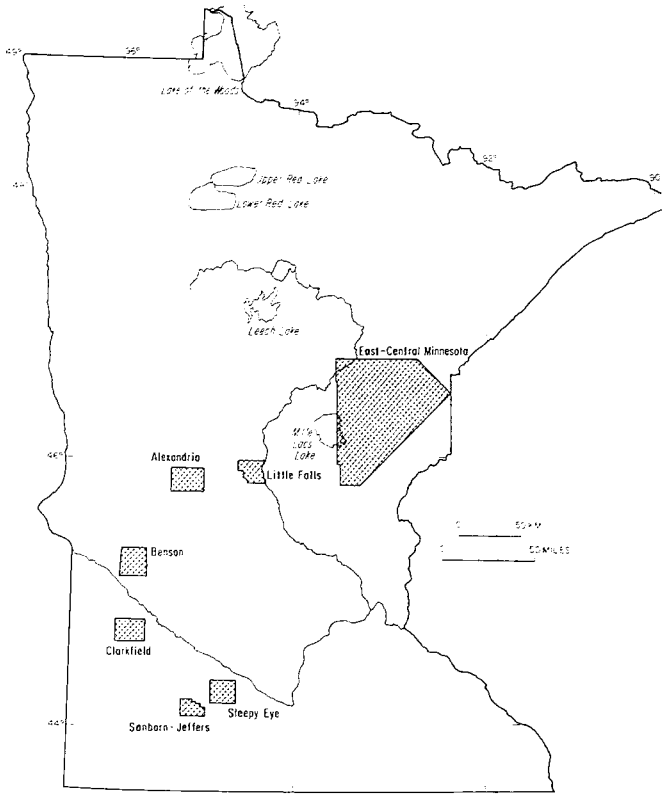

Figure 1 -- Outline map of Minnesota showing locations of the seven areas where radon activity in ground water was measured.

GEOCHEMISTRY OF RADON

The element radon is a naturally occurring, radioactive, chemically inert gas belonging to group VIIIA of the periodic table. It occurs naturally as three isotopes, each specific to the decay series which produces it as an intermediate member. Each of these isotopes decays by the emission of an alpha particle to successive daughter elements (fig. 2). Radon-222 occurs in the uranium (^{238}U) decay series and is the longest lived of the radon isotopes, having a half-life of 3.8 days. Radon-220 (thoron) occurs in the thorium (^{232}Th) decay series and has a half-life of 55.6 seconds. Radon-219, produced in the actinium decay series (^{235}U), has the shortest half-life of 3.96 seconds. Other isotopes of radon are known, but they do not occur naturally (Walker and others, 1977).

Uranium occurs in nearly all rocks and waters. It has an average abundance of 2.8 parts per million (ppm) in crustal rocks, 1 to 4 parts per billion (ppb) in seawater, and a slightly lower average abundance in freshwater. Thorium has a higher crustal abundance of 10 ppm, but a much lower freshwater abundance of 0.01 to 0.001 ppb, reflecting the relative insolubility of thorium in water under near-surface chemical conditions (Wedepohl, 1978).

In principle where uranium or thorium is present, the daughter-element radon will also be present. In actuality, however, the geochemical distribution of radon is dependent on the characteristics and distribution of the radioelements between it and the parent nuclides of U and Th, which head the decay series, and also upon the half-lives of the radon isotopes themselves (see fig. 2).

Radon isotopes ^{220}Rn and ^{219}Rn produced in the ^{232}Th and ^{235}U decay series respectively, have radiochemical properties that in effect eliminate them from most natural hydrologic systems. Radon-220 exists in water only to a very limited extent because its parent ^{232}Th is insoluble in water and because its own half-life of 55.6 seconds results in its rapid decay when formed. Radon-219 is even lower in abundance; its parent ^{235}U forms only 0.711 percent by weight of all uranium, and its even shorter half-life of 3.96 seconds causes it to be undetectable, when separated from its parent nuclide, in approximately 1 minute.

Virtually all natural radon in ground water is therefore the ^{222}Rn isotope, and the radon discussed below and reported in the tables and figures of this report may be considered as ^{222}Rn. Its parent ^{238}U comprises 99.283 percent by weight of all uranium, and is readily soluble in oxidizing natural waters. Moreover, ^{222}Rn has a half-life of 3.8 days, and therefore remains at detectable levels in ground water for several days even when separated from its immediate parent ^{226}Ra.

Radon is readily soluble in ground water (Levinson, 1980), but it is chemically non-reactive, forming no minerals or ionic complexes, and therefore it is not retained by co-precipitation, or by complexing and adsorption on rock surfaces. Dissolved radon was thus thought capable of easy migration away from its point of origin by diffusion through water and by differential transportation in flowing water.

Diffusion through water is no longer viewed as a mechanism for radon migration (Smith and others, 1976; Tanner, 1964a; 1978). It can be shown on theoretical grounds that radon will decrease to about one one-hundredth of its original concentration over a distance $Z = 4.6\sqrt{D/\lambda}$ when moving by diffusion through dry air, and will decrease to that level in about one-tenth the dry-air distance when diffusing through water. D, the observed diffusion coefficient for radon in various porous media, ranges from 5.4×10^{-2} $cm^2 s^{-1}$ (dry sand) to 5.7×10^{-6} $cm^2 s^{-1}$ (mud); λ, the radioactive decay constant for radon, is $2.1 \times 10^{-6} s^{-1}$. In dry sand, radon concentrations will decrease

to one one-hundredth of their initial value after diffusing a distance of about 730 cm (24 ft), and in wet sand the distance will be about 73 cm (29 inches). For mud, the distances are 9 cm (3-1/2 inches) if dry and 0.9 cm if wet. It is clear from this that radon, with its rapid radioactive decay (its short half-life), can travel by diffusion only a few meters (yards) at most before dropping to concentrations below the detection limit.

The ability of moving ground water to remove and transport radon from its source is similarly limited, although the distances tend to be larger than by diffusion alone. Using ground-water flow rates of 1.5 m per day to 1.5 m per year as typical, Smith and others (1976) conclude that radon could travel (at 1.5 m per day) only as far as 60 m (197 ft) from its source before decreasing a thousand-fold in concentration. In underground rivers and actively flowing fracture systems, radon has the potential to be carried for longer distances, but turbulence and contact with air effectively reduce radon concentrations to significantly lower levels than in slow-moving ground water. For example, background values of radon range from 5 to 100 pCi/l in streams, but from 100 to 1,000 pCi/l in wells and springs (Dyck, 1979).

Given these distance limitations on the transport of radon away from its parent nuclides, it follows that radon must be continuously replenished along the flow path of any hydrologic system that yields radon-bearing ground water, by more or less continuous contact with longer lived nuclides that precede it in the decay chain. Where traces of ^{238}U are distributed throughout a rock mass, they act as the long-term source or "support" for radon in water circulating through pore spaces or fractures, and the more uranium there is in the rock, the more radon there should be in the associated ground water. This simple relationship between uranium and radon is the basis for using radon as a uranium exploration tool.

Several complicating factors, however, interfere with simplistic interpretation of radon anomalies. By far the most important complication results from the geochemical behavior of ^{226}Ra, the nuclide that is the immediate parent of ^{222}Rn (fig. 2). Radium-226, which has a half-life of 1,600 years, behaves differently from ^{238}U in the near-surface geochemical environment, and may be physically separated from it by natural processes (Stchepotjeva, 1944; Phair and Levine, 1953; Tanner, 1964b; Morse, 1971; Perel'man, 1977). In particular, dissolved ^{226}Ra combines with any available sulfate ions to form a highly insoluble precipitate, and it also adsorbs easily onto iron oxides and hydroxides that commonly form films on the walls of rock fractures and coatings on sand grains. Consequently, over time, ^{226}Ra may build up in the linings of the pore spaces in rocks and there contribute radon to the water that passes through. Because its short half-life prevents ^{222}Rn from migrating far from its source, its geochemical distribution actually reflects the abundance and distribution of ^{226}Ra, its immediate parent. High radon concentrations in the absence of significant amounts of uranium are termed "false anomalies" by uranium explorationists.

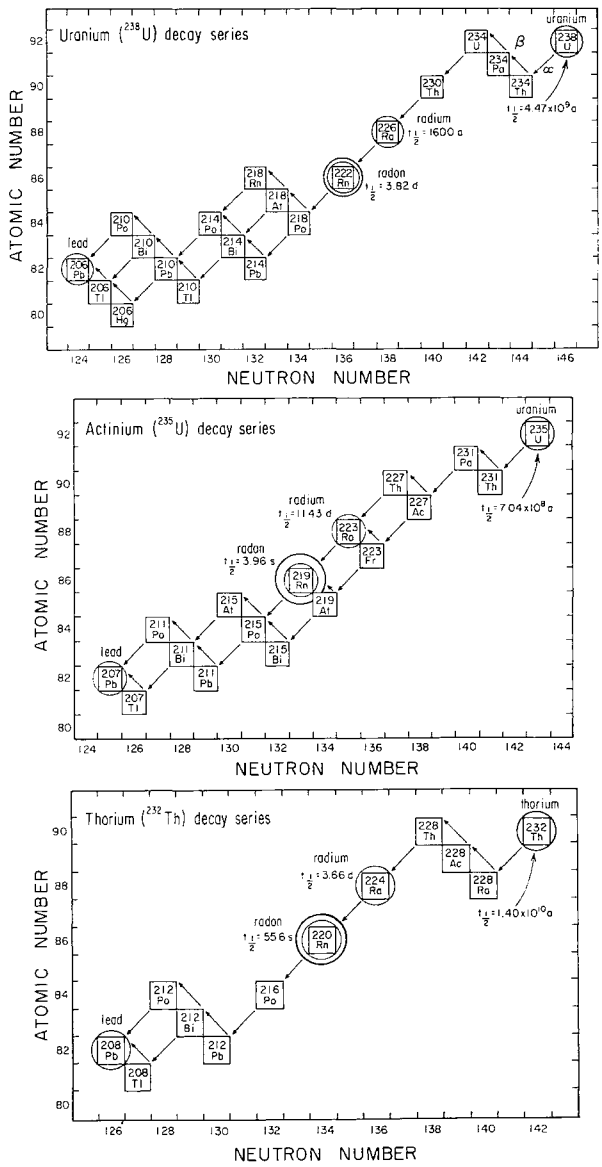

Figure 2 -- The uranium, actinium, and thorium radioactive decay series. The half-lives ($t_{1/2}$) of nuclides mentioned in the text are given in years (a), days (d) or seconds (s). Modified from Faure (1977) and Walker and others (1977).

Another important variable governing the measurable abundance of radon is the so-called emanation factor, which refers to the percentage of the radon that actually escapes into the water or air space. Some rocks hold radon more tightly than others, depending on their original porosity, degree of fracturing, and mineralogical distribution of uranium. Typical emanation factors for common rocks range from 9 to 22 percent, with impermeable, compact rocks having the lower values. This variability may conceal actual differences in radon productivity among different rock types.

In an undisturbed system the low concentration of uranium common in most rocks combined with the long half-life of uranium (4.5×10^9 years) results in a relatively slow rate of production of ^{226}Ra. Radon-222, which reaches equilibrium with ^{226}Ra in about 30 days, is produced at essentially the same rate as ^{226}Ra. If the chemical conditions of the ground water and the rate of flow which influence the concentration of the parent nuclides remain constant, the activity of radon will reflect the activity of the parent of the decay series, ^{238}U. If these conditions alter, and lead to a separation of the members of the decay series, the radon will then only reflect the concentration of ^{226}Ra until such time as ^{226}Ra and the other decay series members reestablish an equilibrium relationship. Although short-term variations in radon are known from geologically active areas, they are not extreme in magnitude or duration and over long time periods still reflect the parent nuclide concentrations.

The radon measured today is the decay product of the radionuclides of uranium and radium naturally existing in the rocks and soils. Uranium and its daughters have been constantly in motion through chemical reactions between the water and rock, and show significant changes only over long periods of time. In geologically and hydrologically stable areas such as central Minnesota, wells which intersect waters with detectable or nondetectable levels of radon are therefore sampling the natural distribution of uranium and its daughter products.

RESULTS OF RADON MEASUREMENTS IN MINNESOTA

Data on the activity of radon in ground water were collected from the seven areas of Minnesota (fig. 1) referred to in the following text and tables by the names Alexandria, Benson, Clarkfield, Little Falls, Sanborn-Jeffers, Sleepy Eye, and east-central Minnesota. The size, the number of wells sampled, and the sample density of each area are given in Table 1. Figures 3-10 are outline maps of the sample areas showing the distribution of the wells that were sampled for radon. All samples were taken from domestic water wells and were analyzed for radon according to the procedure outlined in Appendix A.

Most of the wells sampled draw water from the surficial blanket of glacial drift except in the Sanborn-Jeffers and east-central Minnesota areas, where a significant number of wells are finished in bedrock. The information available on well depths and drift thickness is generally limited, and attempts to sort drift wells from bedrock wells have not been rewarding. Consequently the source horizon for the radon is not well known except in east-central Minnesota where a detailed geological interpretation has been made (Morey and Lively, 1980).

Tables 2-9 summarize the analytical results for the seven test areas. A wide range of radon values was observed, from a low of zero to a high of 26,000 pCi/l. The average radon value for all areas together, taken as the arithmetic mean of the data after transformation to log numbers, is 360 pCi/l. The median value for the transformed data is 320 pCi/l. The test area results are also summarized graphically in Figures 11-18, which are histograms of the radon values for each area plotted on semilogarithmic paper. Figure 19 is a semilogarithmic histogram summarizing the data from all of the study areas.

Table 1 -- Summary by test area of number and density of wells sampled; km^2 = square kilometers; mi^2 = square miles.

Test area	Size of area	Number of wells sampled	Density of wells sampled
Alexandria	555 km^2 (214 mi^2)	249	.45/km^2 (1.16/mi^2)
Benson	541 km^2 (209 mi^2)	154	.28/km^2 (.74/mi^2)
Little Falls	351 km^2 (135 mi^2)	182	.52/km^2 (1.35/mi^2)
Sanborn-Jeffers	258 km^2 (100 mi^2)	117	.45/km^2 (1.17/mi^2)
Sleepy Eye	435 km^2 (168 mi^2)	185	.43/km^2 (1.10/mi^2)
Clarkfield	507 km^2 (196 mi^2)	206	.41/km^2 (1.05/mi^2)
E. Central Minnesota	6820 km^2 (2633 mi^2)	882	.13/km^2 (.34/mi^2)
Totals	9467 km^2 (3655 mi^2)	1975	

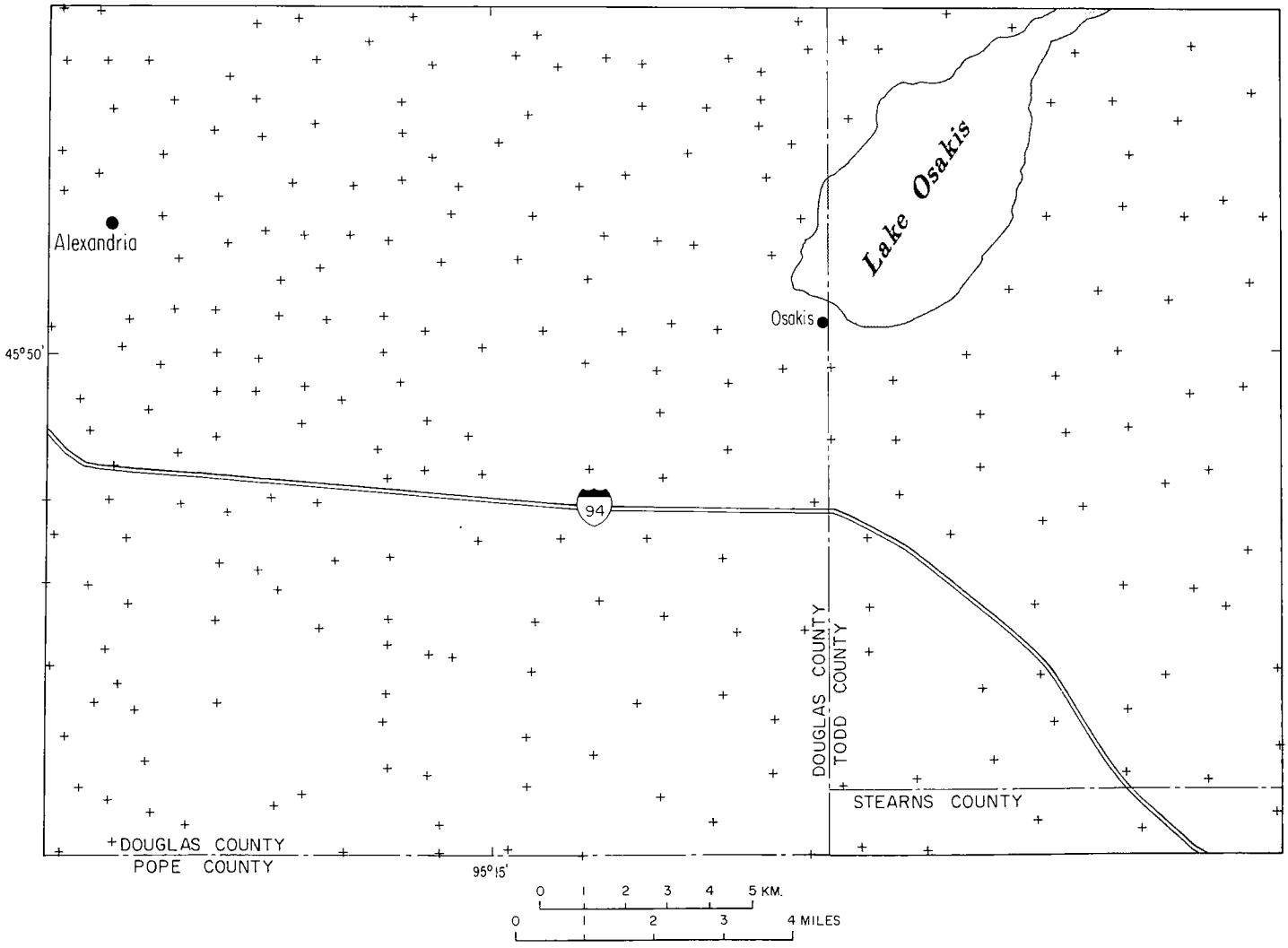

Figure 3 -- Outline map of the Alexandria test area showing locations (+) of wells sampled.

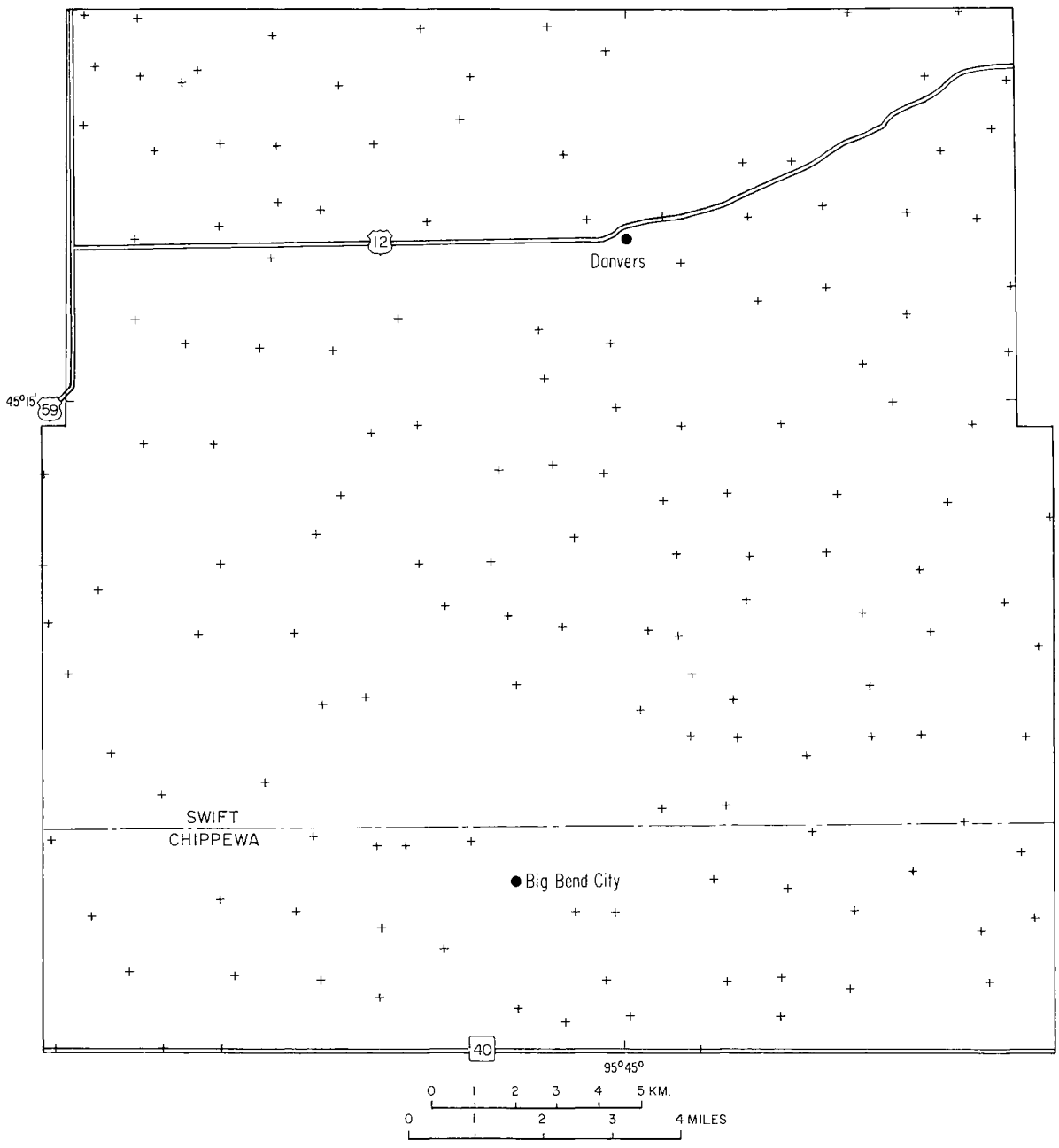

Figure 4 -- Outline map of the Benson test area showing locations (+) of wells sampled.

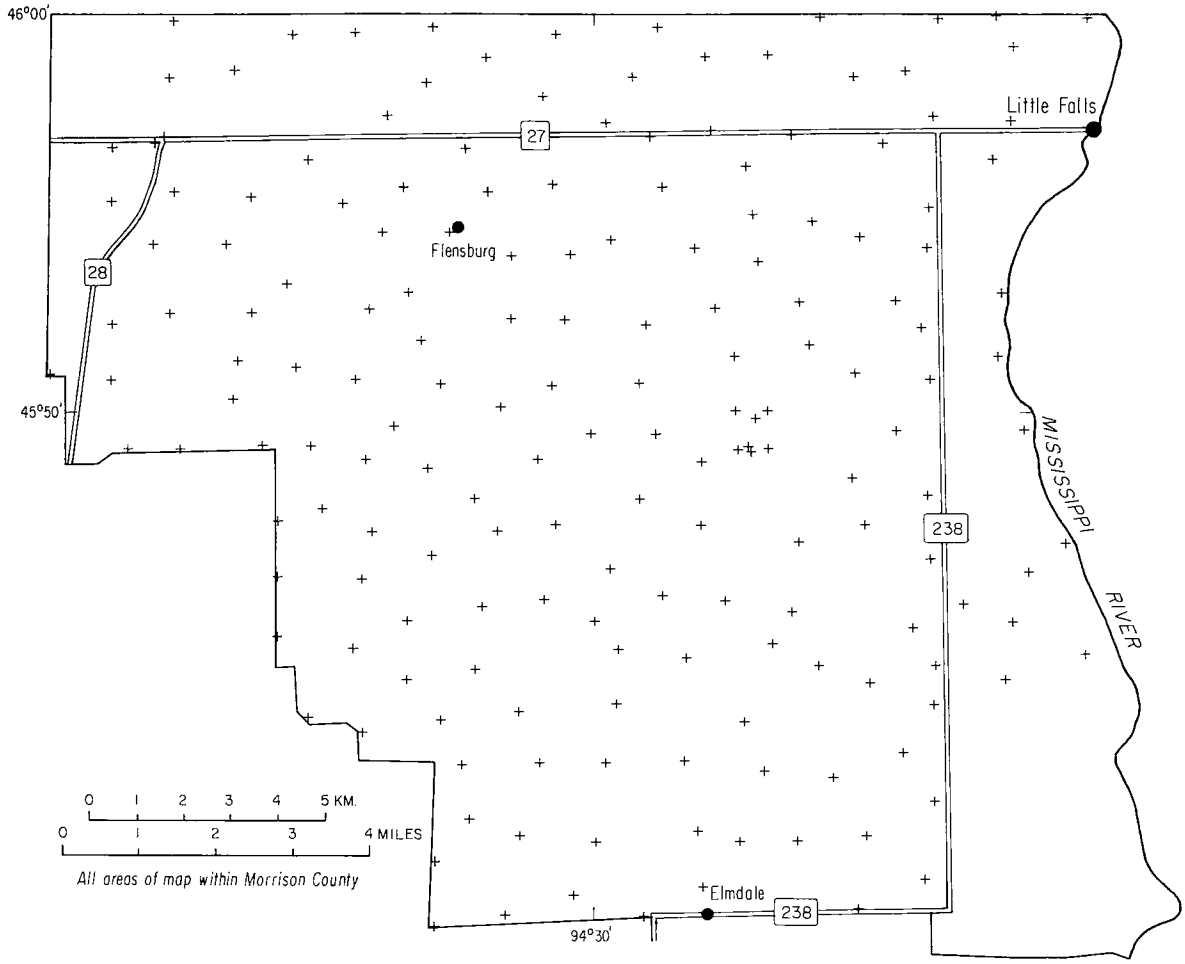

Figure 5 -- Outline map of the Little Falls test area showing locations (+) of wells sampled.

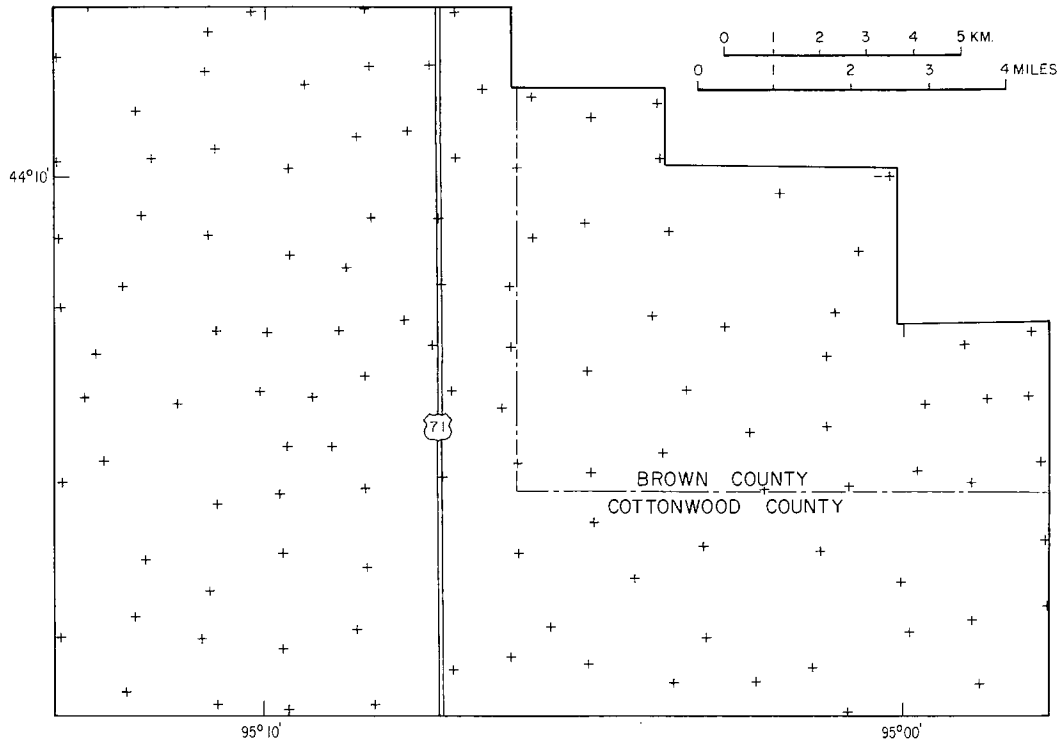

Figure 6 -- Outline map of the Sanborn-Jeffers test area showing locations (+) of wells sampled.

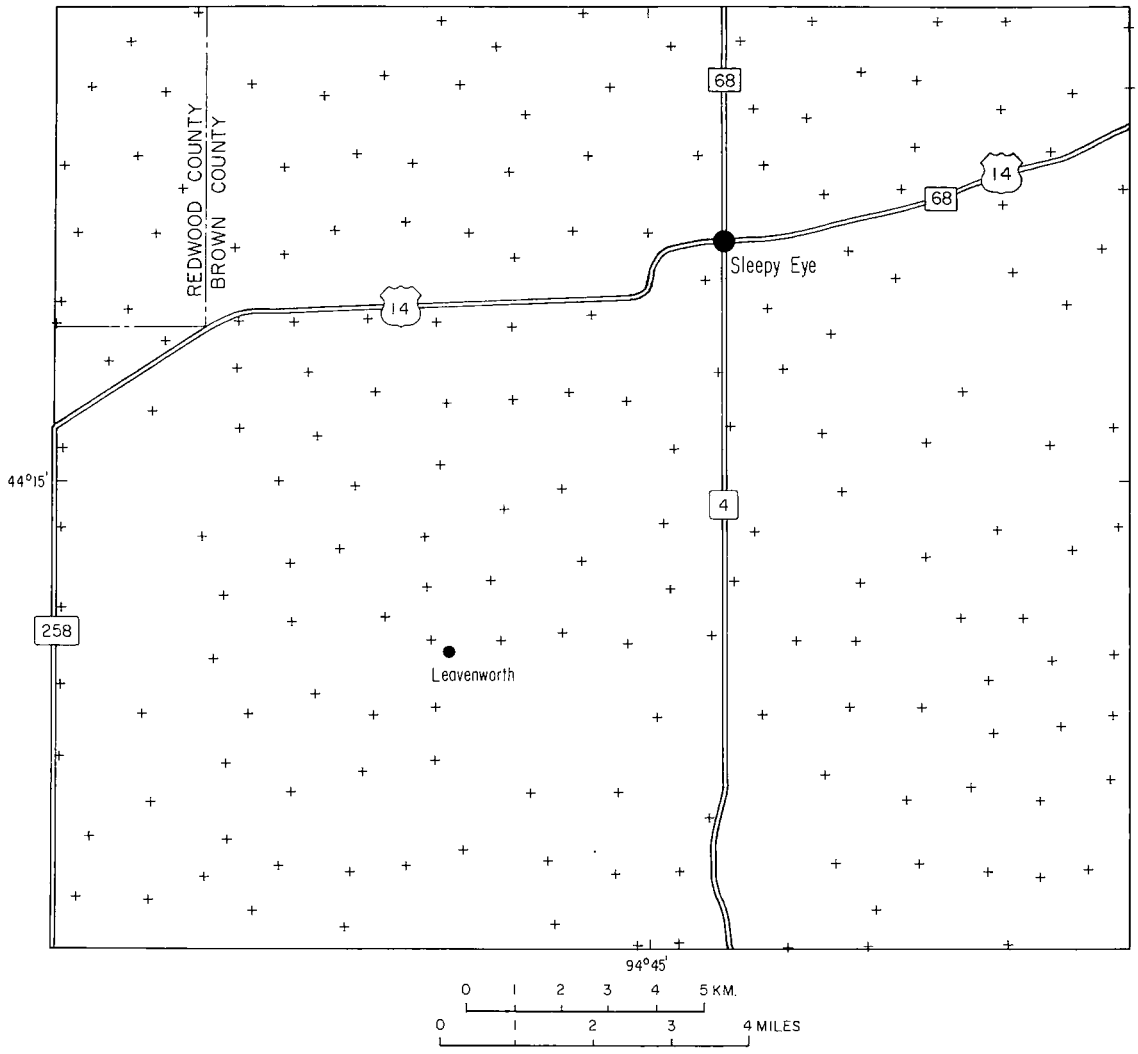

Figure 7 -- Outline map of the Sleepy Eye test area showing locations (+) of wells sampled.

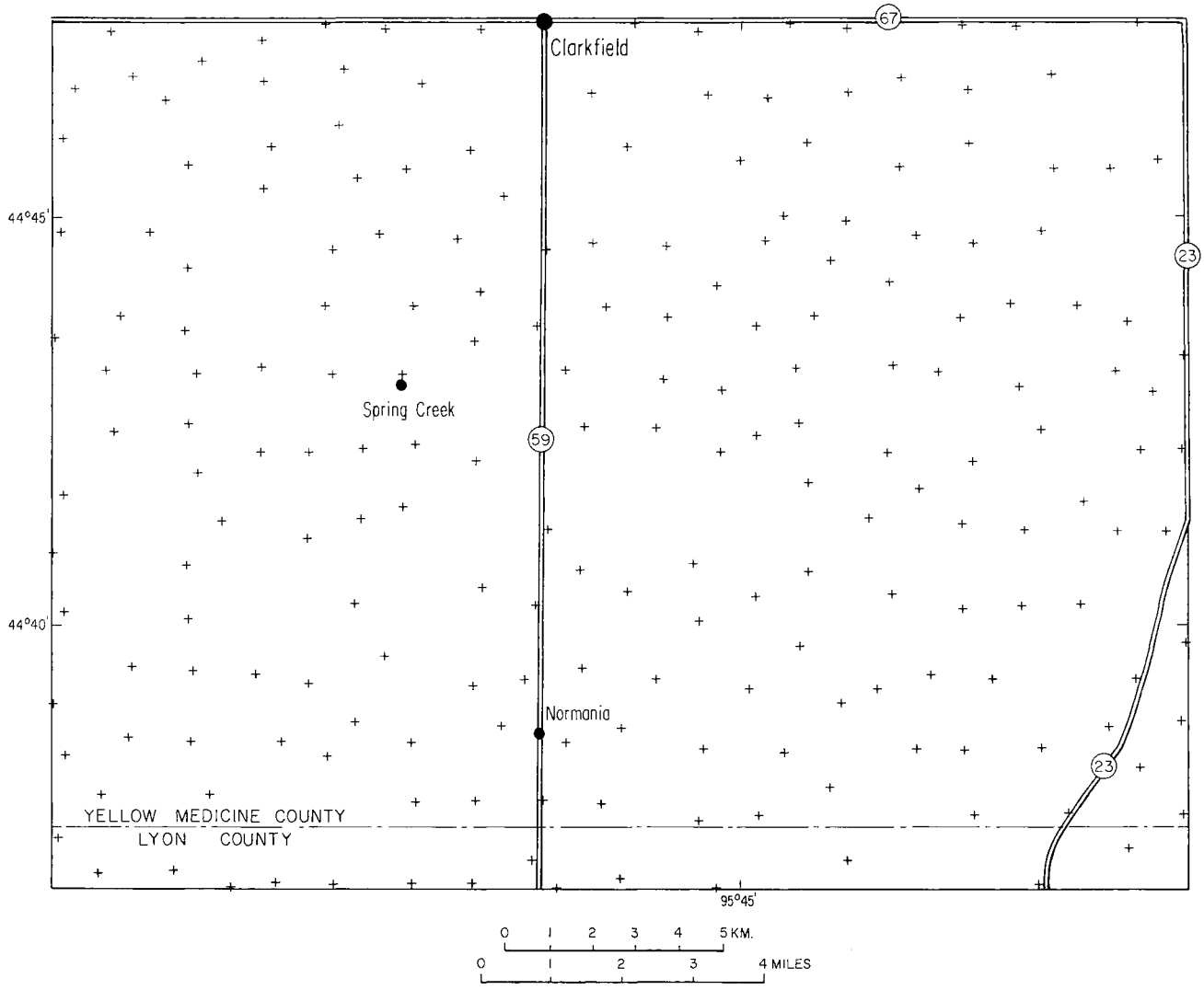

Figure 8 -- Outline map of the Clarkfield test area showing locations (+) of wells sampled.

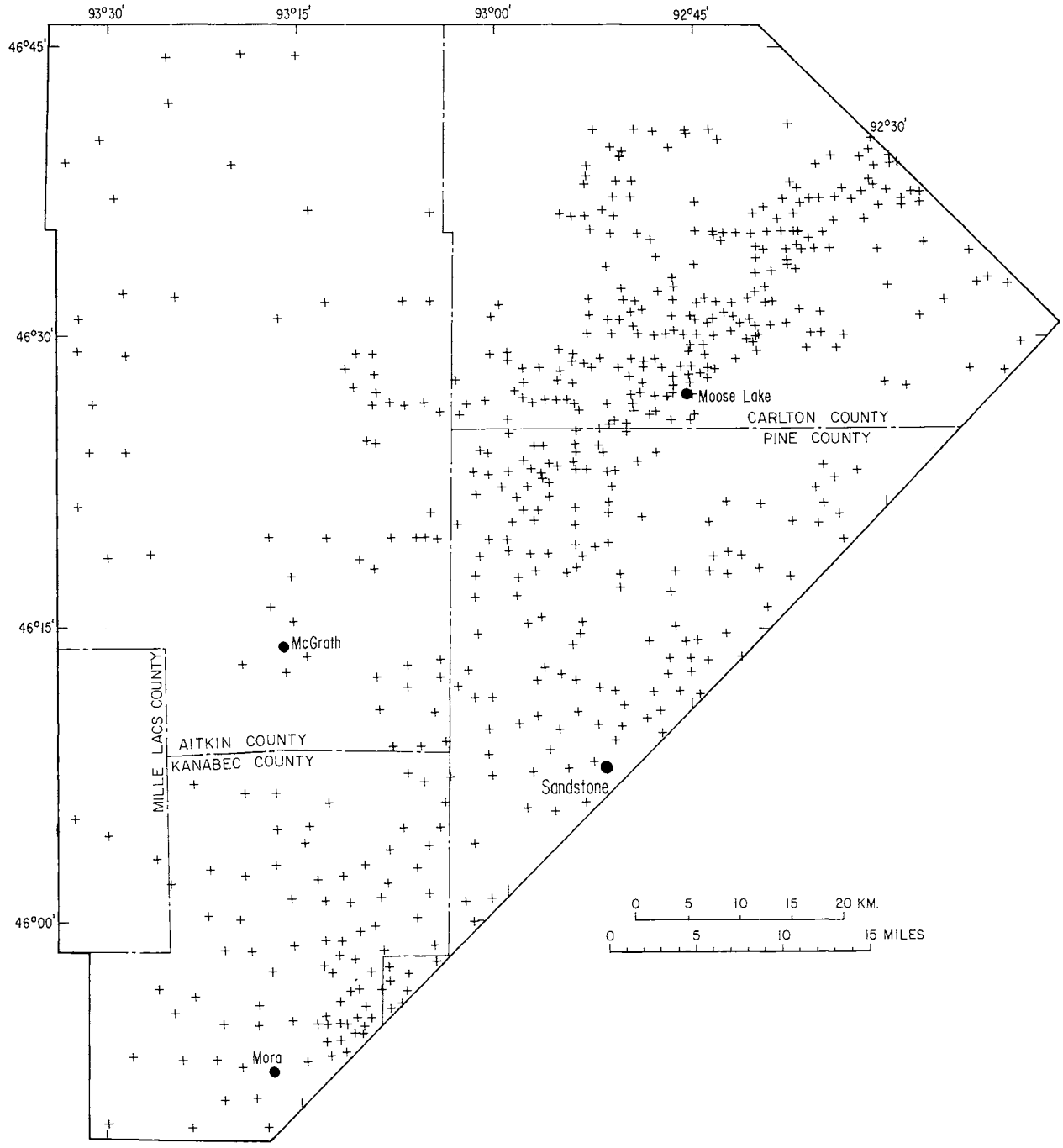

Figure 9 -- Outline map of the east-central Minnesota test area showing the locations (+) of wells finished in bedrock that were sampled for radon.

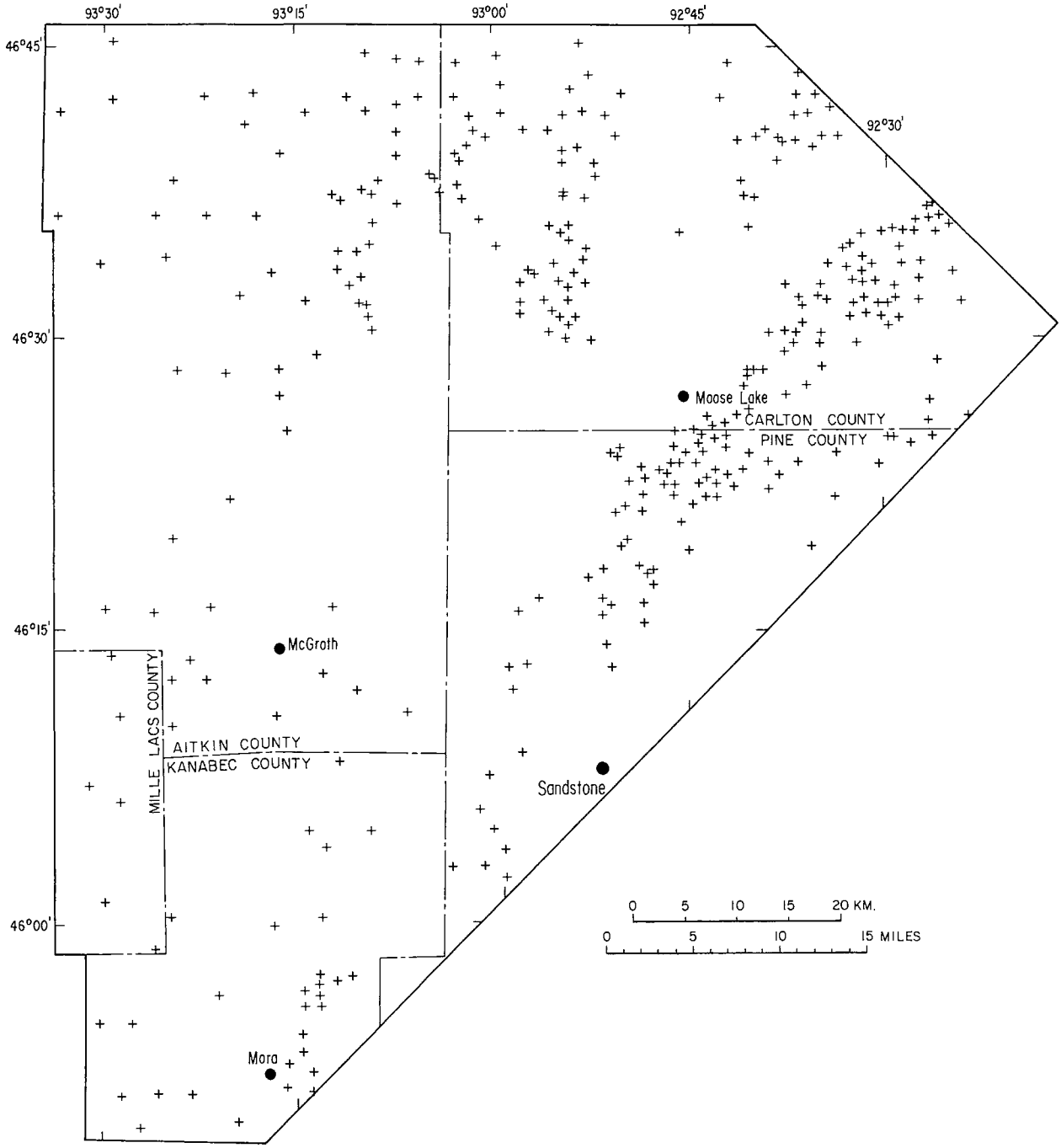

Figure 10 -- Outline map of the east-central Minnesota test area showing the locations (+) of wells finished in surficial deposits (chiefly glacial drift) that were sampled for radon.

Table 2 -- Observed radon activity in the Alexandria test area, in counts per minute (cpm) and picoCuries per liter (pCi/l).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
AX140E 2	45:55:23 N	95:14:42 W	170	22
AX140E 3	45:55:37 N	95:14:19 W	56	17
AX140E 4	45:55:14 N	95:13:56 W	150	21
AX140E 5	45:55:21 N	95:13:03 W	230	29
AX140E 6	45:55:17 N	95:12:25 W	150	21
AX140E 7	45:55:20 N	95:10:52 W	320	38
AX140E 8	45:55:10 N	95:10:16 W	240	31
AX140E 9	45:55:48 N	95:09:35 W	370	41
AX140E 10	45:55:27 N	95:09:25 W	260	33
AX140E 11	45:55:33 N	95:08:47 W	270	34
AX140E 12	45:54:19 N	95:15:01 W	260	32
AX140E 13	45:54:39 N	95:14:29 W	290	35
AX140E 14	45:54:45 N	95:12:25 W	160	26
AX140E 15	45:54:44 N	95:11:15 W	210	28
AX140E 16	45:54:10 N	95:11:35 W	59	16
AX140E 17	45:54:30 N	95:10:18 W	95	20
AX140E 18	45:54:49 N	95:10:16 W	150	26
AX140E 19	45:55:27 N	95:08:09 W	220	30
AX140E 20	45:54:17 N	95:09:42 W	120	21
AX140E 21	45:52:55 N	95:10:04 W	260	35
AX140E 22	45:53:22 N	95:09:33 W	150	25
AX140E 23	45:53:52 N	95:10:11 W	140	26
AX140E 24	45:53:04 N	95:11:30 W	290	39
AX140E 25	45:53:06 N	95:12:08 W	270	34
AX140E 26	45:53:55 N	95:12:44 W	91	28
AX140E 27	45:53:46 N	95:13:33 W	60	19
AX140E 28	45:53:24 N	95:14:23 W	160	31
AX140E 29	45:53:46 N	95:15:44 W	170	31
AX140E 30	45:53:09 N	95:13:07 W	320	43
AX140E 31	45:54:34 N	95:08:42 W	200	35
AX140E 32	45:52:52 N	95:14:40 W	200	33
AX140E 33	45:52:01 N	95:11:05 W	78	26
AX140E 34	45:52:04 N	95:11:54 W	180	29
AX140E 35	45:52:38 N	95:13:24 W	150	35
AX140E 36	45:51:35 N	95:13:27 W	33	6
AX140E 37	45:52:00 N	95:14:12 W	17	4
AX140E 38	45:51:30 N	95:12:10 W	180	29
AX140E 39	45:50:59 N	95:12:06 W	180	32
AX140E 40	45:51:59 N	95:12:48 W	230	38
AX140E 41	45:51:20 N	95:10:52 W	430	51
AX140E 42	45:51:31 N	95:09:54 W	410	49
AX140E 43	45:51:47 N	95:15:13 W	110	25
AX140E 44	45:50:42 N	95:15:35 W	61	24
AX140E 45	45:50:13 N	95:15:19 W	210	28
AX140E 46	45:50:17 N	95:13:24 W	400	48
AX140E 47	45:50:11 N	95:12:03 W	21	62
AX140E 48	45:48:39 N	95:13:13 W	110	27
AX140E 49	45:49:25 N	95:13:55 W	100	30
AX140E 50	45:49:25 N	95:15:25 W	98	23
AX140E 51	45:48:24 N	95:14:22 W	260	41
AX140E 52	45:47:00 N	95:14:31 W	150	33

Table 2 -- Observed radon activity in the Alexandria test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
AX140E 53	45:45:36 N	95:14:52 W	230	37
AX140E 54	45:45:30 N	95:13:34 W	390	76
AX140E 55	45:49:25 N	95:12:21 W	230	50
AX140E 56	45:47:23 N	95:12:32 W	260	54
AX140E 57	45:47:48 N	95:14:26 W	150	46
AX140E 58	45:46:45 N	95:13:20 W	110	50
AX140E 59	45:46:22 N	95:14:31 W	210	58
AX140E 60	45:45:15 N	95:12:07 W	1100	130
AX140E 61	45:45:56 N	95:11:10 W	270	60
AX140E 62	45:47:31 N	95:11:01 W	140	41
AX140E 63	45:48:28 N	95:12:03 W	77	34
AX140E 64	45:49:11 N	95:11:00 W	230	54
AX140E 65	45:48:16 N	95:10:45 W	160	46
AX140E 66	45:47:12 N	95:10:03 W	170	59
AX140E 67	45:46:32 N	95:10:06 W	210	60
AX140E 68	45:45:33 N	95:09:26 W	340	70
AX140E 69	45:45:37 N	95:08:29 W	45	58
AX140E 70	45:46:23 N	95:08:49 W	1000	140
AX140E 71	45:48:01 N	95:08:21 W	77	58
AX140E 72	45:48:18 N	95:09:30 W	64	64
AX140E 73	45:48:35 N	95:08:20 W	160	72
AX140E 74	45:49:26 N	95:08:22 W	320	70
AX140E 75	45:49:52 N	95:09:19 W	230	77
AX140E 76	45:50:32 N	95:10:54 W	260	69
AX140E 77	45:51:32 N	95:09:02 W	1200	150
AX140E 78	45:50:39 N	95:09:02 W	160	60
AX140E 79	45:51:22 N	95:07:55 W	270	76
AX140E 80	45:50:39 N	95:07:51 W	200	75
AX140E 81	45:49:58 N	95:07:47 W	300	84
AX140E 82	45:49:28 N	95:06:53 W	0	0
AX140E 83	45:50:18 N	95:06:20 W	160	81
AX140E 84	45:50:58 N	95:06:21 W	4500	440
AX140E 85	45:53:23 N	95:05:08 W	97	23
AX140E 86	45:53:30 N	95:03:45 W	61	18
AX140E 87	45:53:22 N	95:02:38 W	130	24
AX140E 88	45:53:22 N	95:01:12 W	190	29
AX140E 89	45:54:47 N	95:05:02 W	78	20
AX140E 90	45:54:08 N	95:03:37 W	240	33
AX140E 91	45:55:42 N	95:05:43 W	130	24
AX140E 92	45:55:23 N	95:04:36 W	140	31
AX140E 93	45:54:48 N	95:03:53 W	240	34
AX140E 94	45:54:33 N	95:02:45 W	93	22
AX140E 95	45:54:53 N	95:01:23 W	160	27
AX140E 96	45:55:28 N	95:02:29 W	46	22
AX140E 97	45:53:35 N	95:01:55 W	130	28
AX140E 98	45:52:33 N	95:01:27 W	200	39
AX140E 99	45:52:21 N	95:02:56 W	89	25
AX140E100	45:52:28 N	95:04:13 W	29	16
AX140E101	45:52:29 N	95:05:48 W	380	47
AX140E102	45:51:40 N	95:06:34 W	110	24
AX140E103	45:51:25 N	95:04:53 W	64	23
AX140E104	45:51:44 N	95:03:51 W	190	29
AX140E105	45:50:47 N	95:03:40 W	330	48
AX140E106	45:51:12 N	95:02:33 W	35	18
AX140E107	45:51:17 N	95:01:34 W	240	37
AX140E108	45:50:15 N	95:02:12 W	150	29

Table 2 -- Observed radon activity in the Alexandria test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
AX140E109	45:50:05 N	95:03:00 W	120	27
AX140E110	45:49:43 N	95:04:29 W	130	30
AX140E111	45:50:43 N	95:04:49 W	140	31
AX140E112	45:49:39 N	95:05:12 W	120	23
AX140E113	45:48:36 N	95:05:22 W	280	38
AX140E114	45:56:06 N	95:08:05 W	160	20
AX140E115	45:56:52 N	95:06:21 W	210	25
AX140E116	45:55:53 N	95:06:54 W	150	20
AX140E117	45:46:28 N	95:07:28 W	150	21
AX140E118	45:45:35 N	95:07:18 W	200	23
AX140E119	45:45:57 N	95:05:13 W	16	12
AX140E120	45:46:42 N	95:06:06 W	300	33
AX140E121	45:46:32 N	95:03:44 W	140	20
AX140E122	45:45:51 N	95:03:27 W	220	28
AX140E123	45:47:10 N	95:05:01 W	280	32
AX140E124	45:47:35 N	95:06:18 W	22	11
AX140E125	45:47:44 N	95:05:16 W	130	23
AX140E126	45:47:19 N	95:03:42 W	180	23
AX140E127	45:46:27 N	95:02:14 W	190	44
AX140E128	45:46:03 N	95:01:00 W	560	70
AX140E129	45:46:51 N	95:00:58 W	160	43
AX140E130	45:47:43 N	95:03:00 W	0	0
AX140E131	45:48:51 N	95:03:46 W	240	40
AX140E132	45:49:16 N	95:01:29 W	220	49
AX140E133	45:48:35 N	95:01:54 W	250	53
AX140E134	45:48:46 N	95:02:29 W	120	43
AX140E135	45:47:48 N	95:00:59 W	8	9
AX140E400	45:55:16 N	95:16:12 W	680	64
AX140E401	45:55:33 N	95:17:21 W	150	18
AX140E402	45:55:52 N	95:16:33 W	160	20
AX140E403	45:55:49 N	95:18:39 W	270	28
AX140E404	45:55:46 N	95:19:24 W	150	18
AX140E405	45:55:07 N	95:19:53 W	180	20
AX140E406	45:55:20 N	95:18:19 W	120	15
AX140E407	45:54:23 N	95:19:19 W	150	17
AX140E408	45:54:33 N	95:18:20 W	230	24
AX140E409	45:54:48 N	95:16:45 W	170	19
AX140E410	45:54:26 N	95:16:45 W	210	22
AX140E411	45:53:51 N	95:16:46 W	250	26
AX140E412	45:53:47 N	95:17:39 W	370	37
AX140E413	45:53:49 N	95:18:44 W	190	21
AX140E414	45:54:07 N	95:16:12 W	210	22
AX140E415	45:53:26 N	95:15:52 W	310	35
AX140E416	45:53:06 N	95:17:01 W	390	40
AX140E417	45:53:10 N	95:17:42 W	360	39
AX140E418	45:52:37 N	95:18:59 W	160	21
AX140E419	45:52:46 N	95:18:16 W	170	23
AX140E420	45:53:13 N	95:19:15 W	120	17
AX140E421	45:53:10 N	95:18:32 W	280	31
AX140E422	45:52:11 N	95:17:06 W	84	13
AX140E423	45:53:04 N	95:19:55 W	180	23
AX140E424	45:53:38 N	95:20:06 W	490	49
AX140E425	45:54:28 N	95:20:10 W	150	19
AX140E426	45:54:51 N	95:19:24 W	300	32
AX140E427	45:54:50 N	95:20:53 W	160	19
AX140E428	45:55:19 N	95:21:21 W	230	27

Table 2 -- Observed radon activity in the Alexandria test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
AX140E429	45:54:44 N	95:21:58 W	250	29
AX140E430	45:54:10 N	95:21:06 W	120	19
AX140E431	45:53:24 N	95:21:06 W	230	26
AX140E432	45:52:53 N	95:20:48 W	240	29
AX140E433	45:51:01 N	95:21:22 W	450	45
AX140E434	45:52:08 N	95:21:42 W	350	38
AX140E435	45:51:34 N	95:21:09 W	190	24
AX140E436	45:52:16 N	95:20:54 W	150	20
AX140E437	45:52:14 N	95:20:08 W	120	17
AX140E438	45:51:39 N	95:19:22 W	580	60
AX140E439	45:51:14 N	95:20:07 W	240	27
AX140E440	45:51:19 N	95:18:32 W	390	41
AX140E441	45:50:51 N	95:18:36 W	76	13
AX140E442	45:50:41 N	95:20:03 W	260	29
AX140E443	45:53:56 N	95:22:14 W	200	24
AX140E444	45:50:29 N	95:20:51 W	380	40
AX140E445	45:50:45 N	95:22:24 W	340	36
AX140E446	45:50:19 N	95:22:00 W	310	34
AX140E447	45:51:43 N	95:20:07 W	250	29
AX140E448	45:51:15 N	95:19:24 W	150	19
AX140E449	45:52:50 N	95:16:02 W	520	52
AX140E450	45:51:59 N	95:16:20 W	280	31
AX140E451	45:51:22 N	95:16:48 W	380	39
AX140E452	45:51:08 N	95:17:53 W	190	23
AX140E453	45:52:07 N	95:18:08 W	130	18
AX140E454	45:52:11 N	95:19:00 W	290	32
AX140E455	45:50:16 N	95:16:22 W	200	25
AX140E456	45:50:53 N	95:16:19 W	230	26
AX140E457	45:50:10 N	95:17:02 W	230	27
AX140E458	45:51:44 N	95:17:06 W	210	24
AX140E459	45:50:32 N	95:17:13 W	280	31
AX140E460	45:49:52 N	95:18:18 W	200	24
AX140E461	45:49:55 N	95:19:10 W	500	50
AX140E462	45:49:07 N	95:20:05 W	390	40
AX140E463	45:48:47 N	95:19:02 W	370	39
AX140E464	45:48:20 N	95:18:16 W	250	28
AX140E465	45:49:11 N	95:16:58 W	300	32
AX140E466	45:47:54 N	95:15:51 W	170	24
AX140E467	45:48:07 N	95:17:01 W	410	41
AX140E468	45:49:09 N	95:18:00 W	310	34
AX140E469	45:49:51 N	95:20:46 W	230	26
AX140E470	45:49:26 N	95:21:45 W	280	31
AX140E471	45:49:55 N	95:22:04 W	340	36
AX140E472	45:49:44 N	95:19:57 W	200	24
AX140E473	45:55:56 N	95:22:12 W	150	16
AX140E474	45:55:58 N	95:22:54 W	150	17
AX140E475	45:55:19 N	95:22:49 W	120	15
AX140E476	45:54:13 N	95:22:53 W	360	35
AX140E477	45:53:43 N	95:22:53 W	220	23
AX140E478	45:52:03 N	95:23:07 W	290	29
AX140E479	45:49:54 N	95:23:13 W	700	65
AX140E480	45:48:53 N	95:23:12 W	180	20
AX140E481	45:47:51 N	95:23:09 W	1200	110
AX140E482	45:47:38 N	95:21:56 W	740	68
AX140E483	45:48:04 N	95:22:09 W	490	46
AX140E484	45:48:37 N	95:21:43 W	440	42

Table 2 -- Observed radon activity in the Alexandria test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
AX140E485	45:48:51 N	95:22:26 W	630	58
AX140E486	45:46:12 N	95:22:06 W	430	42
AX140E487	45:47:19 N	95:21:37 W	170	19
AX140E488	45:46:41 N	95:21:26 W	300	30
AX140E489	45:46:12 N	95:22:06 W	390	38
AX140E490	45:46:22 N	95:22:38 W	160	19
AX140E491	45:46:34 N	95:22:59 W	330	32
AX140E492	45:45:41 N	95:22:02 W	130	16
AX140E493	45:46:03 N	95:21:21 W	620	58
AX140E494	45:47:25 N	95:20:08 W	450	44
AX140E495	45:48:25 N	95:20:09 W	270	30
AX140E496	45:46:08 N	95:19:06 W	310	32
AX140E497	45:55:19 N	95:22:05 W	170	18
AX140E498	45:51:08 N	95:22:36 W	270	28
AX140E499	45:51:47 N	95:21:50 W	310	31
AX140E500	45:49:29 N	95:23:05 W	71	10
AX140E501	45:46:59 N	95:22:53 W	300	31
AX140E502	45:47:24 N	95:22:19 W	350	34
AX140E503	45:45:54 N	95:20:42 W	170	19
AX140E504	45:46:17 N	95:18:36 W	270	27
AX140E505	45:47:10 N	95:17:08 W	150	17
AX140E506	45:47:30 N	95:17:04 W	230	24
AX140E507	45:48:26 N	95:17:02 W	130	15
AX140E508	45:48:00 N	95:16:18 W	170	18
AX140E509	45:46:36 N	95:17:02 W	340	33
AX140E510	45:45:33 N	95:17:51 W	330	33
AX140E511	45:45:33 N	95:16:07 W	350	35
AX140E512	45:45:54 N	95:16:06 W	250	27
AX140E513	45:46:30 N	95:16:19 W	290	30
AX140E514	45:49:03 N	95:19:24 W	360	36

Table 3 -- Observed radon activity in the Benson test area, in counts per minute (cpm) and picoCuries per liter (pCi/l).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
BE140E136	45:19:29 N	95:54:21 W	110	15
BE140E137	45:19:26 N	95:53:24 W	91	13
BE140E138	45:18:47 N	95:52:18 W	160	20
BE140E139	45:19:14 N	95:50:56 W	86	12
BE140E140	45:17:52 N	95:50:51 W	36	10
BE140E141	45:17:53 N	95:51:53 W	220	26
BE140E142	45:18:43 N	95:53:20 W	730	69
BE140E143	45:18:08 N	95:54:21 W	140	20
BE140E144	45:17:47 N	95:53:04 W	91	16
BE140E145	45:16:42 N	95:53:27 W	65	13
BE140E146	45:15:23 N	95:52:32 W	67	13
BE140E147	45:15:42 N	95:53:26 W	220	30
BE140E148	45:15:20 N	95:51:11 W	40	13
BE140E149	45:16:51 N	95:51:55 W	370	42
BE140E150	45:17:08 N	95:50:50 W	130	22
BE140E151	45:18:36 N	95:48:44 W	61	19
BE140E152	45:19:18 N	95:48:16 W	200	28
BE140E153	45:18:41 N	95:47:20 W	63	18
BE140E154	45:19:19 N	95:45:57 W	250	31
BE140E155	45:18:10 N	95:47:33 W	140	21
BE140E156	45:17:44 N	95:45:39 W	340	39
BE140E157	45:16:54 N	95:45:14 W	120	20
BE140E158	45:15:33 N	95:46:07 W	12	14
BE140E159	45:15:42 N	95:48:40 W	0	9
BE140E160	45:16:53 N	95:48:09 W	57	15
BE140E161	45:17:52 N	95:49:05 W	120	21
BE140E162	45:17:03 N	95:50:04 W	160	26
BE140E163	45:16:27 N	95:50:58 W	230	30
BE140E164	45:15:19 N	95:49:51 W	160	23
BE140E165	45:14:16 N	95:49:09 W	150	21
BE140E166	45:14:22 N	95:48:18 W	58	14
BE140E167	45:14:56 N	95:46:01 W	83	20
BE140E168	45:11:50 N	95:45:41 W	16	10
BE140E169	45:11:58 N	95:46:41 W	270	32
BE140E170	45:12:06 N	95:47:50 W	78	17
BE140E171	45:11:45 N	95:50:34 W	14	11
BE140E172	45:11:45 N	95:52:18 W	430	46
BE140E180	45:13:51 N	95:45:51 W	190	28
BE140E181	45:13:48 N	95:46:50 W	75	24
BE140E182	45:13:29 N	95:49:43 W	57	18
BE140E183	45:14:08 N	95:52:00 W	40	13
BE140E184	45:12:37 N	95:51:53 W	60	25
BE140E185	45:13:00 N	95:50:09 W	95	20
BE140E186	45:12:37 N	95:48:18 W	31	13
BE140E187	45:12:57 N	95:45:28 W	140	23
BE140E188	45:12:38 N	95:46:59 W	40	15
BE140E189	45:13:45 N	95:55:06 W	190	26
BE140E190	45:14:08 N	95:53:17 W	5	14
BE140E191	45:12:37 N	95:55:08 W	360	44
BE140E192	45:11:53 N	95:55:02 W	180	30
BE140E193	45:12:18 N	95:54:07 W	210	30

Table 3 -- Observed radon activity in the Benson test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
BE140E194	45:11:16 N	95:54:39 W	400	44
BE140E195	45:10:16 N	95:53:52 W	160	24
BE140E196	45:09:44 N	95:52:59 W	200	26
BE140E197	45:09:11 N	95:54:58 W	180	27
BE140E198	45:08:14 N	95:54:15 W	77	20
BE140E199	45:07:31 N	95:53:33 W	220	35
BE140E200	45:07:28 N	95:51:37 W	160	27
BE140E201	45:08:25 N	95:51:55 W	310	40
BE140E202	45:08:16 N	95:50:33 W	230	34
BE140E203	45:08:04 N	95:49:00 W	260	34
BE140E204	45:09:04 N	95:49:03 W	70	21
BE140E205	45:09:12 N	95:50:13 W	5700	510
BE140E206	45:09:53 N	95:51:06 W	72	21
BE140E207	45:10:56 N	95:49:16 W	140	31
BE140E208	45:10:51 N	95:50:02 W	94	27
BE140E209	45:11:06 N	95:46:31 W	160	30
BE140E210	45:07:25 N	95:50:06 W	6	23
BE140E211	45:07:48 N	95:47:51 W	160	29
BE140E212	45:08:14 N	95:45:28 W	620	65
BE140E213	45:06:53 N	95:45:39 W	75	18
BE140E214	45:07:03 N	95:46:32 W	330	42
BE140E215	45:07:11 N	95:49:02 W	150	25
BE140E216	45:06:32 N	95:51:51 W	310	40
BE140E217	45:06:33 N	95:52:55 W	110	34
BE140E218	45:06:34 N	95:54:55 W	190	35
BE140E219	45:09:05 N	95:48:33 W	960	96
BE140E220	45:09:09 N	95:47:22 W	180	33
BE140E221	45:06:57 N	95:44:28 W	490	55
BE140E222	45:06:32 N	95:43:13 W	510	56
BE140E223	45:06:56 N	95:41:46 W	240	37
BE140E224	45:07:16 N	95:40:30 W	160	27
BE140E225	45:07:21 N	95:37:57 W	200	31
BE140E226	45:08:09 N	95:37:10 W	130	23
BE140E227	45:08:00 N	95:38:07 W	180	30
BE140E228	45:08:16 N	95:40:25 W	120	29
BE140E229	45:07:26 N	95:41:43 W	650	68
BE140E230	45:07:22 N	95:42:42 W	570	64
BE140E231	45:07:24 N	95:44:55 W	100	26
BE140E232	45:08:15 N	95:44:47 W	290	40
BE140E233	45:08:39 N	95:42:58 W	470	55
BE140E234	45:08:32 N	95:41:37 W	540	60
BE140E235	45:08:45 N	95:39:22 W	120	29
BE140E236	45:09:39 N	95:42:44 W	29	22
BE140E250	45:19:30 N	95:38:27 W	66	35
BE140E251	45:19:29 N	95:40:29 W	72	44
BE140E252	45:18:42 N	95:33:04 W	110	39
BE140E253	45:18:37 N	95:37:36 W	34	34
BE140E254	45:18:01 N	95:37:52 W	130	36
BE140E255	45:17:45 N	95:38:46 W	110	50
BE140E256	45:17:05 N	95:40:55 W	140	45
BE140E257	45:16:56 N	95:42:17 W	200	57
BE140E258	45:17:37 N	95:42:23 W	220	52
BE140E259	45:17:38 N	95:41:29 W	140	55
BE140E260	45:16:57 N	95:43:52 W	100	55
BE140E261	45:19:01 N	95:44:53 W	37	48
BE140E262	45:15:23 N	95:44:48 W	150	56

Table 3 -- Observed radon activity in the Benson test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
BE140E263	45:16:22 N	95:43:32 W	110	55
BE140E264	45:15:54 N	95:42:06 W	110	50
BE140E265	45:16:04 N	95:40:52 W	1400	150
BE140E266	45:16:58 N	95:39:25 W	320	56
BE140E267	45:15:42 N	95:39:26 W	190	73
BE140E268	45:16:53 N	95:38:08 W	77	52
BE140E269	45:16:04 N	95:37:30 W	97	55
BE140E270	45:15:14 N	95:37:34 W	210	57
BE140E271	45:14:20 N	95:38:14 W	0	0
BE140E272	45:14:37 N	95:39:41 W	990	120
BE140E273	45:15:06 N	95:40:14 W	120	66
BE140E274	45:14:21 N	95:41:42 W	140	66
BE140E275	45:14:21 N	95:43:31 W	170	72
BE140E276	45:14:35 N	95:44:42 W	65	70
BE140E277	45:13:45 N	95:44:57 W	0	0
BE140E278	45:13:24 N	95:43:51 W	86	65
BE140E279	45:13:30 N	95:42:41 W	200	72
BE140E280	45:12:10 N	95:42:21 W	0	0
BE140E281	45:12:45 N	95:40:54 W	0	0
BE140E282	45:12:41 N	95:42:17 W	280	54
BE140E283	45:12:43 N	95:43:37 W	190	67
BE140E284	45:11:47 N	95:44:07 W	300	76
BE140E285	45:11:42 N	95:43:36 W	0	0
BE140E286	45:12:00 N	95:40:14 W	0	0
BE140E287	45:13:28 N	95:40:42 W	180	67
BE140E288	45:13:22 N	95:38:42 W	110	56
BE140E289	45:13:09 N	95:36:50 W	190	67
BE140E290	45:12:06 N	95:37:40 W	250	63
BE140E291	45:11:44 N	95:39:01 W	310	65
BE140E292	45:12:31 N	95:39:12 W	240	73
BE140E293	45:11:34 N	95:37:03 W	300	65
BE140E294	45:10:25 N	95:37:17 W	87	60
BE140E295	45:08:59 N	95:37:24 W	210	47
BE140E296	45:09:21 N	95:38:25 W	330	61
BE140E297	45:10:29 N	95:39:07 W	210	57
BE140E298	45:10:26 N	95:40:05 W	160	56
BE140E299	45:10:12 N	95:41:17 W	450	71
BE140E300	45:11:05 N	95:40:08 W	120	60
BE140E301	45:09:15 N	95:41:11 W	250	58
BE140E302	45:10:55 N	95:42:36 W	0	0
BE140E303	45:10:26 N	95:42:32 W	0	0
BE140E304	45:11:14 N	95:43:21 W	260	74
BE140E305	45:10:27 N	95:43:24 W	150	61
BE140E306	45:09:32 N	95:43:55 W	220	57
BE140E307	45:10:46 N	95:44:16 W	120	51

Table 4 -- Observed radon activity in the Little Falls test area, in counts per minute (cpm) and picoCuries per liter (pCi/l).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
LF140E 1	46:00:00 N	94:23:31 W	14	10
LF140E 2	45:59:56 N	94:24:26 W	2300	210
LF140E 3	45:59:21 N	94:24:59 W	290	32
LF140E 4	45:58:51 N	94:24:33 W	330	36
LF140E 5	45:58:34 N	94:25:22 W	530	53
LF140E 6	45:59:18 N	94:25:49 W	140	18
LF140E 7	45:59:58 N	94:26:22 W	300	33
LF140E 8	45:59:33 N	94:27:13 W	96	16
LF140E 9	45:59:32 N	94:28:13 W	680	66
LF140E 10	45:59:51 N	94:29:00 W	1100	100
LF140E 11	45:59:18 N	94:29:24 W	330	36
LF140E 12	45:58:49 N	94:23:17 W	170	23
LF140E 13	45:58:23 N	94:23:34 W	230	28
LF140E 14	45:59:37 N	94:23:13 W	6800	600
LF140E 15	45:59:57 N	94:22:02 W	270	31
LF140E 16	45:57:51 N	94:24:36 W	320	35
LF140E 17	45:57:31 N	94:25:44 W	420	44
LF140E 18	45:57:42 N	94:26:30 W	540	55
LF140E 19	45:57:47 N	94:27:27 W	490	50
LF140E 20	45:58:19 N	94:27:35 W	310	35
LF140E 21	45:58:40 N	94:26:49 W	1900	180
LF140E 22	45:58:42 N	94:28:09 W	300	33
LF140E 23	45:58:40 N	94:29:08 W	920	87
LF140E 24	45:58:06 N	94:28:54 W	40	10
LF140E 25	45:57:24 N	94:24:37 W	260	29
LF140E 26	45:56:54 N	94:23:25 W	860	81
LF140E 27	45:56:31 N	94:24:42 W	300	31
LF140E 28	45:56:49 N	94:25:08 W	430	43
LF140E 29	45:56:48 N	94:26:41 W	360	38
LF140E 30	45:57:15 N	94:27:22 W	86	12
LF140E 31	45:56:44 N	94:28:04 W	1000	95
LF140E 32	45:57:24 N	94:28:25 W	620	59
LF140E 33	45:57:29 N	94:29:45 W	580	56
LF140E 34	45:56:32 N	94:29:11 W	540	52
LF140E 35	45:56:10 N	94:27:45 W	450	45
LF140E 36	45:55:36 N	94:27:45 W	500	49
LF140E 37	45:55:92 N	94:28:18 W	220	25
LF140E 38	45:55:20 N	94:29:02 W	230	26
LF140E 39	45:55:54 N	94:29:18 W	170	23
LF140E 40	45:54:38 N	94:29:17 W	550	53
LF140E 41	45:54:20 N	94:28:18 W	360	38
LF140E 42	45:54:19 N	94:25:38 W	340	37
LF140E 43	45:54:52 N	94:25:51 W	260	29
LF140E 44	45:55:11 N	94:27:13 W	25000	2200
LF140E 45	45:56:02 N	94:25:48 W	410	41
LF140E 46	45:56:19 N	94:26:33 W	310	32
LF140E 47	45:55:23 N	94:25:08 W	370	38
LF140E 48	45:55:57 N	94:24:36 W	740	70
LF140E 49	45:56:12 N	94:23:30 W	590	57
LF140E 50	45:55:24 N	94:23:05 W	590	57
LF140E 51	45:54:39 N	94:24:37 W	260	28

Table 4 -- Observed radon activity in the Little Falls test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
LF140E 52	45:53:57 N	94:24:36 W	320	33
LF140E 53	45:54:08 N	94:26:44 W	280	30
LF140E 54	45:53:23 N	94:26:50 W	460	45
LF140E 55	45:53:30 N	94:27:54 W	270	29
LF140E 56	45:53:33 N	94:28:55 W	340	35
LF140E 57	45:53:51 N	94:29:45 W	300	32
LF140E 58	45:52:57 N	94:29:38 W	430	44
LF140E 59	45:52:51 N	94:28:32 W	390	40
LF140E 60	45:53:48 N	94:23:01 W	270	28
LF140E 61	45:54:07 N	94:22:25 W	220	24
LF140E 62	45:52:54 N	94:22:04 W	290	30
LF140E 63	45:52:37 N	94:23:23 W	310	31
LF140E 64	45:53:16 N	94:23:16 W	210	23
LF140E 65	45:53:27 N	94:24:04 W	160	20
LF140E 66	45:52:47 N	94:24:31 W	3400	300
LF140E 67	45:52:34 N	94:25:33 W	250	26
LF140E 68	45:53:11 N	94:24:53 W	2400	210
LF140E 69	45:52:47 N	94:26:24 W	600	57
LF140E 70	45:53:00 N	94:27:08 W	650	60
LF140E 71	45:53:30 N	94:30:51 W	16	9
LF140E 72	45:54:20 N	94:30:40 W	600	57
LF140E 73	45:55:03 N	94:30:56 W	69	16
LF140E 74	45:55:20 N	94:30:05 W	150	17
LF140E 75	45:55:53 N	94:30:44 W	220	24
LF140E 76	45:56:35 N	94:30:30 W	380	37
LF140E 77	45:56:37 N	94:31:23 W	520	49
LF140E 78	45:57:19 N	94:30:26 W	510	49
LF140E 79	45:58:07 N	94:30:44 W	230	24
LF140E 80	45:58:48 N	94:29:52 W	170	19
LF140E 81	45:59:05 N	94:30:53 W	240	27
LF140E 82	45:59:46 N	94:30:39 W	350	36
LF140E 83	45:59:31 N	94:31:48 W	520	51
LF140E 84	45:59:51 N	94:32:39 W	270	30
LF140E 85	45:59:14 N	94:32:45 W	330	34
LF140E 86	45:58:31 N	94:32:08 W	440	43
LF140E 87	45:58:04 N	94:33:07 W	510	50
LF140E 88	45:58:01 N	94:31:46 W	270	29
LF140E 89	45:57:35 N	94:32:23 W	330	35
LF140E 90	45:57:19 N	94:31:23 W	730	68
LF140E 91	45:56:22 N	94:32:49 W	360	36
LF140E 92	45:54:57 N	94:32:43 W	200	22
LF140E 93	45:55:38 N	94:31:34 W	360	36
LF140E 94	45:55:54 N	94:32:31 W	320	33
LF140E 95	45:54:15 N	94:31:35 W	350	36
LF140E 96	45:53:26 N	94:31:52 W	650	62
LF140E 97	45:53:59 N	94:32:39 W	490	48
LF140E 98	45:55:08 N	94:27:29 W	270	27
LF140E 99	45:55:11 N	94:27:30 W	480	46
LF140E100	45:55:10 N	94:27:42 W	280	29
LF140E101	45:55:30 N	94:27:25 W	140	17
LF140E102	45:53:16 N	94:30:02 W	330	33
LF140E103	45:52:44 N	94:31:57 W	170	18
LF140E104	45:53:16 N	94:33:04 W	230	25
LF140E105	45:52:57 N	94:33:55 W	150	17
LF140E106	45:52:37 N	94:33:05 W	180	20
LF140E107	45:56:56 N	94:33:03 W	470	45

Table 4 -- Observed radon activity in the Little Falls test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
LF140E108	45:55:25 N	94:33:17 W	410	39
LF140E109	45:54:37 N	94:31:58 W	200	21
LF140E110	45:54:15 N	94:33:37 W	230	24
LF140E111	45:53:43 N	94:33:47 W	150	16
LF140E112	45:54:30 N	94:34:26 W	380	37
LF140E113	45:53:45 N	94:35:08 W	380	37
LF140E114	45:53:05 N	94:35:08 W	240	25
LF140E115	45:54:22 N	94:35:08 W	260	26
LF140E116	45:55:03 N	94:33:43 W	350	34
LF140E117	45:55:12 N	94:34:36 W	220	23
LF140E118	45:55:56 N	94:33:53 W	360	35
LF140E119	45:56:43 N	94:33:41 W	480	46
LF140E120	45:57:33 N	94:33:28 W	500	48
LF140E121	45:58:51 N	94:33:24 W	330	33
LF140E122	45:59:47 N	94:33:55 W	390	38
LF140E123	45:59:45 N	94:34:54 W	440	43
LF140E124	45:59:21 N	94:35:50 W	260	28
LF140E125	45:59:55 N	94:36:52 W	290	29
LF140E126	45:59:17 N	94:36:56 W	690	64
LF140E127	45:58:34 N	94:37:10 W	2100	190
LF140E128	45:58:37 N	94:36:16 W	290	29
LF140E129	45:57:00 N	94:34:59 W	410	39
LF140E130	45:57:54 N	94:34:05 W	280	29
LF140E131	45:58:01 N	94:36:50 W	330	33
LF140E132	45:57:26 N	94:37:11 W	410	40
LF140E133	45:56:39 N	94:36:51 W	380	37
LF140E134	45:56:09 N	94:35:48 W	680	63
LF140E135	45:56:42 N	94:35:33 W	700	65
LF140E136	45:57:25 N	94:35:59 W	550	52
LF140E137	45:57:58 N	94:35:35 W	350	35
LF140E138	45:58:22 N	94:34:39 W	310	31
LF140E139	45:57:54 N	94:37:52 W	210	22
LF140E140	45:56:32 N	94:37:50 W	1600	140
LF140E141	45:55:55 N	94:37:52 W	210	25
LF140E142	45:55:09 N	94:37:34 W	130	17
LF140E143	45:55:09 N	94:36:45 W	170	20
LF140E144	45:55:43 N	94:35:52 W	270	28
LF140E145	45:56:05 N	94:34:51 W	280	29
LF140E146	45:56:00 N	94:38:50 W	570	57
LF140E147	45:58:31 N	94:37:51 W	180	23
LF140E148	45:55:12 N	94:35:23 W	430	45
LF140E149	45:55:01 N	94:38:32 W	330	36
LF140E150	45:55:35 N	94:27:13 W	240	30
LF140E151	45:52:11 N	94:34:38 W	110	17
LF140E152	45:52:01 N	94:33:48 W	98	15
LF140E153	45:52:10 N	94:32:31 W	230	27
LF140E154	45:51:40 N	94:32:10 W	210	24
LF140E155	45:52:16 N	94:31:14 W	220	26
LF140E156	45:51:41 N	94:30:55 W	630	61
LF140E157	45:50:53 N	94:31:14 W	280	31
LF140E158	45:51:05 N	94:32:04 W	870	82
LF140E159	45:50:37 N	94:32:36 W	400	41
LF140E160	45:49:53 N	94:32:38 W	190	23
LF140E161	45:50:01 N	94:31:27 W	720	69
LF140E162	45:50:14 N	94:30:22 W	410	42
LF140E163	45:52:21 N	94:29:40 W	650	64

Table 4 -- Observed radon activity in the Little Falls test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
LF140E164	45:51:42 N	94:29:50 W	970	91
LF140E165	45:50:49 N	94:29:59 W	140	19
LF140E166	45:50:01 N	94:29:16 W	180	23
LF140E167	45:50:20 N	94:28:14 W	130	18
LF140E168	45:50:56 N	94:28:20 W	410	41
LF140E169	45:51:43 N	94:28:35 W	210	26
LF140E170	45:52:09 N	94:27:36 W	270	31
LF140E171	45:51:36 N	94:27:16 W	370	39
LF140E172	45:50:51 N	94:26:43 W	250	29
LF140E173	45:50:50 N	94:27:40 W	370	39
LF140E174	45:50:03 N	94:25:48 W	240	27
LF140E175	45:50:53 N	94:25:39 W	4100	360
LF140E176	45:51:33 N	94:26:08 W	490	49
LF140E177	45:51:49 N	94:25:01 W	340	36
LF140E178	45:52:20 N	94:24:32 W	440	45
LF140E179	45:51:16 N	94:24:31 W	2200	200
LF140E180	45:50:25 N	94:24:41 W	510	51
LF140E181	45:50:10 N	94:26:44 W	180	23
LF140E182	45:49:36 N	94:24:29 W	260	29

Table 5 -- Observed radon activity in the Sanborn-Jeffers test area, in counts per minute (cpm) and picoCuries per liter (pCi/l).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
SJ136E 1	44:06:40 N	94:57:44 W	160	21
SJ136E 2	44:07:24 N	94:57:54 W	1000	96
SJ136E 3	44:08:06 N	94:57:52 W	580	58
SJ136E 4	44:07:58 N	94:58:56 W	680	67
SJ136E 5	44:07:22 N	94:58:34 W	590	59
SJ136E 6	44:07:18 N	94:59:33 W	180	23
SJ136E 7	44:06:34 N	94:59:40 W	460	47
SJ136E 8	44:06:26 N	94:58:49 W	620	61
SJ136E 9	44:04:56 N	94:58:49 W	240	28
SJ136E 10	44:04:47 N	94:59:43 W	2410	220
SJ136E 11	44:03:21 N	94:59:55 W	260	29
SJ136E 12	44:05:43 N	94:57:33 W	1600	140
SJ136E 13	44:05:09 N	94:57:37 W	350	37
SJ136E 14	44:03:54 N	95:00:46 W	2100	180
SJ136E 15	44:04:24 N	95:01:13 W	1300	130
SJ136E 16	44:05:41 N	95:01:12 W	400	45
SJ136E 17	44:06:23 N	95:00:44 W	5500	570
SJ136E 18	44:04:12 N	94:58:42 W	4300	380
SJ136E 19	44:04:19 N	95:02:11 W	530	54
SJ136E 20	44:04:43 N	95:02:37 W	380	42
SJ136E 21	44:04:14 N	95:03:26 W	54	14
SJ136E 22	44:04:26 N	95:04:49 W	16000	1400
SJ136E 23	44:04:31 N	95:06:02 W	14000	1200

Table 5 -- Observed radon activity in the Sanborn-Jeffers test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
SJ136E 24	44:04:22 N	95:08:57 W	910	87
SJ136E 25	44:05:40 N	95:05:55 W	860	82
SJ136E 26	44:04:50 N	95:05:26 W	2300	210
SJ136E 27	44:06:23 N	95:04:06 W	470	49
SJ136E 28	44:05:44 N	95:03:01 W	2100	190
SJ136E 29	44:06:23 N	95:02:04 W	610	62
SJ136E 30	44:07:00 N	95:02:17 W	900	87
SJ136E 31	44:07:04 N	95:01:05 W	250	30
SJ136E 32	44:06:47 N	95:03:33 W	250	30
SJ136E 33	44:06:34 N	95:04:47 W	160	20
SJ136E 34	44:06:00 N	95:04:44 W	6000	530
SJ136E 35	44:06:40 N	95:05:56 W	7900	700
SJ136E 36	44:08:20 N	95:00:53 W	540	51
SJ136E 37	44:09:00 N	95:00:35 W	250	26
SJ136E 38	44:09:50 N	95:00:08 W	240	26
SJ136E 39	44:08:33 N	95:01:49 W	350	49
SJ136E 40	44:09:14 N	95:03:34 W	4500	400
SJ136E 41	44:10:39 N	95:03:44 W	160	19
SJ136E 42	44:10:02 N	95:03:41 W	170	20
SJ136E 43	44:10:30 N	95:04:46 W	700	66
SJ136E 44	44:10:43 N	95:05:44 W	320	33
SJ136E 45	44:09:57 N	95:05:57 W	180	21
SJ136E 46	44:08:19 N	95:04:53 W	340	36
SJ136E 47	44:08:17 N	95:03:43 W	740	70
SJ136E 48	44:08:10 N	95:02:41 W	220	24
SJ136E 49	44:07:50 N	95:01:05 W	770	71
SJ136E 50	44:07:25 N	95:03:17 W	320	32
SJ136E 51	44:07:40 N	95:04:52 W	240	26
SJ136E 52	44:07:57 N	95:06:03 W	660	62
SJ136E 53	44:07:16 N	95:06:10 W	1400	130
SJ136E 54	44:06:32 N	95:07:07 W	5300	490
SJ136E 55	44:07:25 N	95:07:00 W	350	36
SJ136E 56	44:07:58 N	95:07:16 W	310	33
SJ136E 57	44:08:39 N	95:07:03 W	390	40
SJ136E 58	44:09:22 N	95:07:11 W	330	34
SJ136E 59	44:10:02 N	95:06:56 W	260	28
SJ136E 60	44:10:43 N	95:06:31 W	150	18
SJ136E 61	44:11:04 N	95:07:20 W	160	19
SJ136E 62	44:11:39 N	95:06:56 W	92	13
SJ136E 63	44:04:09 N	95:05:43 W	770	76
SJ136E 64	44:03:36 N	95:06:04 W	830	81
SJ136E 65	44:06:51 N	95:08:50 W	1800	170
SJ136E 66	44:05:32 N	95:08:17 W	6500	580
SJ136E 67	44:04:49 N	95:08:27 W	330	36
SJ136E 68	44:03:58 N	95:08:04 W	460	49
SJ136E 69	44:03:55 N	95:09:31 W	6	11
SJ136E 70	44:04:36 N	95:09:36 W	1600	150
SJ136E 71	44:05:39 N	95:09:37 W	no data	no data
SJ136E 72	44:06:19 N	95:09:40 W	3700	330
SJ136E 73	44:07:38 N	95:08:21 W	1300	120
SJ136E 74	44:07:24 N	95:09:04 W	550	57
SJ136E 75	44:07:27 N	95:09:53 W	280	33
SJ136E 76	44:07:19 N	95:11:16 W	280	35
SJ136E 77	44:06:12 N	95:10:38 W	6500	580
SJ136E 78	44:05:13 N	95:10:44 W	2700	250

Table 5 -- Observed radon activity in the Sanborn-Jeffers test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
SJ136E 79	44:04:43 N	95:10:52 W	590	60
SJ136E 80	44:03:54 N	95:10:37 W	320	37
SJ136E 81	44:04:54 N	95:11:55 W	590	60
SJ136E 82	44:05:36 N	95:11:46 W	9100	800
SJ136E 83	44:04:07 N	95:12:04 W	500	53
SJ136E 84	44:04:44 N	95:13:06 W	290	36
SJ136E 85	44:05:47 N	95:13:10 W	1500	140
SJ136E 86	44:06:27 N	95:13:04 W	1200	120
SJ136E 87	44:06:41 N	95:12:25 W	3400	340
SJ136E 88	44:07:24 N	95:12:56 W	920	92
SJ136E 89	44:05:23 N	95:08:19 W	5200	460
SJ136E 90	44:08:19 N	95:07:43 W	230	37
SJ136E 91	44:06:43 N	95:06:37 W	310	39
SJ136E 92	44:09:23 N	95:08:13 W	570	59
SJ136E 93	44:10:16 N	95:08:29 W	190	26
SJ136E 94	44:11:03 N	95:08:16 W	230	30
SJ136E 95	44:10:20 N	95:07:40 W	330	43
SJ136E 96	44:11:41 N	95:08:20 W	170	26
SJ136E 97	44:11:39 N	95:10:07 W	220	28
SJ136E 98	44:10:51 N	95:09:16 W	310	36
SJ136E 99	44:09:59 N	95:09:32 W	240	35
SJ136E100	44:08:59 N	95:09:31 W	230	28
SJ136E101	44:08:07 N	95:09:52 W	220	33
SJ136E102	44:06:06 N	95:08:44 W	490	52
SJ136E103	44:08:07 N	95:10:39 W	730	71
SJ136E104	44:09:11 N	95:10:47 W	360	41
SJ136E105	44:10:06 N	95:10:42 W	140	22
SJ136E106	44:10:01 N	95:11:41 W	150	26
SJ136E107	44:10:59 N	95:10:50 W	580	68
SJ136E108	44:11:41 N	95:12:42 W	690	69
SJ136E109	44:11:09 N	95:13:12 W	290	35
SJ136E110	44:11:26 N	95:10:48 W	1000	99
SJ136E111	44:10:00 N	95:13:11 W	560	57
SJ136E112	44:09:09 N	95:13:03 W	230	28
SJ136E113	44:09:25 N	95:11:51 W	270	33
SJ136E114	44:10:32 N	95:11:56 W	110	24
SJ136E115	44:08:37 N	95:12:09 W	390	41
SJ136E116	44:08:23 N	95:13:07 W	320	37
SJ136E117	44:07:53 N	95:12:34 W	360	40
SJ136E118	44:06:52 N	95:09:32 W	5000	450

Table 6 -- Observed radon activity in the Sleepy Eye test area, in counts per minute (cpm) and picoCuries per liter (pCi/l).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
SE136E339	44:14:03 N	94:43:43 W	380	45
SE136E340	44:13:57 N	94:44:43 W	360	41
SE136E341	44:13:27 N	94:44:06 W	260	33
SE136E342	44:13:23 N	94:42:46 W	140	21
SE136E343	44:13:23 N	94:41:48 W	420	48
SE136E344	44:14:19 N	94:40:54 W	330	40
SE136E345	44:14:37 N	94:39:36 W	140	22
SE136E346	44:14:24 N	94:38:24 W	380	43
SE136E347	44:14:40 N	94:37:41 W	260	33
SE136E348	44:14:01 N	94:41:45 W	470	50
SE136E349	44:14:35 N	94:43:25 W	470	51
SE136E350	44:12:34 N	94:43:18 W	290	35
SE136E351	44:14:40 N	94:44:50 W	45	16
SE136E352	44:12:31 N	94:44:55 W	430	50
SE136E353	44:11:54 N	94:42:16 W	2	15
SE136E354	44:12:39 N	94:41:54 W	370	43
SE136E355	44:12:38 N	94:40:46 W	120	21
SE136E356	44:12:59 N	94:39:44 W	440	50
SE136E357	44:13:39 N	94:40:10 W	410	46
SE136E358	44:13:38 N	94:39:12 W	310	36
SE136E359	44:13:14 N	94:37:46 W	210	32
SE136E360	44:12:34 N	94:37:46 W	220	30
SE136E361	44:12:26 N	94:38:34 W	930	91
SE136E362	44:13:10 N	94:38:44 W	210	33
SE136E363	44:12:22 N	94:39:39 W	480	53
SE136E364	44:11:46 N	94:40:00 W	220	28
SE136E365	44:11:38 N	94:38:53 W	49	23
SE136E366	44:11:52 N	94:37:43 W	240	31
SE136E367	44:11:38 N	94:41:01 W	270	36
SE136E368	44:11:25 N	94:44:06 W	340	42
SE136E369	44:10:43 N	94:44:32 W	760	77
SE136E370	44:10:03 N	94:44:34 W	160	27
SE136E371	44:10:02 N	94:42:48 W	130	23
SE136E372	44:10:25 N	94:41:30 W	180	28
SE136E373	44:10:56 N	94:42:06 W	250	32
SE136E374	44:10:56 N	94:40:48 W	290	43
SE136E375	44:10:50 N	94:39:44 W	300	39
SE136E376	44:10:02 N	94:39:24 W	200	31
SE136E377	44:10:53 N	94:38:08 W	260	33
SE136E378	44:10:45 N	94:38:54 W	580	59
SE136E379	44:13:21 N	94:45:23 W	94	17
SE136E380	44:13:27 N	94:46:26 W	400	43
SE136E381	44:14:16 N	94:46:06 W	330	39
SE136E382	44:11:42 N	94:45:32 W	280	37
SE136E383	44:10:43 N	94:45:33 W	300	37
SE136E384	44:10:01 N	94:45:13 W	330	36
SE136E385	44:10:57 N	94:46:37 W	220	32
SE136E386	44:10:14 N	94:46:29 W	570	58
SE136E387	44:11:42 N	94:46:54 W	330	39
SE136E388	44:12:35 N	94:48:23 W	330	37
SE136E389	44:13:23 N	94:48:24 W	530	56

Table 6 -- Observed radon activity in the Sleepy Eye test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
SE136E390	44:13:22 N	94:47:22 W	130	19
SE136E391	44:14:03 N	94:47:33 W	170	51
SE136E392	44:14:50 N	94:47:20 W	110	15
SE136E393	44:13:58 N	94:48:32 W	130	47
SE136E394	44:14:31 N	94:48:34 W	250	32
SE136E395	44:14:23 N	94:49:56 W	320	37
SE136E396	44:14:13 N	94:50:42 W	580	60
SE136E397	44:13:34 N	94:49:12 W	170	26
SE136E398	44:12:02 N	94:48:24 W	210	28
SE136E399	44:11:04 N	94:47:57 W	230	48
SE136E400	44:10:54 N	94:48:51 W	210	31
SE136E401	44:10:13 N	94:49:43 W	360	41
SE136E402	44:10:43 N	94:49:44 W	34	24
SE136E403	44:10:52 N	94:50:52 W	1700	160
SE136E404	44:10:22 N	94:51:17 W	120	27
SE136E405	44:10:45 N	94:52:01 W	250	33
SE136E406	44:11:10 N	94:51:33 W	340	58
SE136E407	44:11:42 N	94:50:40 W	320	41
SE136E408	44:11:56 N	94:49:33 W	12	23
SE136E409	44:12:32 N	94:49:22 W	360	15
SE136E410	44:12:43 N	94:50:16 W	140	25
SE136E411	44:12:34 N	94:51:20 W	270	34
SE136E412	44:13:32 N	94:50:40 W	52	30
SE136E413	44:12:00 N	94:51:42 W	140	22
SE136E414	44:13:10 N	94:51:53 W	110	15
SE136E415	44:13:52 N	94:51:43 W	310	34
SE136E416	44:14:31 N	94:52:06 W	150	54
SE136E417	44:15:03 N	94:50:51 W	290	35
SE136E418	44:15:37 N	94:50:18 W	290	35
SE136E419	44:15:05 N	94:49:40 W	300	37
SE136E420	44:16:06 N	94:49:22 W	710	72
SE136E421	44:16:00 N	94:48:13 W	620	63
SE136E422	44:15:14 N	94:48:20 W	390	45
SE136E423	44:16:03 N	94:47:12 W	150	50
SE136E424	44:16:07 N	94:46:14 W	320	37
SE136E425	44:15:04 N	94:46:26 W	240	31
SE136E426	44:16:52 N	94:47:13 W	210	29
SE136E427	44:15:55 N	94:48:24 W	350	41
SE136E428	44:15:56 N	94:49:29 W	160	24
SE136E429	44:16:54 N	94:50:39 W	160	31
SE136E430	44:16:21 N	94:50:24 W	510	55
SE136E431	44:17:34 N	94:50:43 W	530	55
SE136E432	44:16:02 N	94:45:24 W	320	38
SE136E433	44:15:54 N	94:45:58 W	120	28
SE136E434	44:17:38 N	94:47:11 W	290	40
SE136E435	44:17:59 N	94:46:15 W	290	35
SE136E436	44:17:54 N	94:45:03 W	160	24
SE136E437	44:17:54 N	94:47:53 W	130	15
SE136E438	44:18:01 N	94:48:53 W	330	39
SE136E439	44:17:54 N	94:50:07 W	190	27
SE136E440	44:18:37 N	94:50:48 W	390	44
SE136E441	44:19:39 N	94:48:47 W	100	28
SE136E442	44:19:35 N	94:47:16 W	390	44
SE136E443	44:19:44 N	94:46:00 W	310	38
SE136E444	44:19:31 N	94:45:41 W	290	37
SE136E445	44:20:29 N	94:46:05 W	250	33

Table 6 -- Observed radon activity in the Sleepy Eye test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
SE136E+06	44:13:43 N	94:49:40 W	240	29
SE136E+07	44:13:56 N	94:47:29 W	730	71
SE136E+08	44:13:13 N	94:47:00 W	170	25
SE136E+09	44:13:32 N	94:46:03 W	210	29
SE136E+50	44:20:15 N	94:48:22 W	220	30
SE136E+51	44:13:41 N	94:49:10 W	130	24
SE136E+52	44:13:24 N	94:50:10 W	320	37
SE136E+53	44:20:24 N	94:49:53 W	240	32
SE136E+54	44:13:30 N	94:51:19 W	300	35
SE136E+55	44:20:20 N	94:52:11 W	350	42
SE136E+56	44:13:26 N	94:52:41 W	310	37
SE136E+57	44:13:55 N	94:51:52 W	380	44
SE136E+58	44:20:00 N	94:53:14 W	410	45
SE136E+59	44:14:23 N	94:53:43 W	390	39
SE136E+60	44:13:38 N	94:54:16 W	88	14
SE136E+61	44:17:54 N	94:54:02 W	340	35
SE136E+62	44:17:52 N	94:52:49 W	310	32
SE136E+63	44:17:43 N	94:51:33 W	860	80
SE136E+64	44:17:02 N	94:53:15 W	310	32
SE136E+65	44:17:07 N	94:54:17 W	560	53
SE136E+66	44:16:43 N	94:51:29 W	700	66
SE136E+67	44:16:22 N	94:51:32 W	580	56
SE136E+68	44:16:54 N	94:51:30 W	170	20
SE136E+69	44:14:43 N	94:53:06 W	460	45
SE136E+70	44:14:22 N	94:52:25 W	90	13
SE136E+71	44:16:41 N	94:52:39 W	340	34
SE136E+72	44:16:27 N	94:53:32 W	330	34
SE136E+73	44:15:54 N	94:52:51 W	190	22
SE136E+74	44:15:29 N	94:54:15 W	380	38
SE136E+75	44:14:37 N	94:54:13 W	160	20
SE136E+76	44:13:44 N	94:54:17 W	360	37
SE136E+77	44:12:53 N	94:54:17 W	240	28
SE136E+78	44:12:05 N	94:54:18 W	120	19
SE136E+79	44:11:34 N	94:52:52 W	200	23
SE136E+80	44:11:13 N	94:53:49 W	770	73
SE136E+81	44:10:31 N	94:54:03 W	170	20
SE136E+82	44:10:29 N	94:52:54 W	260	28
SE136E+83	44:12:33 N	94:53:01 W	180	21
SE136E+84	44:13:58 N	94:44:44 W	130	17
SE136E+85	44:20:02 N	94:43:33 W	320	33
SE136E+86	44:13:17 N	94:43:26 W	220	24
SE136E+87	44:13:10 N	94:42:35 W	610	58
SE136E+88	44:13:39 N	94:43:16 W	390	39
SE136E+89	44:18:45 N	94:44:18 W	310	33
SE136E+90	44:15:30 N	94:44:34 W	540	51
SE136E+91	44:15:11 N	94:43:52 W	280	30
SE136E+92	44:15:46 N	94:43:46 W	200	23
SE136E+93	44:15:21 N	94:44:00 W	620	59
SE136E+94	44:16:24 N	94:42:58 W	290	30
SE136E+95	44:17:22 N	94:44:10 W	7900	690
SE136E+96	44:15:19 N	94:42:19 W	160	21
SE136E+97	44:17:43 N	94:41:56 W	110	16
SE136E+98	44:16:47 N	94:42:13 W	290	31
SE136E+99	44:15:42 N	94:42:20 W	220	25
SE136E500	44:15:02 N	94:42:02 W	590	57
SE136E501	44:15:34 N	94:40:43 W	190	23

Table 6 -- Observed radon activity in the Sleepy Eye test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
SE136E502	44:16:09 N	94:40:09 W	420	43
SE136E503	44:17:24 N	94:41:10 W	340	36
SE136E504	44:17:29 N	94:39:21 W	2400	210
SE136E505	44:16:32 N	94:35:46 W	170	21
SE136E506	44:16:45 N	94:37:44 W	250	29
SE136E507	44:17:07 N	94:38:30 W	520	55
SE136E508	44:18:23 N	94:41:06 W	300	37
SE136E509	44:20:15 N	94:42:31 W	460	51
SE136E510	44:19:42 N	94:41:44 W	270	36
SE136E511	44:20:16 N	94:40:32 W	330	43
SE136E512	44:20:16 N	94:39:28 W	260	34
SE136E513	44:20:12 N	94:37:30 W	54	17
SE136E514	44:19:31 N	94:37:30 W	320	41
SE136E515	44:19:28 N	94:38:23 W	280	36
SE136E516	44:19:17 N	94:39:32 W	320	41
SE136E517	44:18:51 N	94:40:52 W	450	51
SE136E518	44:19:36 N	94:40:31 W	200	28
SE136E519	44:18:14 N	94:39:31 W	490	55
SE136E520	44:17:44 N	94:37:57 W	590	63
SE136E521	44:19:23 N	94:37:36 W	160	26
SE136E522	44:15:45 N	94:38:44 W	110	22
SE136E523	44:17:05 N	94:43:12 W	600	65

Table 7 -- Observed radon activity in the Clarkfield test area, in counts per minute (cpm) and picoCuries per liter (pCi/l).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
CF136E119	44:46:32 N	95:43:18 W	160	18
CF136E120	44:46:43 N	95:42:25 W	440	43
CF136E121	44:47:24 N	95:44:20 W	270	29
CF136E122	44:45:56 N	95:44:02 W	320	32
CF136E123	44:45:03 N	95:44:27 W	160	19
CF136E124	44:44:59 N	95:43:23 W	470	45
CF136E125	44:45:39 N	95:42:26 W	240	25
CF136E126	44:45:55 N	95:41:15 W	210	23
CF136E127	44:46:34 N	95:41:16 W	160	18
CF136E128	44:47:21 N	95:41:22 W	350	34
CF136E129	44:47:19 N	95:43:20 W	240	25
CF136E130	44:47:19 N	95:40:25 W	650	61
CF136E131	44:46:44 N	95:39:50 W	140	18
CF136E132	44:47:23 N	95:38:21 W	380	38
CF136E133	44:45:37 N	95:39:47 W	190	21
CF136E134	44:44:53 N	95:40:01 W	360	37
CF136E135	44:45:36 N	95:38:48 W	170	20
CF136E136	44:45:43 N	95:37:58 W	350	36
CF136E137	44:43:46 N	95:38:32 W	530	51
CF136E138	44:43:58 N	95:39:24 W	290	30
CF136E139	44:44:00 N	95:40:32 W	150	18
CF136E140	44:44:42 N	95:41:11 W	190	21
CF136E141	44:44:49 N	95:42:11 W	290	30
CF136E142	44:43:45 N	95:44:55 W	210	23
CF136E143	44:44:31 N	95:43:38 W	650	62
CF136E144	44:43:50 N	95:41:24 W	270	29
CF136E145	44:42:56 N	95:38:06 W	200	25
CF136E146	44:43:22 N	95:37:34 W	360	36
CF136E147	44:43:10 N	95:38:44 W	320	34
CF136E148	44:42:59 N	95:40:24 W	230	25
CF136E149	44:43:11 N	95:41:49 W	350	35
CF136E150	44:42:15 N	95:37:36 W	260	27
CF136E151	44:42:13 N	95:38:19 W	630	60
CF136E152	44:41:16 N	95:37:52 W	2700	240
CF136E153	44:41:37 N	95:39:18 W	650	62
CF136E154	44:41:15 N	95:38:43 W	450	44
CF136E155	44:42:28 N	95:40:02 W	280	29
CF136E156	44:42:06 N	95:41:12 W	380	40
CF136E157	44:41:17 N	95:40:20 W	320	33
CF136E158	44:41:47 N	95:42:08 W	530	51
CF136E159	44:41:25 N	95:42:59 W	140	20
CF136E160	44:42:12 N	95:42:38 W	440	43
CF136E161	44:41:50 N	95:44:02 W	320	34
CF136E162	44:42:34 N	95:44:11 W	260	27
CF136E163	44:42:25 N	95:44:56 W	360	37
CF136E164	44:43:14 N	95:44:15 W	180	22
CF136E165	44:43:52 N	95:43:56 W	160	22
CF136E166	44:44:16 N	95:42:37 W	320	34
CF136E167	44:40:47 N	95:44:02 W	110	54
CF136E168	44:40:29 N	95:44:57 W	160	62
CF136E169	44:39:53 N	95:44:12 W	230	71

Table 7 -- Observed radon activity in the Clarkfield test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
CF136E170	44:40:30 N	95:42:35 W	360	89
CF136E171	44:40:19 N	95:41:23 W	220	63
CF136E172	44:40:22 N	95:40:23 W	760	120
CF136E173	44:41:21 N	95:41:24 W	560	90
CF136E174	44:40:22 N	95:39:21 W	620	110
CF136E175	44:39:29 N	95:38:24 W	200	62
CF136E176	44:39:55 N	95:37:31 W	200	63
CF136E177	44:38:59 N	95:37:38 W	140	54
CF136E178	44:39:29 N	95:40:52 W	210	70
CF136E179	44:39:32 N	95:41:55 W	110	53
CF136E180	44:39:22 N	95:42:50 W	140	71
CF136E181	44:38:36 N	95:44:27 W	240	82
CF136E182	44:39:12 N	95:43:28 W	110	62
CF136E183	44:38:54 N	95:38:53 W	140	62
CF136E184	44:38:39 N	95:40:02 W	83	53
CF136E185	44:37:52 N	95:39:35 W	550	100
CF136E186	44:37:51 N	95:37:34 W	520	90
CF136E187	44:38:24 N	95:38:19 W	100	53
CF136E188	44:37:50 N	95:41:11 W	0	0
CF136E189	44:38:38 N	95:41:22 W	410	91
CF136E190	44:38:38 N	95:42:10 W	230	55
CF136E191	44:38:11 N	95:43:40 W	380	79
CF136E192	44:37:18 N	95:43:22 W	210	49
CF136E194	44:37:51 N	95:44:53 W	260	57
CF136E208	44:37:00 N	95:40:04 W	2200	230
CF136E209	44:37:27 N	95:38:31 W	680	97
CF136E210	44:36:58 N	95:45:38 W	370	66
CF136E211	44:37:05 N	95:47:18 W	620	99
CF136E212	44:37:00 N	95:48:22 W	220	73
CF136E213	44:38:00 N	95:47:37 W	340	59
CF136E214	44:37:47 N	95:45:55 W	610	100
CF136E215	44:43:15 N	95:42:34 W	1400	120
CF136E216	44:42:58 N	95:45:31 W	420	40
CF136E217	44:42:32 N	95:46:40 W	380	37
CF136E218	44:42:14 N	95:45:33 W	720	66
CF136E219	44:44:42 N	95:46:28 W	550	52
CF136E220	44:44:44 N	95:47:45 W	240	24
CF136E221	44:44:40 N	95:48:34 W	120	14
CF136E222	44:43:44 N	95:48:42 W	290	29
CF136E223	44:43:58 N	95:47:31 W	400	38
CF136E224	44:43:52 N	95:46:27 W	600	56
CF136E225	44:43:07 N	95:46:31 W	90	13
CF136E226	44:44:14 N	95:45:37 W	390	38
CF136E227	44:44:46 N	95:44:46 W	230	23
CF136E228	44:44:48 N	95:50:05 W	1200	110
CF136E229	44:44:00 N	95:52:20 W	490	47
CF136E230	44:44:10 N	95:49:40 W	310	33
CF136E231	44:42:32 N	95:47:54 W	370	38
CF136E232	44:43:34 N	95:49:47 W	1300	110
CF136E233	44:40:53 N	95:46:00 W	410	39
CF136E234	44:40:11 N	95:45:56 W	440	43
CF136E235	44:39:23 N	95:45:02 W	2400	210
CF136E236	44:39:29 N	95:46:40 W	370	37
CF136E237	44:39:38 N	95:47:58 W	430	41
CF136E238	44:40:33 N	95:47:10 W	830	80
CF136E239	44:47:17 N	95:45:56 W	470	47

Table 7 -- Observed radon activity in the Clarkfield test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
CF136E240	44:47:24 N	95:47:01 W	1400	130
CF136E241	44:46:32 N	95:47:47 W	200	23
CF136E242	44:45:44 N	95:45:11 W	1900	170
CF136E243	44:45:53 N	95:47:10 W	890	84
CF136E244	44:45:13 N	95:49:16 W	220	26
CF136E245	44:45:52 N	95:49:50 W	470	48
CF136E246	44:47:18 N	95:49:39 W	400	41
CF136E247	44:46:28 N	95:44:43 W	160	20
CF136E248	44:46:30 N	95:45:45 W	440	48
CF136E249	44:45:38 N	95:50:57 W	380	40
CF136E250	44:46:40 N	95:50:41 W	250	30
CF136E251	44:47:18 N	95:51:18 W	130	22
CF136E252	44:47:23 N	95:52:20 W	180	26
CF136E253	44:45:31 N	95:51:48 W	370	43
CF136E254	44:44:51 N	95:51:25 W	430	47
CF136E255	44:44:41 N	95:52:14 W	230	29
CF136E256	44:44:00 N	95:50:50 W	570	59
CF136E257	44:43:11 N	95:52:13 W	150	24
CF136E258	44:43:10 N	95:51:02 W	420	45
CF136E259	44:42:19 N	95:50:48 W	240	31
CF136E260	44:42:16 N	95:51:41 W	170	25
CF136E261	44:41:27 N	95:51:43 W	75	20
CF136E262	44:41:34 N	95:51:00 W	85	23
CF136E263	44:42:08 N	95:49:45 W	530	51
CF136E264	44:43:13 N	95:48:14 W	310	32
CF136E265	44:41:19 N	95:48:31 W	400	40
CF136E266	44:40:49 N	95:47:59 W	430	43
CF136E267	44:40:23 N	95:48:44 W	190	27
CF136E268	44:40:36 N	95:49:39 W	560	59
CF136E269	44:39:30 N	95:48:55 W	480	51
CF136E270	44:38:57 N	95:49:19 W	570	59
CF136E271	44:38:44 N	95:48:13 W	590	62
CF136E272	44:38:55 N	95:47:15 W	350	41
CF136E273	44:38:39 N	95:45:51 W	200	27
CF136E274	44:38:02 N	95:48:37 W	380	42
CF136E275	44:38:02 N	95:49:46 W	490	54
CF136E276	44:38:01 N	95:50:48 W	540	57
CF136E277	44:38:44 N	95:50:52 W	410	47
CF136E278	44:39:25 N	95:49:47 W	940	92
CF136E279	44:46:49 N	95:52:01 W	440	48
CF136E280	44:46:09 N	95:52:06 W	530	56
CF136E281	44:39:46 N	95:51:19 W	350	41
CF136E282	44:40:25 N	95:51:50 W	290	35
CF136E283	44:38:59 N	95:51:50 W	780	77
CF136E284	44:38:35 N	95:52:19 W	290	34
CF136E285	44:37:52 N	95:52:11 W	260	33
CF136E286	44:37:02 N	95:50:52 W	350	41
CF136E287	44:37:02 N	95:49:49 W	350	40
CF136E288	44:37:19 N	95:48:48 W	610	63
CF136E289	44:37:01 N	95:52:12 W	840	84
CF136E290	44:37:03 N	95:53:12 W	690	71
CF136E291	44:37:00 N	95:53:59 W	390	45
CF136E292	44:37:12 N	95:54:57 W	290	36
CF136E293	44:37:10 N	95:56:15 W	290	36
CF136E294	44:37:35 N	95:56:56 W	300	38
CF136E295	44:38:36 N	95:56:49 W	300	36

Table 7 -- Observed radon activity in the Clarkfield test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
CF136E296	44:38:06 N	95:56:12 W	300	36
CF136E297	44:38:07 N	95:54:19 W	100	20
CF136E298	44:38:45 N	95:54:40 W	430	48
CF136E299	44:38:48 N	95:55:44 W	260	34
CF136E300	44:39:14 N	95:57:01 W	220	32
CF136E301	44:39:39 N	95:55:40 W	380	46
CF136E302	44:40:19 N	95:56:50 W	1800	170
CF136E303	44:40:14 N	95:54:42 W	310	41
CF136E304	44:39:36 N	95:54:38 W	390	46
CF136E305	44:37:44 N	95:52:55 W	580	62
CF136E306	44:38:46 N	95:53:05 W	340	42
CF136E307	44:39:33 N	95:53:33 W	1000	100
CF136E308	44:39:28 N	95:52:36 W	560	60
CF136E309	44:41:13 N	95:52:39 W	1100	110
CF136E310	44:42:15 N	95:52:37 W	1200	120
CF136E311	44:42:14 N	95:53:28 W	960	93
CF136E312	44:41:25 N	95:54:07 W	320	38
CF136E313	44:40:53 N	95:54:44 W	520	56
CF136E314	44:41:02 N	95:57:01 W	260	33
CF136E315	44:41:44 N	95:56:50 W	540	59
CF136E316	44:42:30 N	95:55:59 W	1500	140
CF136E317	44:42:00 N	95:54:32 W	1100	100
CF136E318	44:42:35 N	95:54:42 W	520	57
CF136E319	44:43:12 N	95:54:34 W	890	89
CF136E320	44:43:16 N	95:53:26 W	250	32
CF136E321	44:43:42 N	95:54:45 W	240	33
CF136E322	44:43:53 N	95:55:52 W	950	93
CF136E323	44:43:13 N	95:56:07 W	1200	110
CF136E324	44:43:37 N	95:57:00 W	140	24
CF136E325	44:44:27 N	95:54:43 W	450	50
CF136E326	44:44:53 N	95:55:23 W	230	33
CF136E327	44:44:53 N	95:56:53 W	560	61
CF136E328	44:45:24 N	95:53:26 W	530	61
CF136E329	44:45:55 N	95:53:16 W	1600	150
CF136E330	44:46:41 N	95:53:24 W	540	60
CF136E331	44:47:10 N	95:53:26 W	180	30
CF136E332	44:46:56 N	95:54:28 W	220	34
CF136E333	44:46:28 N	95:55:05 W	490	55
CF136E334	44:46:45 N	95:55:39 W	260	38
CF136E335	44:47:17 N	95:56:02 W	330	42
CF136E336	44:46:36 N	95:56:39 W	260	35
CF136E337	44:46:00 N	95:56:51 W	590	63
CF136E338	44:45:42 N	95:54:42 W	260	34

Table 8 -- Observed radon activity in water from wells finished in bedrock, east-central Minnesota test area, in counts per minute (cpm) and picoCuries per liter (pCi/l).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
EC8603116	46:40:15 N	92:31:44 W	190	20
EC8603117	46:39:39 N	92:31:58 W	200	20
EC8603118	46:39:17 N	92:32:34 W	240	24
EC8603119	46:39:52 N	92:31:33 W	870	78
EC8603120	46:38:56 N	92:30:25 W	780	70
EC8603121	46:39:03 N	92:31:55 W	3400	300
EC8603122	46:37:29 N	92:32:31 W	1100	94
EC8603123	46:37:05 N	92:33:10 W	240	24
EC8603124	46:37:40 N	92:33:54 W	1000	92
EC8603125	46:37:11 N	92:35:34 W	1100	99
EC8603126	46:37:04 N	92:36:28 W	2500	220
EC8603127	46:36:57 N	92:37:04 W	5700	500
EC8603128	46:37:51 N	92:31:30 W	1600	140
EC8603129	46:39:03 N	92:29:34 W	600	55
EC8603130	46:37:15 N	92:34:26 W	5300	470
EC8603133	46:39:21 N	92:34:44 W	630	58
EC8603134	46:38:56 N	92:35:52 W	310	31
EC8603135	46:39:59 N	92:34:33 W	550	52
EC8603136	46:39:23 N	92:35:24 W	530	50
EC8603137	46:39:04 N	92:36:23 W	1800	160
EC8603138	46:39:27 N	92:37:22 W	430	41
EC8603139	46:39:27 N	92:38:34 W	3900	340
EC8603140	46:39:21 N	92:37:37 W	2600	230
EC8603141	46:37:04 N	92:38:27 W	300	30
EC8603142	46:37:44 N	92:37:22 W	480	45
EC8603143	46:38:02 N	92:37:58 W	4400	390
EC8603146	46:34:37 N	92:36:03 W	720	66
EC8603147	46:28:45 N	92:20:31 W	290	29
EC8603148	46:28:19 N	92:21:43 W	260	26
EC8603150	46:29:26 N	92:24:21 W	1300	120
EC8603155	46:27:39 N	92:29:13 W	300	31
EC8603156	46:27:43 N	92:30:50 W	240	26
EC8603171	46:16:39 N	92:53:49 W	1600	140
EC8603172	46:17:53 N	92:56:49 W	240	27
EC8603173	46:17:39 N	92:57:57 W	1100	97
EC8603176	46:17:52 N	92:58:40 W	500	47
EC8603177	46:18:10 N	92:57:25 W	730	72
EC8603178	46:20:49 N	92:57:23 W	2700	250
EC8603179	46:20:41 N	92:59:05 W	1500	140
EC8603180	46:19:11 N	92:59:24 W	1200	120
EC8603181	46:19:04 N	92:57:50 W	18000	1600
EC8603182	46:19:04 N	92:56:24 W	1400	130
EC8603183	46:34:37 N	92:34:55 W	1600	150
EC8603184	46:35:27 N	92:37:40 W	500	48
EC8603185	46:34:47 N	92:37:30 W	720	67
EC8603186	46:34:37 N	92:37:04 W	1300	120
EC8603189	46:34:35 N	92:31:15 W	490	48
EC8603191	46:36:03 N	92:32:13 W	500	52
EC8603192	46:36:46 N	92:31:04 W	420	41
EC8603193	46:37:33 N	92:30:36 W	420	41
EC8603201	46:29:31 N	92:34:22 W	240	24

Table 8 -- Observed radon activity in water from wells finished in bedrock, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
ECB603203	46:29:34 N	92:36:46 W	310	30
ECB603211	46:36:53 N	92:28:01 W	320	31
ECB603212	46:37:29 N	92:28:44 W	900	82
ECB603213	46:36:53 N	92:29:24 W	130	15
ECB603214	46:37:08 N	92:29:24 W	660	61
ECB603217	46:37:23 N	92:27:57 W	300	30
ECB603219	46:19:29 N	92:54:18 W	720	71
ECB603220	46:18:57 N	92:53:52 W	300	37
ECB603221	46:20:33 N	92:54:25 W	430	41
ECB603222	46:21:28 N	92:54:18 W	650	60
ECB603223	46:22:01 N	92:56:20 W	240	25
ECB603224	46:23:20 N	92:59:24 W	1200	110
ECB603225	46:23:23 N	92:57:36 W	800	74
ECB603226	46:23:13 N	92:56:56 W	4600	410
ECB603227	46:22:58 N	92:56:43 W	1500	130
ECB603228	46:23:41 N	92:56:16 W	8300	720
ECB603229	46:22:44 N	92:56:20 W	1500	130
ECB603230	46:24:17 N	92:54:18 W	1400	120
ECB603233	46:24:23 N	92:40:37 W	130	15
ECB603234	46:23:58 N	92:42:10 W	170	19
ECB603235	46:24:04 N	92:44:20 W	450	43
ECB603236	46:23:19 N	92:44:52 W	670	64
ECB603237	46:24:37 N	92:44:20 W	800	74
ECB603238	46:24:13 N	92:44:27 W	420	41
ECB603239	46:23:41 N	92:44:34 W	210	23
ECB603240	46:27:46 N	92:45:38 W	7700	680
ECB603241	46:23:11 N	92:45:43 W	1500	140
ECB603242	46:23:37 N	92:46:22 W	2300	210
ECB603245	46:34:29 N	92:24:21 W	160	19
ECB603246	46:33:03 N	92:22:55 W	180	21
ECB603247	46:32:49 N	92:23:45 W	190	21
ECB603248	46:32:45 N	92:21:25 W	120	16
ECB603253	46:34:51 N	92:27:43 W	390	38
ECB603255	46:23:33 N	92:55:44 W	2800	250
ECB603257	46:23:16 N	92:52:01 W	2900	250
ECB603258	46:23:23 N	92:53:27 W	1400	130
ECB603259	46:23:23 N	92:54:18 W	4100	360
ECB603260	46:24:43 N	92:54:21 W	4100	360
ECB603261	46:25:22 N	92:54:21 W	1400	130
ECB603262	46:26:23 N	92:54:03 W	440	42
ECB603263	46:26:49 N	92:54:23 W	550	51
ECB603264	46:23:20 N	92:51:13 W	740	68
ECB603265	46:24:35 N	92:52:40 W	1300	120
ECB603266	46:24:17 N	92:52:22 W	950	87
ECB603267	46:23:03 N	92:46:51 W	1800	160
ECB603268	46:23:24 N	92:43:51 W	1200	110
ECB603269	46:23:33 N	92:47:45 W	1070	94
ECB603270	46:23:02 N	92:48:13 W	1000	96
ECB603271	46:23:40 N	92:49:15 W	770	73
ECB603273	46:23:51 N	92:49:03 W	310	32
ECB603274	46:23:02 N	92:50:03 W	110	14
ECB603275	46:23:03 N	92:50:13 W	230	24
ECB603276	46:27:14 N	92:30:03 W	290	30
ECB603277	46:26:45 N	92:51:57 W	1900	170
ECB603278	46:25:43 N	92:50:02 W	670	63
ECB603281	46:31:54 N	92:26:15 W	390	39

Table 8 -- Observed radon activity in water from wells finished in bedrock, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
EC3603283	46:31:09 N	92:28:04 W	120	15
EC3603291	46:26:20 N	92:49:55 W	1400	130
EC3603292	46:23:47 N	92:50:34 W	4300	380
EC3603293	46:25:13 N	92:50:34 W	2300	200
EC3603294	46:25:53 N	92:51:25 W	1300	110
EC3603295	46:25:13 N	92:48:46 W	3400	300
EC3603296	46:25:20 N	92:48:14 W	2600	250
EC3603297	46:25:44 N	92:51:50 W	7200	630
EC3603298	46:26:23 N	92:52:33 W	310	32
EC3603299	46:27:14 N	92:49:26 W	1100	100
EC3603300	46:27:50 N	92:49:13 W	340	34
EC3603301	46:27:10 N	92:48:21 W	8600	750
EC3603302	46:27:07 N	92:47:24 W	180	20
EC3603306	46:30:14 N	92:33:57 W	540	52
EC3603310	46:32:45 N	92:30:32 W	680	64
EC3603315	46:27:14 N	92:46:55 W	830	82
EC3603316	46:27:39 N	92:46:55 W	540	52
EC3603317	46:28:59 N	92:41:20 W	570	54
EC3603318	46:27:10 N	92:45:15 W	430	41
EC3603321	46:21:10 N	92:51:50 W	950	88
EC3603322	46:21:39 N	92:51:54 W	140	17
EC3603323	46:13:21 N	93:09:28 W		
EC3603324	46:18:50 N	93:10:40 W	420	44
EC3603326	46:19:55 N	93:08:13 W	700	68
EC3603327	46:28:43 N	92:45:35 W	390	38
EC3603328	46:28:23 N	92:45:43 W	3300	310
EC3603329	46:26:37 N	92:45:36 W	5900	510
EC3603330	46:28:34 N	92:55:33 W	290	30
EC3603331	46:26:37 N	92:57:03 W	290	29
EC3603332	46:28:33 N	92:58:13 W	160	18
EC3603333	46:29:23 N	92:59:24 W	580	55
EC3603334	46:28:58 N	92:59:24 W	570	53
EC3603335	46:26:59 N	92:56:34 W	850	78
EC3603336	46:27:03 N	92:58:13 W	470	45
EC3603337	46:27:21 N	92:58:51 W	790	72
EC3603338	46:26:02 N	92:59:24 W	5600	510
EC3603339	46:24:02 N	92:52:30 W	710	66
EC3603340	46:24:33 N	92:51:07 W	120	16
EC3603342	46:28:40 N	92:53:09 W	1100	98
EC3603343	46:26:44 N	92:53:33 W	77	13
EC3603345	46:28:20 N	92:54:23 W	450	43
EC3603346	46:28:55 N	92:54:32 W	8400	740
EC3603347	46:27:50 N	92:54:23 W	260	26
EC3603348	46:26:53 N	92:55:01 W	1500	140
EC3603349	46:26:56 N	92:55:44 W	510	48
EC3603350	46:27:57 N	92:55:37 W	8300	780
EC3603357	46:31:26 N	92:35:42 W	72	11
EC3603358	46:30:17 N	92:35:34 W	1200	110
EC3603363	46:19:55 N	93:06:21 W	130	16
EC3603364	46:19:55 N	93:05:35 W	260	26
EC3603365	46:19:55 N	93:04:43 W	420	41
EC3603366	46:22:08 N	93:01:43 W	480	46
EC3603367	46:22:23 N	92:59:49 W	1500	140
EC3603368	46:23:13 N	93:00:54 W	2100	190
EC3603369	46:23:16 N	93:01:58 W	550	52
EC3603370	46:24:25 N	93:01:37 W	3700	320

Table 8 -- Observed radon activity in water from wells finished in bedrock, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
EC860 3371	46:24:17 N	93:00:50 W	1400	170
EC860 3372	46:23:01 N	93:03:13 W	240	25
EC860 3373	46:23:45 N	93:02:34 W	130	16
EC860 3374	46:23:56 N	93:01:06 W	1000	92
EC860 3376	46:31:23 N	92:37:19 W	180	20
EC860 3377	46:30:50 N	92:38:16 W	160	18
EC860 3378	46:30:43 N	92:39:23 W	130	17
EC860 3379	46:30:17 N	92:36:23 W	270	28
EC860 3383	46:30:17 N	92:40:30 W	290	30
EC860 3384	46:23:52 N	92:40:51 W	130	17
EC860 3385	46:31:01 N	92:41:03 W	150	21
EC860 3386	46:30:36 N	92:40:40 W	77	14
EC860 3387	46:28:25 N	92:55:30 W	310	31
EC860 3388	46:25:11 N	92:59:20 W	1100	99
EC860 3389	46:27:50 N	92:58:03 W	1200	110
EC860 3390	46:26:46 N	92:57:32 W	4600	410
EC860 3391	46:23:52 N	92:58:12 W	710	71
EC860 3392	46:24:35 N	92:56:45 W	2400	220
EC860 3393	46:24:35 N	92:57:25 W	15000	1300
EC860 3394	46:22:29 N	92:57:57 W	810	79
EC860 3395	46:22:01 N	92:58:40 W	220	25
EC860 3396	46:21:21 N	92:58:13 W	2500	220
EC860 3398	46:21:21 N	92:57:14 W	560	56
EC860 3399	46:24:50 N	93:09:25 W	150	18
EC860 3400	46:24:57 N	93:10:04 W	460	45
EC860 3401	46:26:45 N	93:09:23 W	280	28
EC860 3402	46:27:21 N	93:09:21 W	15	5
EC860 3403	46:23:15 N	93:09:32 W	320	30
EC860 3404	46:23:23 N	93:10:51 W	510	50
EC860 3406	46:28:37 N	93:11:45 W	220	25
EC860 3407	46:27:39 N	93:11:02 W	1200	110
EC860 3408	46:26:52 N	93:08:16 W	290	29
EC860 3410	46:19:55 N	93:00:50 W	460	81
EC860 3411	46:31:55 N	92:39:54 W	2300	210
EC860 3412	46:32:41 N	92:39:57 W	450	44
EC860 3413	46:33:25 N	92:39:21 W	1200	110
EC860 3415	46:33:46 N	92:38:06 W	1200	110
EC860 3416	46:34:01 N	92:38:16 W	780	73
EC860 3417	46:33:35 N	92:37:30 W	510	49
EC860 3418	46:31:53 N	92:39:13 W	250	29
EC860 3419	46:32:27 N	92:40:40 W	1800	160
EC860 3420	46:33:21 N	92:40:33 W	830	78
EC860 3421	46:34:11 N	92:40:37 W	1800	170
EC860 3422	46:34:33 N	92:40:04 W	340	35
EC860 3423	46:18:57 N	93:01:37 W	1200	110
EC860 3424	46:17:59 N	93:01:48 W	110	16
EC860 3425	46:16:51 N	93:01:53 W	6200	550
EC860 3426	46:20:39 N	93:03:14 W	680	65
EC860 3427	46:21:14 N	93:05:16 W	1100	110
EC860 3428	46:26:45 N	93:07:12 W	31	15
EC860 3429	46:26:52 N	93:05:45 W	84	16
EC860 3430	46:26:16 N	93:03:03 W	6600	580
EC860 3431	46:26:27 N	93:04:26 W	760	74
EC860 3432	46:31:11 N	93:00:39 W	360	37
EC860 3433	46:29:16 N	93:00:43 W	500	49
EC860 3434	46:31:51 N	93:00:00 W	780	74

Table 8 -- Observed radon activity in water from wells finished in bedrock, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
EC8603435	46:34:37 N	92:38:13 W	3100	280
EC8603436	46:35:27 N	92:39:39 W	11000	930
EC8603441	46:36:28 N	92:40:44 W	1900	170
EC8603443	46:36:43 N	92:39:54 W	580	59
EC8603444	46:36:10 N	92:38:52 W	480	49
EC8603445	46:34:40 N	92:40:37 W	730	76
EC8603446	46:32:02 N	92:41:13 W	710	68
EC8603447	46:18:44 N	92:59:38 W	290	34
EC8603448	46:16:55 N	92:58:43 W	340	36
EC8603450	46:18:10 N	92:55:04 W	1500	140
EC8603451	46:18:25 N	92:54:18 W	190	32
EC8603452	46:22:29 N	92:51:36 W	310	33
EC8603453	46:23:49 N	92:54:28 W	3400	310
EC8603455	46:26:53 N	92:45:43 W	210	26
EC8603458	46:26:13 N	92:45:21 W	5	7
EC8603459	46:31:47 N	92:42:32 W	460	47
EC8603460	46:31:08 N	92:42:21 W	650	63
EC8603461	46:30:50 N	92:41:49 W	470	47
EC8603462	46:30:10 N	92:40:40 W	330	38
EC8603463	46:30:14 N	92:43:51 W	110	20
EC8603464	46:30:50 N	92:44:20 W	7200	630
EC8603465	46:31:11 N	92:45:39 W	140	26
EC8603466	46:31:04 N	92:45:14 W	550	54
EC8603467	46:31:04 N	92:43:53 W	190	24
EC8603468	46:31:55 N	92:45:07 W	170	28
EC8603469	46:32:06 N	92:44:27 W	580	56
EC8603470	46:31:22 N	92:43:04 W	770	71
EC8603479	46:31:58 N	93:13:12 W	3400	300
EC8603482	46:29:20 N	93:09:32 W	280	28
EC8603485	46:27:55 N	92:47:09 W	360	35
EC8603486	46:24:14 N	92:48:10 W	170	19
EC8603492	46:23:49 N	92:49:40 W	260	29
EC8603495	46:30:25 N	92:42:23 W	4300	430
EC8603496	46:31:55 N	92:43:33 W	130	19
EC8603497	46:33:50 N	92:45:14 W	2	6
EC8603498	46:34:59 N	92:43:12 W	15	12
EC8603499	46:35:27 N	92:43:04 W	2400	220
EC8603500	46:35:23 N	92:42:03 W	3100	270
EC8603501	46:35:23 N	92:40:55 W	1100	100
EC8603502	46:35:23 N	92:43:51 W	1900	170
EC8603503	46:35:31 N	92:43:51 W	4200	370
EC8603504	46:35:31 N	92:45:10 W	650	80
EC8603505	46:37:01 N	92:45:14 W	3500	310
EC8603507	46:35:06 N	92:48:32 W	100	14
EC8603508	46:34:11 N	92:48:07 W	1000	93
EC8603509	46:33:10 N	92:46:56 W	690	65
EC8603510	46:32:02 N	92:46:51 W	460	44
EC8603517	46:40:11 N	92:43:25 W	1100	100
EC8603518	46:40:44 N	92:44:03 W	2700	240
EC8603520	46:32:05 N	93:07:15 W	680	64
EC8603521	46:32:02 N	93:05:04 W	1100	95
EC8603528	46:36:33 N	93:05:13 W	670	63
FC8603-9	46:21:38 N	92:42:57 W	590	54
EC8603531	46:19:24 N	92:52:55 W	650	62
EC8603532	46:19:37 N	92:51:54 W	1600	150
EC8603534	46:40:40 N	92:45:54 W	430	42

Table 8 -- Observed radon activity in water from wells finished in bedrock, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
ECB603555	46:40:33 N	92:45:50 W	200	22
ECB603557	46:40:44 N	92:52:48 W	3500	310
ECB603559	46:40:44 N	92:49:48 W	670	63
ECB603560	46:40:40 N	92:48:21 W	160	18
ECB603561	46:39:50 N	92:47:09 W	330	76
ECB603562	46:35:27 N	92:49:33 W	120	16
ECB603563	46:37:15 N	92:50:02 W	250	31
ECB603564	46:37:15 N	92:51:21 W	130	19
ECB603565	46:36:09 N	92:49:53 W	2600	230
ECB603566	46:38:09 N	92:51:03 W	270	32
ECB603569	46:35:43 N	93:14:31 W	450	43
ECB603579	46:39:21 N	92:50:52 W	200	26
ECB603580	46:39:35 N	92:50:45 W	6500	570
ECB603581	46:39:50 N	92:51:36 W	630	63
ECB603586	46:37:53 N	92:53:31 W	970	92
ECB603587	46:38:56 N	92:53:27 W	300	34
ECB603592	46:20:56 N	92:49:22 W	230	26
ECB603595	46:20:38 N	92:44:20 W	860	81
ECB603596	46:18:53 N	92:43:53 W	1300	120
ECB603597	46:19:04 N	92:42:46 W	3100	280
ECB603598	46:18:57 N	92:41:52 W	2400	210
ECB603599	46:18:17 N	92:40:33 W	380	39
ECB603600	46:17:59 N	92:43:01 W	830	79
ECB603601	46:18:07 N	92:44:20 W	720	68
ECB603614	46:18:10 N	92:46:55 W	26000	2300
ECB603615	46:17:13 N	92:47:09 W	490	49
ECB603616	46:30:17 N	92:45:10 W	2700	240
ECB603618	46:30:14 N	92:46:04 W	2200	200
ECB603619	46:30:25 N	92:46:51 W	1000	95
ECB603620	46:31:11 N	92:46:58 W	1300	160
ECB603621	46:30:17 N	92:47:24 W	1300	120
ECB603622	46:30:14 N	92:48:18 W	1300	110
ECB603623	46:31:26 N	92:50:06 W	550	51
ECB603624	46:31:33 N	92:49:12 W	520	49
ECB603625	46:32:27 N	92:48:03 W	670	62
ECB603626	46:32:05 N	92:50:42 W	440	42
ECB603634	46:24:50 N	92:35:33 W	220	23
ECB603636	46:23:38 N	92:35:31 W	1000	95
ECB603639	46:31:53 N	92:49:40 W	330	33
ECB603640	46:30:43 N	92:49:55 W	190	21
ECB603641	46:30:17 N	92:49:33 W	770	70
ECB603642	46:31:01 N	92:50:56 W	440	42
ECB603643	46:30:21 N	92:51:35 W	510	48
ECB603644	46:31:01 N	92:51:59 W	690	63
ECB603645	46:32:39 N	92:50:49 W	200	21
ECB603646	46:33:46 N	92:51:57 W	350	34
ECB603649	46:32:23 N	92:53:27 W	560	52
ECB603665	46:21:32 N	92:40:22 W	2000	180
ECB603666	46:20:41 N	92:37:53 W	430	42
ECB603667	46:20:38 N	92:36:03 W	240	26
ECB603668	46:21:34 N	92:35:31 W	320	32
ECB603669	46:22:22 N	92:36:10 W	2600	230
ECB603671	46:22:55 N	92:34:44 W	2400	210
ECB603673	46:21:03 N	92:34:22 W	450	43
ECB603674	46:19:47 N	92:34:03 W	160	18
ECB603676	46:31:15 N	92:53:13 W	550	52

Table 8 -- Observed radon activity in water from wells finished in bedrock, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
ECB603677	46:32:05 N	92:53:16 W	1300	120
ECB603680	46:35:34 N	92:53:02 W	280	29
ECB603681	46:35:23 N	92:51:32 W	610	57
ECB603682	46:36:17 N	92:51:14 W	420	41
ECB603683	46:36:39 N	92:52:12 W	690	66
ECB603684	46:36:21 N	92:53:27 W	280	28
ECB603685	46:36:24 N	92:55:22 W	160	20
ECB603686	46:36:17 N	92:54:32 W	4600	400
ECB603689	46:40:53 N	92:37:53 W	270	27
ECB603704	46:32:36 N	92:46:51 W	1600	150
ECB603710	46:30:21 N	92:53:24 W	160	22
ECB603723	46:23:16 N	92:53:00 W	1500	130
ECB603729	46:17:52 N	92:38:03 W	240	24
ECB603730	46:16:19 N	92:39:57 W	670	62
ECB603731	46:14:53 N	92:43:03 W	2300	200
ECB603732	46:14:38 N	92:45:10 W	420	40
ECB603735	46:06:25 N	93:04:15 W	640	61
ECB603736	46:07:44 N	93:03:54 W	420	44
ECB603737	46:07:24 N	93:05:43 W	1400	130
ECB603738	46:07:55 N	93:07:01 W	640	63
ECB603744	46:15:21 N	92:46:55 W	450	43
ECB603745	46:09:14 N	93:08:13 W	3100	280
ECB603746	46:09:21 N	93:06:03 W	1100	100
ECB603747	46:14:33 N	92:48:54 W	450	44
ECB603748	46:14:34 N	92:46:08 W	570	54
ECB603749	46:13:47 N	92:41:52 W	820	75
ECB603750	46:13:40 N	92:44:27 W	7100	630
ECB603751	46:13:44 N	92:45:43 W	3100	280
ECB603752	46:13:47 N	92:47:24 W	1500	140
ECB603753	46:11:52 N	92:45:07 W	1700	160
ECB603754	46:12:03 N	92:46:37 W	260	27
ECB603755	46:13:01 N	92:45:43 W	2200	200
ECB603756	46:12:53 N	92:47:34 W	240	25
ECB603757	46:12:03 N	92:48:36 W	290	28
ECB603758	46:11:05 N	92:48:07 W	490	47
ECB603759	46:09:32 N	93:04:12 W	0	0
ECB603760	46:03:57 N	93:08:24 W	320	32
ECB603761	46:05:09 N	93:07:22 W	2100	190
ECB603763	46:05:09 N	93:04:37 W	1200	110
ECB603764	46:04:11 N	93:05:24 W	290	29
ECB603766	46:03:07 N	93:06:25 W	1100	97
ECB603767	46:03:14 N	93:10:19 W	800	73
ECB603769	46:04:19 N	93:01:58 W	270	27
ECB603772	46:01:33 N	93:15:50 W	1300	120
ECB603774	46:00:23 N	93:19:48 W	300	30
ECB603775	46:00:39 N	93:22:08 W	5300	470
ECB603776	46:02:59 N	93:22:01 W	470	46
ECB603777	46:02:41 N	93:19:19 W	450	43
ECB603778	46:03:10 N	93:17:02 W	160	17
ECB603782	46:04:44 N	93:29:31 W	370	37
ECB603785	46:07:47 N	93:00:43 W	1200	110
ECB603786	46:01:29 N	93:00:50 W	580	54
ECB603787	46:00:21 N	93:02:09 W	650	61
ECB603788	46:01:22 N	93:02:45 W	600	57
ECB603789	46:01:44 N	93:05:31 W	490	48
ECB603790	46:00:32 N	93:06:21 W	350	36

Table 8 -- Observed radon activity in water from wells finished in bedrock, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
EC8603791	46:00:10 N	93:09:32 W	1400	130
EC8603792	46:01:33 N	93:09:07 W	920	86
EC8603793	46:02:20 N	93:08:34 W	240	25
EC8603794	46:01:22 N	93:11:31 W	560	52
EC8603795	46:07:38 N	93:32:02 W	360	36
EC8603799	46:07:22 N	93:23:13 W	260	28
EC8603800	46:03:32 N	93:25:55 W	400	40
EC8603801	46:02:20 N	93:24:54 W	110	18
EC8603802	46:06:53 N	93:19:26 W	360	36
EC8603803	46:05:02 N	93:16:55 W	510	51
EC8603804	46:06:53 N	93:17:02 W	170	30
EC8603805	46:13:03 N	93:16:12 W	200	28
EC8603811	46:17:23 N	92:51:03 W	420	43
EC8603812	46:18:03 N	92:51:03 W	1300	120
EC8603816	46:12:07 N	92:51:23 W	1100	100
EC8603818	46:12:17 N	92:52:44 W	440	46
EC8603819	46:01:22 N	93:13:19 W	1400	130
EC8603820	46:02:38 N	93:11:56 W	770	74
EC8603822	46:02:31 N	93:13:51 W	4500	400
EC8603824	46:04:19 N	93:14:43 W	380	40
EC8603826	46:05:13 N	93:14:31 W	560	56
EC8603827	46:06:25 N	93:13:04 W	1300	170
EC8603831	46:12:39 N	92:54:23 W	160	23
EC8603832	46:14:59 N	92:54:00 W	1100	110
EC8603833	46:14:27 N	92:54:36 W	1900	170
EC8603834	46:13:01 N	92:55:26 W	610	60
EC8603835	46:13:22 N	92:56:45 W	1100	100
EC8603836	46:12:35 N	92:57:14 W	550	54
EC8603839	46:10:40 N	92:49:08 W	6400	560
EC8603840	46:09:57 N	92:48:03 W	2300	200
EC8603843	46:15:43 N	93:15:39 W	500	51
EC8603844	46:16:22 N	93:17:24 W	4	12
EC8603848	46:13:29 N	93:19:33 W	270	36
EC8603853	46:05:56 N	92:56:02 W	380	38
EC8603854	46:04:04 N	92:55:40 W	1500	130
EC8603855	46:13:51 N	93:14:42 W	5100	450
EC8603858	46:12:50 N	93:09:21 W	1200	110
EC8603859	46:13:26 N	93:06:57 W	1900	170
EC8603860	46:12:50 N	93:04:37 W	350	38
EC8603861	46:11:45 N	93:01:58 W	770	71
EC8603862	46:11:49 N	93:00:43 W	410	40
EC8603863	46:10:11 N	93:00:57 W	2300	200
EC8603864	46:08:56 N	93:00:54 W	310	30
EC8603866	46:09:03 N	92:56:20 W	1300	110
EC8603867	46:10:11 N	92:55:40 W	400	39
EC8603868	46:10:47 N	92:57:21 W	660	61
EC8603869	46:10:26 N	92:58:40 W	220	24
EC8603872	46:10:19 N	92:51:00 W	1400	130
EC8603873	46:09:32 N	92:51:23 W	2100	190
EC8603874	46:13:11 N	93:02:31 W	430	41
EC8603875	46:14:59 N	93:01:54 W	520	49
EC8603876	46:11:05 N	92:54:21 W	670	63
EC8603877	46:10:19 N	92:52:48 W	280	29
EC8603878	46:11:23 N	92:50:45 W	300	30
EC8603879	46:12:21 N	93:06:57 W	27	9
EC8603881	46:11:02 N	93:04:58 W	390	38

Table 8 -- Observed radon activity in water from wells finished in bedrock, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
ECB603882	46:11:13 N	93:09:07 W	3100	270
ECB603883	46:13:44 N	93:04:33 W	1100	99
ECB603884	46:12:21 N	93:03:14 W	500	48
ECB603886	46:44:35 N	93:15:23 W	300	31
ECB603888	46:44:41 N	93:19:33 W	100	14
ECB603890	46:42:10 N	93:25:01 W	340	37
ECB603892	46:44:27 N	93:25:19 W	450	43
ECB603895	46:31:08 N	93:16:51 W	160	20
ECB603897	46:39:03 N	93:20:16 W	140	20
ECB603902	46:37:13 N	93:29:05 W	620	59
ECB603903	46:08:31 N	92:53:02 W	2900	260
ECB603904	46:08:09 N	92:55:04 W	120	15
ECB603905	46:07:58 N	92:57:39 W	210	22
ECB603906	46:07:15 N	92:55:40 W	370	38
ECB603907	46:06:07 N	92:58:04 W	620	58
ECB603908	46:06:21 N	92:53:49 W	2600	240
ECB603909	46:40:13 N	93:30:14 W	510	48
ECB603910	46:39:07 N	93:32:49 W	360	36
ECB603917	46:32:13 N	93:24:32 W	550	55
ECB603919	46:32:27 N	93:28:26 W	360	37
ECB603920	46:29:13 N	93:28:15 W	230	26
ECB603921	46:31:09 N	93:31:44 W	1900	170
ECB603925	46:29:31 N	93:31:55 W	170	21
ECB603926	46:26:45 N	93:30:43 W	100	16
ECB603927	46:24:17 N	93:31:01 W	280	31
ECB603928	46:24:17 N	93:28:15 W	360	38
ECB603929	46:21:39 N	93:31:48 W	340	35
ECB603930	46:19:57 N	93:29:34 W	320	35
ECB603931	46:19:08 N	93:26:16 W	1100	99
ECB603938	46:17:58 N	93:15:46 W	170	23
ECB603939	46:19:55 N	93:13:04 W	330	35
ECB603940	46:19:58 N	93:17:27 W	190	23
ECB604035	45:59:09 N	93:05:09 W	2700	240
ECB604036	45:59:19 N	93:04:58 W	1600	140
ECB604037	45:57:43 N	93:07:04 W	980	89
ECB604038	45:58:51 N	93:08:32 W	1100	100
ECB604039	45:58:01 N	93:08:31 W	290	30
ECB604040	45:57:17 N	93:08:27 W	1800	170
ECB604041	45:56:53 N	93:06:27 W	360	36
ECB604042	45:56:13 N	93:07:37 W	640	60
ECB604043	45:56:49 N	93:07:12 W	2700	240
ECB604044	45:56:52 N	93:09:07 W	120	15
ECB604045	45:57:46 N	93:09:50 W	1200	110
ECB604048	45:54:35 N	93:10:30 W	2500	230
ECB604049	45:56:26 N	93:09:54 W	2300	200
ECB604050	45:56:02 N	93:10:19 W	240	26
ECB604051	45:56:52 N	93:10:51 W	2000	180
ECB604053	45:58:26 N	93:11:06 W	3900	350
ECB604054	45:59:16 N	93:12:07 W	1800	170
ECB604055	45:58:49 N	93:12:14 W	830	77
ECB604056	45:57:43 N	93:12:46 W	2200	200
ECB604059	45:52:59 N	93:19:37 W	2400	220
ECB604060	45:53:20 N	93:21:32 W	1200	110
ECB604062	45:55:15 N	93:15:50 W	600	56
ECB604063	45:55:04 N	93:18:21 W	1200	110
ECB604064	45:56:06 N	93:20:56 W	830	77

Table 8 -- Observed radon activity in water from wells finished in bedrock, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
ECB604066	45:56:02 N	93:18:13 W	2600	230
ECB604067	45:57:46 N	93:17:16 W	330	32
ECB604068	45:59:05 N	93:15:43 W	1400	130
ECB604070	45:58:51 N	93:18:50 W	520	50
ECB604072	45:58:04 N	93:13:26 W	460	44
ECB604073	45:59:23 N	93:13:19 W	510	49
ECB604075	45:56:43 N	93:11:27 W	280	28
ECB604076	45:56:45 N	93:11:27 W	2300	220
ECB604077	45:59:43 N	93:10:44 W	970	89
ECB604080	45:56:16 N	93:12:14 W	1100	100
ECB604081	45:55:29 N	93:10:55 W	330	34
ECB604082	45:55:01 N	93:10:25 W	410	40
ECB604083	45:54:17 N	93:12:10 W	1200	110
ECB604084	45:54:33 N	93:11:09 W	1700	150
ECB604085	45:55:04 N	93:11:42 W	600	57
ECB604086	45:55:08 N	93:12:14 W	1700	160
ECB604087	45:55:29 N	93:13:26 W	1700	150
ECB604088	45:55:04 N	93:13:08 W	1400	130
ECB604089	45:55:08 N	93:13:55 W	920	85
ECB604093	45:53:09 N	93:14:45 W	530	51
ECB604094	45:54:14 N	93:13:15 W	1100	97
ECB604095	45:58:51 N	93:20:52 W	530	50
ECB604097	45:56:56 N	93:25:51 W	270	28
ECB604098	45:56:31 N	93:23:06 W	190	20
ECB604099	45:55:40 N	93:24:36 W	84	12
ECB604103	45:53:27 N	93:27:50 W	1800	160
ECB604104	45:53:13 N	93:24:03 W	410	39
ECB604105	45:53:41 N	93:11:45 W	1100	100
ECB604106	45:53:27 N	93:12:57 W	2600	230
ECB604111	45:49:51 N	93:17:38 W	4800	430
ECB604112	45:51:21 N	93:18:30 W	3500	320
ECB604114	45:51:14 N	93:20:56 W	650	63
ECB604115	45:49:51 N	93:23:13 W	240	28
ECB604117	45:50:02 N	93:29:31 W	550	55

Table 9 -- Observed radon activity in water from wells finished in surficial deposits, east-central Minnesota test area, in counts per minute (cpm) and picoCuries per liter (pCi/l).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
ECS603131	46:40:15 N	92:33:57 W	270	27
ECS603132	46:40:19 N	92:35:09 W	510	48
ECS603144	46:39:03 N	92:38:34 W	310	31
ECS603145	46:39:57 N	92:38:02 W	490	46
ECS603149	46:26:02 N	92:24:21 W	370	36
ECS603152	46:26:49 N	92:27:18 W	240	26
ECS603153	46:25:44 N	92:27:21 W	340	35
ECS603154	46:28:51 N	92:26:34 W	170	21
ECS603157	46:28:40 N	92:35:24 W	210	24
ECS603158	46:27:39 N	92:36:28 W	170	21
ECS603159	46:27:10 N	92:38:06 W	51	12
ECS603160	46:26:02 N	92:39:21 W	360	37
ECS603161	46:25:04 N	92:39:32 W	1100	310
ECS603162	46:24:57 N	92:30:28 W	250	25
ECS603163	46:25:33 N	92:34:12 W	260	26
ECS603164	46:26:05 N	92:39:28 W	46	9
ECS603165	46:26:09 N	92:41:56 W	220	23
ECS603166	46:25:40 N	92:43:40 W	250	26
ECS603167	46:25:01 N	92:43:26 W	150	17
ECS603168	46:25:04 N	92:42:36 W	130	16
ECS603169	46:25:08 N	92:44:31 W	78	12
ECS603170	46:25:47 N	92:42:46 W	94	12
ECS603174	46:16:15 N	92:58:30 W	500	47
ECS603187	46:34:37 N	92:33:43 W	310	32
ECS603188	46:34:47 N	92:33:10 W	780	72
ECS603190	46:35:16 N	92:32:20 W	880	85
ECS603194	46:35:27 N	92:30:43 W	510	55
ECS603195	46:26:23 N	92:40:55 W	200	26
ECS603196	46:26:56 N	92:42:07 W	84	20
ECS603197	46:27:28 N	92:41:16 W	540	55
ECS603199	46:28:08 N	92:40:58 W	140	21
ECS603200	46:29:45 N	92:32:42 W	260	26
ECS603202	46:29:45 N	92:35:34 W	190	20
ECS603204	46:29:45 N	92:37:30 W	260	26
ECS603205	46:29:20 N	92:38:02 W	290	28
ECS603206	46:28:29 N	92:40:33 W	220	23
ECS603207	46:35:34 N	92:29:52 W	190	27
ECS603208	46:35:27 N	92:29:06 W	160	29
ECS603209	46:35:59 N	92:28:12 W	230	24
ECS603210	46:36:43 N	92:27:18 W	460	43
ECS603215	46:35:23 N	92:28:22 W	200	21
ECS603216	46:36:50 N	92:26:56 W	440	42
ECS603218	46:36:03 N	92:27:10 W	610	56
ECS603231	46:28:29 N	92:39:50 W	330	33
ECS603232	46:28:33 N	92:40:58 W	390	38
ECS603243	46:36:14 N	92:26:24 W	230	25
ECS603244	46:35:49 N	92:25:37 W	210	23
ECS603250	46:31:51 N	92:24:50 W	220	27
ECS603251	46:33:21 N	92:25:22 W	120	21
ECS603252	46:35:23 N	92:26:34 W	240	28
ECS603254	46:33:57 N	92:27:50 W	63	22

Table 9 -- Observed radon activity in water from wells finished in surficial deposits, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
ECS603256	46:24:03 N	92:50:49 W	1100	100
ECS603279	46:32:59 N	92:27:54 W	180	20
ECS603280	46:31:55 N	92:27:50 W	320	32
ECS603284	46:31:01 N	92:29:27 W	160	23
ECS603285	46:31:58 N	92:29:45 W	140	18
ECS603286	46:32:41 N	92:29:49 W	230	25
ECS603287	46:33:50 N	92:29:13 W	190	21
ECS603288	46:34:37 N	92:29:24 W	7	5
ECS603289	46:34:08 N	92:32:13 W	260	26
ECS603290	46:33:46 N	92:31:33 W	270	28
ECS603303	46:33:21 N	92:32:16 W	390	39
ECS603304	46:32:52 N	92:31:15 W	400	40
ECS603305	46:31:04 N	92:33:10 W	200	23
ECS603307	46:31:51 N	92:32:52 W	260	27
ECS603308	46:32:05 N	92:32:06 W	170	19
ECS603309	46:32:49 N	92:32:16 W	110	15
ECS603311	46:31:15 N	92:31:58 W	220	24
ECS603312	46:31:08 N	92:30:46 W	220	23
ECS603313	46:30:35 N	92:30:14 W	150	20
ECS603314	46:31:47 N	92:30:21 W	110	15
ECS603319	46:21:32 N	92:50:16 W	120	18
ECS603320	46:21:10 N	92:51:03 W	250	27
ECS603341	46:29:59 N	92:52:40 W	97	14
ECS603351	46:31:44 N	92:31:04 W	170	20
ECS603352	46:32:56 N	92:33:03 W	480	46
ECS603353	46:33:46 N	92:33:10 W	180	20
ECS603354	46:33:50 N	92:34:44 W	360	36
ECS603355	46:32:49 N	92:35:24 W	380	38
ECS603356	46:30:14 N	92:35:24 W	150	17
ECS603359	46:31:58 N	92:34:55 W	240	24
ECS603360	46:32:16 N	92:35:34 W	200	21
ECS603361	46:32:09 N	92:36:57 W	250	26
ECS603362	46:31:40 N	92:36:43 W	210	24
ECS603375	46:30:50 N	92:36:50 W	150	18
ECS603380	46:30:17 N	92:37:22 W	290	30
ECS603381	46:30:25 N	92:38:06 W	230	24
ECS603382	46:30:17 N	92:39:18 W	110	15
ECS603405	46:29:23 N	93:13:33 W	250	27
ECS603414	46:32:49 N	92:37:58 W	1100	100
ECS603438	46:35:41 N	92:40:51 W	3000	270
ECS603439	46:37:15 N	92:41:09 W	520	53
ECS603440	46:38:05 N	92:41:24 W	350	38
ECS603442	46:37:11 N	92:40:19 W	340	38
ECS603449	46:16:51 N	92:56:49 W	3000	270
ECS603454	46:23:16 N	92:47:09 W	350	36
ECS603456	46:26:02 N	92:44:06 W	270	28
ECS603457	46:27:10 N	92:43:01 W	240	27
ECS603471	46:33:46 N	93:12:03 W	490	49
ECS603472	46:34:37 N	93:12:00 W	130	17
ECS603473	46:34:37 N	93:10:33 W	330	35
ECS603474	46:34:58 N	93:09:36 W	380	38
ECS603475	46:36:07 N	93:09:21 W	200	25
ECS603477	46:37:29 N	93:09:28 W	420	42
ECS603478	46:32:09 N	93:14:24 W	420	40
ECS603480	46:32:02 N	93:10:19 W	400	38
ECS603481	46:31:15 N	93:09:43 W	860	78

Table 9 -- Observed radon activity in water from wells finished in surficial deposits, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
ECS603483	46:25:26 N	92:45:07 W	170	29
ECS603484	46:25:22 N	92:46:33 W	210	25
ECS603487	46:24:35 N	92:46:40 W	490	46
ECS603488	46:23:41 N	92:46:58 W	570	53
ECS603489	46:23:20 N	92:47:45 W	280	28
ECS603491	46:23:34 N	92:49:04 W	150	17
ECS603493	46:22:51 N	92:49:58 W	270	28
ECS603494	46:24:32 N	92:50:42 W	1500	130
ECS603506	46:35:31 N	92:46:01 W	2100	190
ECS603511	46:39:46 N	92:35:45 W	370	37
ECS603512	46:40:08 N	92:37:04 W	380	37
ECS603513	46:40:15 N	92:38:27 W	850	79
ECS603514	46:40:19 N	92:40:12 W	290	30
ECS603515	46:40:44 N	92:39:25 W	410	40
ECS603516	46:40:15 N	92:41:31 W	200	21
ECS603519	46:30:35 N	93:09:28 W	280	29
ECS603522	46:31:58 N	93:09:50 W	200	23
ECS603523	46:32:56 N	93:11:02 W	370	36
ECS603524	46:33:21 N	93:10:08 W	170	21
ECS603525	46:38:31 N	93:05:06 W	350	42
ECS603526	46:38:20 N	93:04:40 W	490	47
ECS603527	46:37:37 N	93:04:19 W	240	25
ECS603529	46:37:01 N	93:07:30 W	340	34
ECS603530	46:38:16 N	93:08:56 W	400	39
ECS603531	46:24:17 N	92:51:25 W	1100	98
ECS603532	46:22:55 N	92:48:46 W	230	24
ECS603534	46:22:40 N	92:47:20 W	320	32
ECS603535	46:23:45 N	92:46:15 W	1100	96
ECS603536	46:23:45 N	92:45:00 W	410	41
ECS603537	46:24:14 N	92:44:20 W	180	21
ECS603538	46:24:14 N	92:45:43 W	570	54
ECS603539	46:24:43 N	92:44:45 W	290	30
ECS603540	46:24:28 N	92:42:36 W	120	15
ECS603541	46:24:17 N	92:40:51 W	340	34
ECS603542	46:23:23 N	92:43:30 W	100	13
ECS603543	46:22:58 N	92:43:58 W	140	17
ECS603544	46:22:01 N	92:44:13 W	190	21
ECS603545	46:22:01 N	92:43:19 W	100	14
ECS603546	46:22:37 N	92:43:26 W	150	18
ECS603547	46:23:09 N	92:42:28 W	170	20
ECS603548	46:23:23 N	92:41:20 W	160	18
ECS603550	46:22:29 N	92:42:03 W	110	15
ECS603553	46:19:29 N	92:50:38 W	610	59
ECS603558	46:40:29 N	92:50:52 W	560	54
ECS603567	46:37:47 N	93:10:08 W	320	35
ECS603568	46:37:15 N	93:11:45 W	390	39
ECS603570	46:37:33 N	93:12:25 W	240	26
ECS603571	46:39:25 N	93:07:30 W	490	47
ECS603572	46:34:51 N	93:00:00 W	440	45
ECS603573	46:36:14 N	93:01:19 W	150	21
ECS603574	46:37:15 N	93:02:34 W	340	39
ECS603575	46:37:58 N	93:02:52 W	140	24
ECS603576	46:39:10 N	93:02:45 W	270	31
ECS603577	46:39:35 N	93:03:07 W	230	29
ECS603578	46:39:57 N	93:02:09 W	940	89
ECS603582	46:39:07 N	92:52:22 W	600	60

Table 9 -- Observed radon activity in water from wells finished in surficial deposits, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
ECS603584	46:38:23 N	92:52:19 W	270	32
ECS603585	46:37:15 N	92:53:09 W	620	62
ECS603588	46:39:50 N	92:53:38 W	6900	610
ECS603589	46:39:39 N	92:54:54 W	620	61
ECS603590	46:38:59 N	92:54:54 W	290	33
ECS603591	46:19:47 N	92:50:13 W	160	21
ECS603593	46:21:17 N	92:49:01 W	320	34
ECS603594	46:22:08 N	92:49:01 W	360	38
ECS603602	46:19:19 N	92:45:32 W	440	44
ECS603603	46:40:22 N	93:00:43 W	450	46
ECS603604	46:41:31 N	93:01:58 W	300	33
ECS603605	46:40:44 N	93:01:44 W	63	21
ECS603606	46:42:28 N	93:03:07 W	200	28
ECS603607	46:33:35 N	92:57:36 W	450	44
ECS603608	46:33:25 N	92:57:07 W	310	34
ECS603609	46:33:03 N	92:55:08 W	1000	93
ECS603610	46:31:58 N	92:54:28 W	530	53
ECS603611	46:18:28 N	92:49:15 W	430	44
ECS603612	46:18:17 N	92:48:14 W	750	72
ECS603613	46:18:07 N	92:48:39 W	590	58
ECS603627	46:22:40 N	92:46:30 W	220	24
ECS603628	46:22:04 N	92:46:40 W	780	72
ECS603629	46:20:41 N	92:46:08 W	370	37
ECS603630	46:21:39 N	92:45:14 W	290	29
ECS603631	46:22:44 N	92:44:42 W	410	40
ECS603632	46:24:28 N	92:39:18 W	750	70
ECS603633	46:24:57 N	92:36:46 W	840	77
ECS603635	46:24:10 N	92:34:22 W	330	33
ECS603637	46:23:41 N	92:37:15 W	48	9
ECS603638	46:23:49 N	92:39:25 W	510	49
ECS603647	46:34:04 N	92:53:20 W	330	32
ECS603648	46:32:56 N	92:53:09 W	130	14
ECS603650	46:37:33 N	92:54:46 W	150	17
ECS603651	46:32:59 N	92:58:12 W	680	63
ECS603652	46:31:58 N	92:58:12 W	610	57
ECS603653	46:31:22 N	92:58:12 W	350	35
ECS603654	46:32:05 N	92:56:20 W	490	46
ECS603655	46:31:11 N	92:55:08 W	260	27
ECS603656	46:30:28 N	92:56:02 W	210	24
ECS603657	46:42:28 N	92:35:34 W	340	33
ECS603658	46:43:29 N	92:36:57 W	580	54
ECS603659	46:42:28 N	92:37:04 W	300	30
ECS603660	46:41:20 N	92:37:08 W	340	34
ECS603661	46:41:27 N	92:36:10 W	430	41
ECS603662	46:41:41 N	92:34:30 W	82	14
ECS603664	46:22:22 N	92:39:25 W	170	20
ECS603670	46:23:05 N	92:38:34 W	270	28
ECS603672	46:21:57 N	92:34:22 W	72	10
ECS603675	46:37:29 N	92:54:50 W	89	15
ECS603678	46:33:53 N	92:55:33 W	700	65
ECS603679	46:34:37 N	92:53:02 W	360	36
ECS603688	46:42:21 N	92:42:57 W	150	20
ECS603690	46:44:05 N	92:42:25 W	150	18
ECS603691	46:41:41 N	92:53:16 W	120	14
ECS603692	46:42:46 N	92:54:14 W	340	33
ECS603693	46:43:29 N	92:52:51 W	160	18

Table 9 -- Observed radon activity in water from wells finished in surficial deposits, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
ECS603694	46:45:10 N	92:53:34 W		
ECS603695	46:41:31 N	92:51:32 W	580	54
ECS603696	46:42:32 N	92:50:20 W	68	10
ECS603697	46:41:31 N	92:54:50 W	290	29
ECS603698	46:40:44 N	92:56:02 W	340	33
ECS603699	46:35:49 N	92:54:28 W	190	23
ECS603700	46:35:31 N	92:55:04 W	180	21
ECS603701	46:35:49 N	92:55:58 W	410	40
ECS603702	46:35:05 N	92:54:28 W	180	21
ECS603703	46:32:41 N	92:54:25 W	2000	180
ECS603705	46:33:25 N	92:54:07 W	3200	290
ECS603706	46:31:33 N	92:55:44 W	260	29
ECS603707	46:31:11 N	92:54:03 W	510	52
ECS603708	46:30:46 N	92:54:32 W	230	27
ECS603709	46:30:10 N	92:54:43 W	310	35
ECS603711	46:40:44 N	92:57:57 W	370	36
ECS603712	46:41:38 N	92:59:34 W	340	33
ECS603714	46:43:04 N	92:59:34 W	500	47
ECS603715	46:44:31 N	93:00:00 W	230	23
ECS603716	46:40:40 N	93:07:30 W	140	17
ECS603717	46:42:07 N	93:07:30 W	340	33
ECS603718	46:42:28 N	93:05:49 W	200	21
ECS603719	46:44:09 N	93:03:03 W	550	52
ECS603720	46:44:16 N	93:05:42 W	340	34
ECS603721	46:44:20 N	93:07:33 W	140	15
ECS603722	46:44:38 N	93:09:54 W	160	18
ECS603724	46:23:38 N	92:31:08 W	200	21
ECS603725	46:24:57 N	92:30:03 W	320	32
ECS603726	46:24:57 N	92:27:03 W	87	11
ECS603727	46:24:39 N	92:28:40 W	340	33
ECS603728	46:19:26 N	92:36:14 W	250	26
ECS603733	46:17:31 N	92:48:18 W	2700	240
ECS603739	46:41:49 N	93:09:54 W	560	54
ECS603740	46:42:32 N	93:11:16 W	150	18
ECS603741	46:41:38 N	93:14:24 W	330	36
ECS603742	46:16:40 N	92:49:04 W	360	35
ECS603743	46:15:32 N	92:48:54 W	220	23
ECS603762	46:05:02 N	93:09:36 W	570	53
ECS603765	46:03:10 N	93:03:28 W	1600	150
ECS603768	46:03:14 N	93:01:04 W	830	76
ECS603770	46:05:05 N	93:00:28 W	680	63
ECS603771	46:39:39 N	93:16:19 W	130	15
ECS603773	46:00:10 N	93:16:55 W	420	40
ECS603779	46:00:35 N	93:24:36 W	530	51
ECS603780	46:01:22 N	93:29:38 W	380	38
ECS603783	46:06:07 N	93:01:26 W	2900	260
ECS603784	46:07:51 N	93:00:43 W	1600	140
ECS603796	46:07:19 N	93:30:46 W	470	45
ECS603797	46:06:32 N	93:28:19 W	570	54
ECS603798	46:07:29 N	93:25:48 W	340	34
ECS603805	46:10:55 N	93:16:40 W	420	47
ECS603807	46:18:21 N	92:51:57 W	560	55
ECS603808	46:17:56 N	92:53:09 W	430	43
ECS603809	46:16:51 N	92:52:08 W	350	37
ECS603810	46:15:57 N	92:52:04 W	230	27
ECS603813	46:16:29 N	92:51:25 W	550	54

Table 9 -- Observed radon activity in water from wells finished in surficial deposits, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
ECS603814	46:14:31 N	92:51:50 W	550	54
ECS603815	46:13:15 N	92:51:21 W	820	78
ECS603821	46:00:35 N	93:13:12 W	520	54
ECS603823	46:04:15 N	93:12:54 W	1900	170
ECS603825	46:05:05 N	93:14:16 W	440	46
ECS603829	46:08:38 N	93:12:00 W	540	55
ECS603830	46:14:38 N	93:12:07 W	410	44
ECS603837	46:13:33 N	92:57:54 W	100	26
ECS603838	46:13:22 N	92:59:13 W	360	40
ECS603841	46:02:38 N	92:59:27 W	500	49
ECS603842	46:04:04 N	92:59:34 W	380	39
ECS603845	46:16:26 N	93:21:39 W	240	30
ECS603846	46:13:47 N	93:23:13 W	230	30
ECS603847	46:12:50 N	93:21:54 W	390	43
ECS603849	46:12:43 N	93:24:28 W	19	18
ECS603850	46:10:26 N	93:24:25 W	310	33
ECS603851	46:08:34 N	93:24:32 W	580	57
ECS603852	46:05:52 N	93:25:55 W	370	39
ECS603856	46:13:04 N	93:13:12 W	240	27
ECS603857	46:12:17 N	93:10:37 W	240	27
ECS603865	46:08:59 N	92:58:12 W	930	85
ECS603871	46:12:14 N	92:58:51 W	1300	110
ECS603880	46:11:09 N	93:06:50 W	900	82
ECS603885	46:41:05 N	93:19:01 W	270	29
ECS603887	46:42:43 N	93:18:21 W	150	17
ECS603889	46:42:35 N	93:22:01 W	82	16
ECS603891	46:42:25 N	93:28:55 W	240	24
ECS603893	46:41:45 N	93:32:52 W	500	48
ECS603894	46:45:21 N	93:28:51 W	77	13
ECS603896	46:36:28 N	93:18:10 W	82	17
ECS603898	46:36:25 N	93:21:54 W	1400	130
ECS603899	46:38:13 N	93:24:21 W	100	15
ECS603900	46:36:32 N	93:25:40 W	570	55
ECS603911	46:36:32 N	93:33:07 W	300	30
ECS603912	46:33:35 N	93:16:58 W	210	22
ECS603913	46:28:37 N	93:16:26 W	280	32
ECS603914	46:28:29 N	93:20:24 W	430	43
ECS603915	46:28:33 N	93:24:03 W	460	47
ECS603916	46:32:20 N	93:19:26 W	290	32
ECS603918	46:34:01 N	93:30:00 W	970	91
ECS603922	46:34:22 N	93:24:50 W	140	18
ECS603923	46:27:17 N	93:16:22 W	370	39
ECS603924	46:25:29 N	93:15:46 W	82	15
ECS603932	46:16:22 N	93:29:31 W	240	27
ECS603933	46:16:11 N	93:25:51 W	230	27
ECS603935	46:13:58 N	93:29:06 W	650	63
ECS603936	46:10:55 N	93:28:19 W	31	170
ECS603937	46:16:29 N	93:12:32 W	250	29
ECS603941	46:22:01 N	93:20:06 W	510	51
ECS603942	46:19:58 N	93:24:25 W	210	25
ECS604047	45:54:35 N	93:09:00 W	440	43
ECS604052	45:57:39 N	93:11:06 W	2400	210
ECS604057	45:57:43 N	93:13:30 W	2000	180
ECS604058	45:56:38 N	93:13:30 W	430	39
ECS604061	45:53:09 N	93:15:50 W	590	55
ECS604065	45:56:38 N	93:21:00 W	540	51

Table 9 -- Observed radon activity in water from wells finished in surficial deposits, east-central Minnesota test area (cont.).

UNIQUE NO.	LAT.	LON.	RN(PCI/L)	CALCULATED ERROR(+OR-PCI/L)
ECS604071	45:57:10 N	93:13:30 W	520	50
ECS604074	45:57:25 N	93:12:10 W	39	11
ECS604078	45:56:52 N	93:14:45 W	360	36
ECS604079	45:56:02 N	93:13:26 W	510	49
ECS604090	45:56:02 N	93:14:38 W	860	79
ECS604091	45:54:43 N	93:14:45 W	1400	130
ECS604092	45:53:49 N	93:14:49 W	1500	140
ECS604096	45:58:58 N	93:25:48 W	290	30
ECS604100	45:55:11 N	93:27:28 W	63	10
ECS604101	45:55:15 N	93:30:00 W	280	28
ECS604107	45:52:47 N	93:14:02 W	320	34
ECS604108	45:51:46 N	93:14:06 W	380	42
ECS604109	45:52:01 N	93:15:57 W	280	31
ECS604110	45:49:51 N	93:15:50 W	660	65
ECS604113	45:50:13 N	93:19:37 W	530	53
ECS604116	45:49:55 N	93:26:56 W	190	25
ECS604118	45:51:28 N	93:28:22 W	310	34
ECS604119	45:51:39 N	93:25:37 W	530	53
ECS604120	45:51:32 N	93:23:02 W	270	31

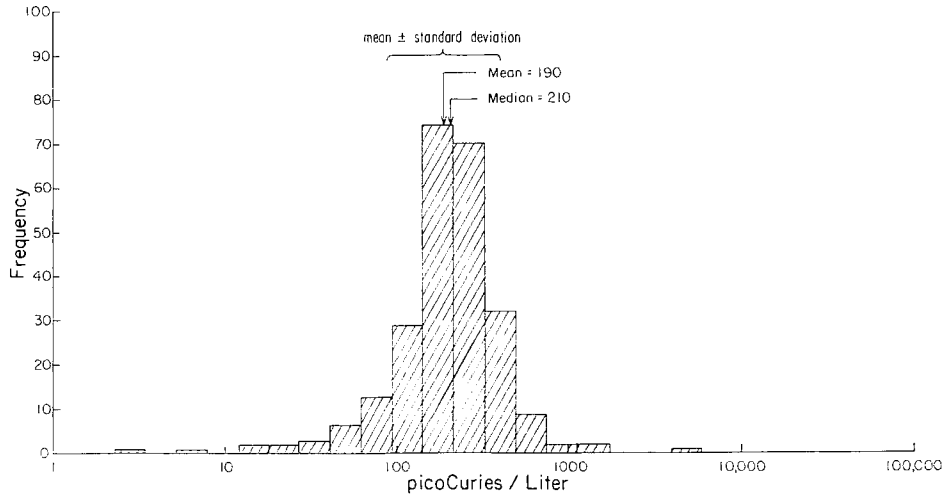

Figure 11 -- Histogram of radon activities measured in the Alexandria test area; 249 samples analyzed; no radon detectable in 1 sample; N = 248; minimum value = 0 pCi/l; maximum value = 4,500 pCi/l. In this and following histograms (Figs. 12-18) the radon activity scale is logarithmic.

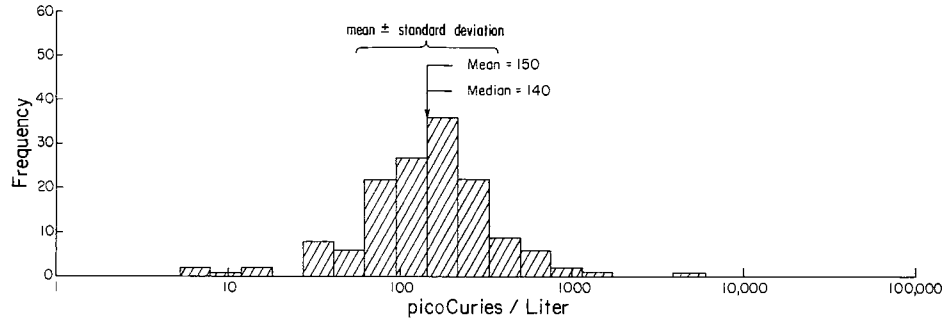

Figure 12 -- Histogram of radon activities measured in the Benson test area; 154 samples analyzed; no radon detectable in 9 samples; N = 145; minimum value - 0 pCi/l; maximum value = 5,700 pCi/l.

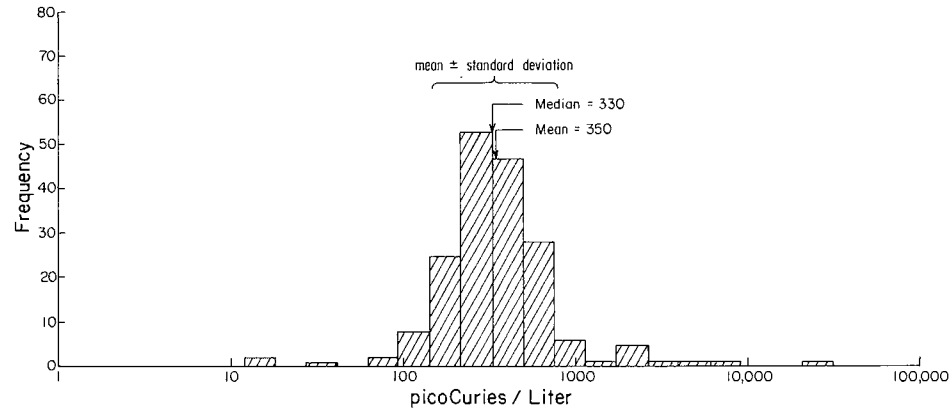

Figure 13 -- Histogram of radon activities measured in the Little Falls test area; 182 samples analyzed; N = 182; minimum value = 14 pCi/l; maximum value = 25,000 pCi/l.

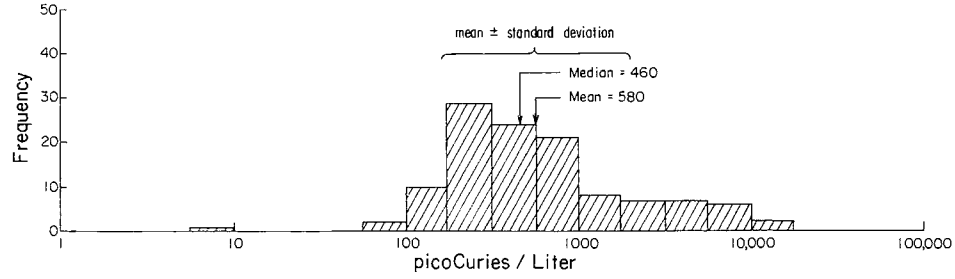

Figure 14 -- Histogram of radon activities measured in the Sanborn-Jeffers test area; 117 samples analyzed; N = 117; minimum value = 6 pCi/l; maximum value 16,000 pCi/l.

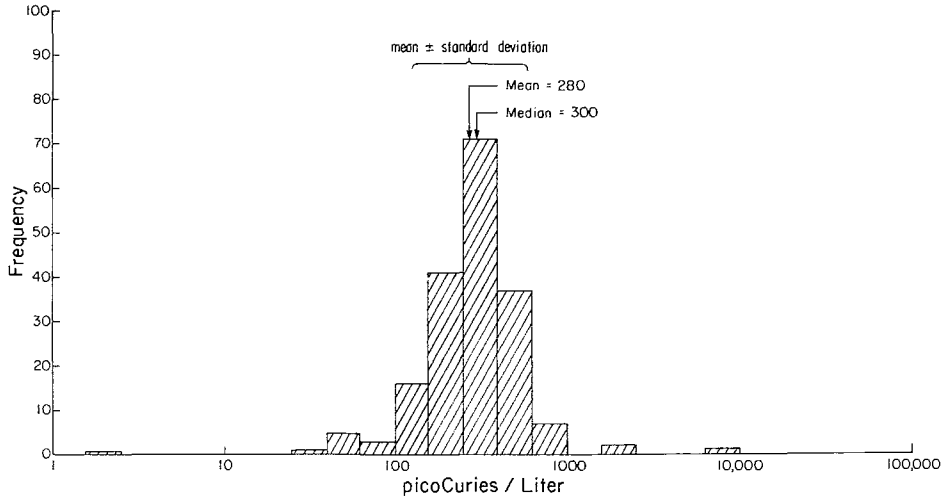

Figure 15 -- Histogram of radon activities measured in the Sleepy Eye test area; 185 samples analyzed; N = 185; minimum value = 2 pCi/l; maximum value = 7,900 pCi/l.

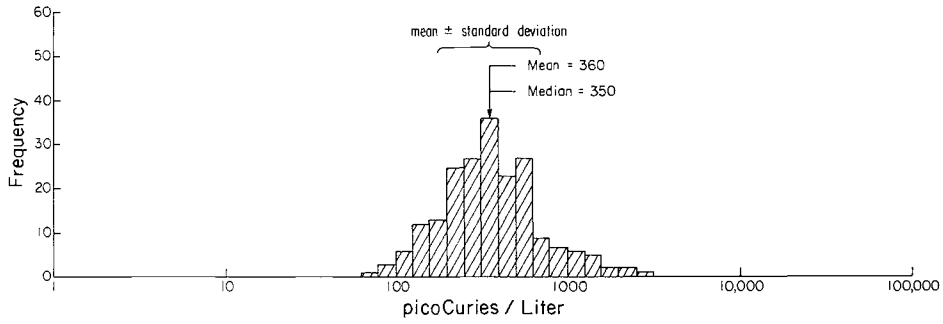

Figure 16 -- Histogram of radon activities measured in the Clarkfield test area; 206 samples analyzed; no radon detectable in 1 sample; N = 205; minimum value = 0 pCi/l; maximum value = 2,700 pCi/l.

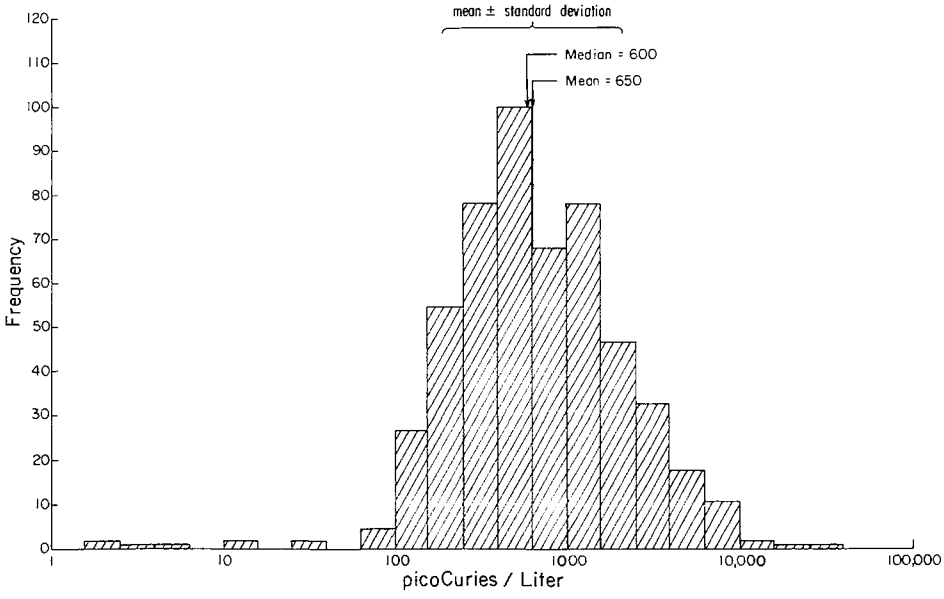

Figure 17 -- Histogram of radon activities measured in water from wells in bedrock in the east-central Minnesota test area; 533 samples analyzed; no radon detectable in 1 sample; N = 532; minimum value = 0 pCi/l; maximum = 26,000 pCi/l.

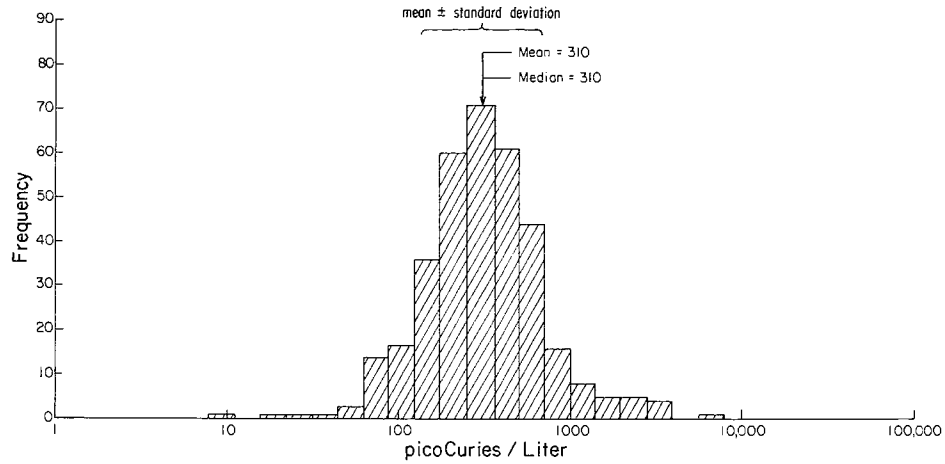

Figure 18 -- Histogram of radon activities measured in water from wells in surficial deposits (chiefly glacial outwash) in the east-central Minnesota test area; 349 samples analyzed; N = 349; minimum value = 7 pCi/l; maximum value = 6,900 pCi/l.

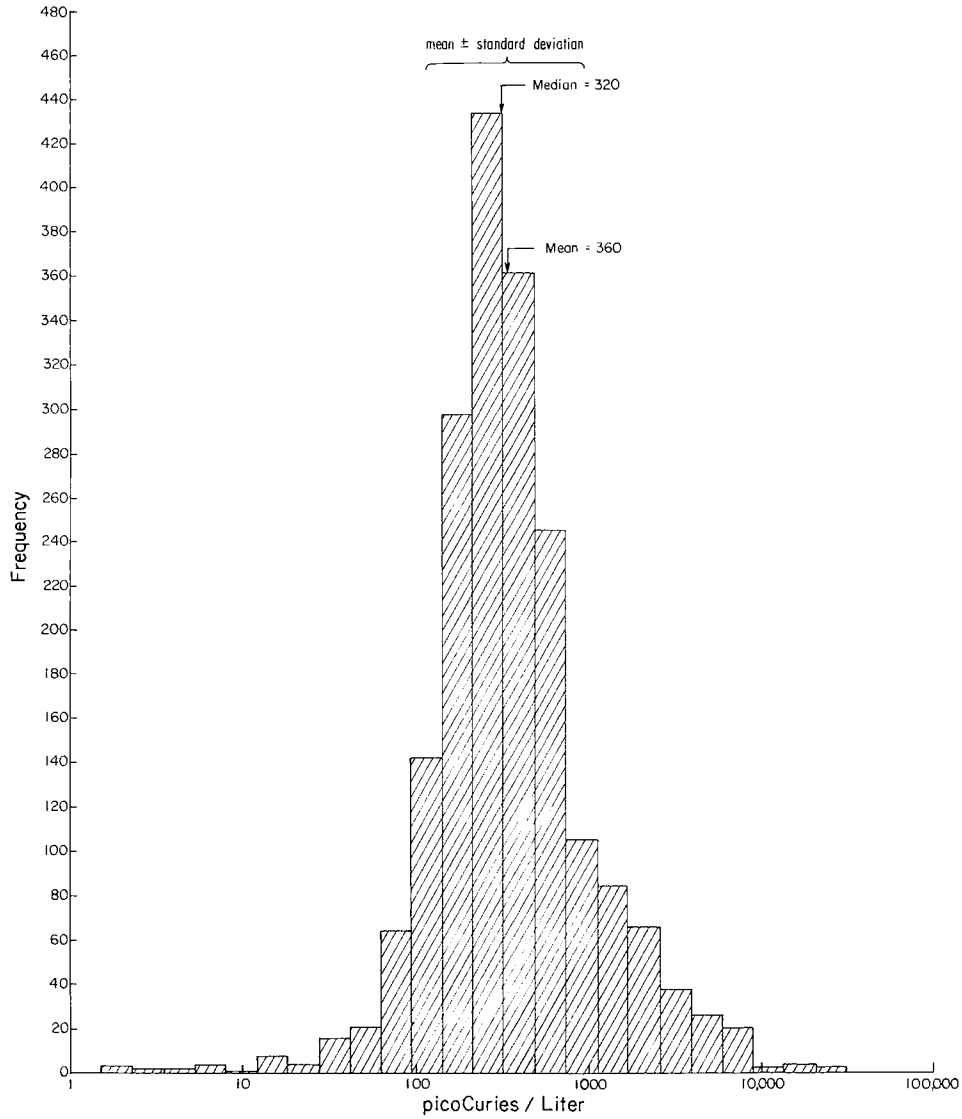

Figure 19 -- Histogram of radon activities in all of the test areas combined; 1,975 samples analyzed; no radon detectable in 11 samples; N = 1,964; minimum value = 0 pCi/l; maximum value = 26,000 pCi/l.

Table 10 is an attempt to show the statistical differences and similarities in observed radon activity among the seven areas studied. Because the radon data, like most geochemical data, are approximately log normal in their distribution (see figs. 11-19), they were first transformed into $\log_{10}$ numbers before statistical treatment. $\log_{10}$ values for the mean ($\overline{X}$) and the standard deviation (S) were computed for the number of samples (N) in each test area, and are shown in the boxes along the diagonal of Table 10. In order to compare the distribution of radon activity in one area with that in another, the test statistic t was computed from the log-normalized data. If the sample sets from two areas are statistically similar, the computed value for $|t|$, a measure of the deviation between the means, will be a small number and will become smaller as the number of samples in each group is increased. For the present study, two sample sets are considered to be statistically indistinguishable if $|t| \leq 1.96$, the t-statistic for the 0.025 percent point and an infinite number of degrees of freedom. Thus, in terms of radon distribution, the Little Falls area statistically resembles the Clarkfield area, the surficial materials of east-central Minnesota statistically resemble the Little Falls and Sleepy Eye areas, and the bedrock of east-central Minnesota statistically resembles the Sanborn-Jeffers area. Other paired sample areas differ significantly from one another.

The range of radon activities observed in Minnesota ground water is due in part to the natural variation in the uranium content of the material through which the water passes, and in part to the chemical behavior of radium in the hydrogeochemical system. Uranium is more abundant in granite than in more mafic igneous rocks or most metamorphic rocks; it also is more abundant in shale than in most other sedimentary rocks. Therefore, unless natural processes have altered the normal geochemical distribution, water moving through granite or shale should have higher radon activity than water moving through basalt, greenstone, or limestone. On the whole, glacial drift is uranium-poor and water within it tends to be radon-poor. Some of the drift in southwestern Minnesota, however, contains enough pulverized shale that circulating waters may contain radon levels as high or higher than water in bedrock. As noted above, detectable levels of radon indicate the presence of radium, and radium is likely to be concentrated in iron-rich and sulfate-rich materials, including certain glacial deposits. This may account for an unknown but significant amount of the regional variation in observed radon activity.

CONCLUSIONS

The following conclusions may be drawn from the study of radon dissolved in ground water in Minnesota:

(1) The observed radon values closely approach log normal distributions, and the range of radon activity is in accord with that reported from other areas of the United States by Feldman (1977). The Minnesota data therefore appear to be reasonable estimates of natural radon distribution for areas of the upper midwest that are mantled by glacial deposits of Wisconsinan age. We would expect the ground-water radon values from any area of Minnesota that is drift covered and comparable in size to be similar in mean value and range to one or more of the test areas.

(2) The variation in radon activity observed in Minnesota is a natural consequence of the uneven low-level distribution of uranium in bedrock and glacial drift, and of the uneven distribution of radium in hydrogeochemical systems.

(3) Although local areas with anomalously high dissolved radon levels may contain anomalously high concentrations of uranium in the bedrock, this is not necessarily the case. The uranium exploration industry uses radon measurement as one of several exploration techniques but cannot rely on radon alone as a foolproof indicator of uranium. Some high-radon areas in east-central Minnesota and the Sanborn-Jeffers area do have other geological and geochemical characteristics that may indicate some natural concentrations of uranium (Morey and Lively, 1980; Southwick and others, 1981). However, many if not most of the radon anomalies observed elsewhere are likely to be "false anomalies" related to natural, non-economic concentrations of radium rather than uranium in both glacial drift and bedrock.

(4) The maximum "safe" level of radon in domestic water supplies has not been established by environmental and health authorities, partly because data on the natural background are insufficient. Regional data of the sort reported here will aid health scientists in establishing acceptable standards, but the data in and of themselves do not set the standards and should not be interpreted as a statement on environmentally safe radon levels.

Table 10 -- Statistical comparison of the radon distribution in each test area with each of the other test areas. N = number of samples; $\overline{X}$ = mean radon value in $\log_{10}$; S = standard deviation of the radon values, in $\log_{10}$; $|t|$ = the numerical value of the test statistic defined below the table.

	Alexandria	Benson	Little Falls	Sanborn-Jeffers	Sleepy Eye	Clarkfield	E. Central Minnesota-bedrock	E. Central Minnesota-surficial
Alexandria	N=248 $\overline{X}$=2.287 S=0.335 NS^2= 27.832							
Benson	|t| = 3.3	N=145 $\overline{X}$=2.160 S=0.407 NS^2= 24.019						
Little Falls	|t| = 7.7	|t| = 9.1	N=182 $\overline{X}$=2.548 S=0.362 NS^2= 23.850					
Sanborn-Jeffers	|t| = 10.3	|t| = 10.3	|t| = 4.1	N=117 $\overline{X}$= 2.765 S=0.543 NS^2= 34.497				
Sleepy Eye	|t| = 4.8	|t| = 6.9	|t| = 2.9	|t| = 6.4	N=185 $\overline{X}$=2.443 S=0.333 NS^2= 20.514			
Clarkfield	|t| = 9.0	|t| = 10.6	|t| = 0.2	|t| = 4.5	|t| = 3.6	N=205 $\overline{X}$=2.556 S=0.291 NS^2= 17.360		
E. Central Minnesota-bedrock	|t| = 14.6	|t| = 14.0	|t| = 6.4	|t| = 0.9	|t| = 9.1	|t| = 6.7	N=532 $\overline{X}$=2.813 S=0.517 NS^2=142.198	
E. Central Minnesota-surficial	|t| = 7.1	|t| = 9.0	|t| = 1.7	|t| = 6.2	|t| = 1.5	|t| = 2.2	|t| = 10.2	N=349 $\overline{X}$=2.491 S=0.354 NS^2= 43.735

$$|t| = \frac{X_1 - X_2}{S_d} \quad \text{where } S_d = \sqrt{\left(\frac{N_1 S_1^2 + N_2 S_2^2}{N_1 + N_2 - 2}\right)\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}$$

subscripts 1 and 2 refer to the areas being compared. The t-test was performed after radon values were transformed into $\log_{10}$ numbers and a mean was calculated from the $\log_{10}$ values.

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APPENDIX A

ANALYTICAL PROCEDURE

Ground-water samples were collected by Minnesota Geological Survey personnel who kept a record of the date and time of sampling and measured the water temperature, the pH, the conductivity, and the amount of dissolved oxygen at each sample site. Some field tests of alkalinity were also done. Samples were collected in 8-ounce (0.28 liter) glass jars and sealed with plastic-lined, metal screw caps. Unsoftened and unfiltered water was obtained from faucets after allowing it to run for a few minutes to clear the pipes of standing water. Where necessary to minimize radon loss from aeration of the water, a flexible hose was attached to the tap and placed at the bottom of the jar, which was slowly filled from the bottom and allowed to run over until no air bubbles were present. The jar was then capped, labeled, and sent to the laboratory at the Minnesota Geological Survey for analysis.

The procedure used for radon analysis is based upon the procedure followed by the Geological Survey of Canada (Dyck, 1969). Briefly it consists of removing the radon from the water with a degassing unit and transferring it into an evacuated, alpha-sensitive cell. The radon activity in the separated gas phase is measured using a radon counter (a scaler, timer and photomultiplier tube). The instruments used in the Minnesota study were the RDU-200 degassing unit and RD-200 detector unit manufactured by E.D.A. Instruments of Toronto, Canada.

The analytical routine employed in the Minnesota study was as follows. From each sample jar 130 ml of water was transferred to a glass bubbler using a siphon tube to minimize radon loss from the water during the transfer. The system, including the scintillation cell, was evacuated. With the system evacuated, air was bubbled into the glass tube from the bottom. The air removed the radon from the water and carried it into the scintillation cell. The degassing step was timed to last 4 minutes.

The scintillation cell is a sealed chamber with a clear window on one end. The inside of the cell is coated with a layer of zinc sulfide, which reacts to alpha particles by producing minute flashes of light that are "seen" by the photomultiplier tube and recorded as individual decay events or counts. Prior to each sample analysis a background count was taken for the cell being used, in order to monitor the buildup of radon daughter products on the cell walls resulting from continued use of the cells.

At the expiration of 10 minutes from the beginning of degassing, two consecutive 5-minute counts were taken of each sample. A record was kept of the date, sample number, cell number, cell background, the time of day when the degassing occurred, and the results of the two 5-minute counts.

Following the end of the second count period, the cell used was placed on the degassing unit and flushed with air a number of times to remove the radon. Cells which had a high background count rate were not used again until the residual activity had decayed.

Count rates, in counts per minute, were obtained by subtracting the cell background values from the sample counts and dividing the difference by the count time. Errors were calculated for the count rates on the basis of the statistics of radioactive decay. A correction for the elapsed time between sample collection and analysis was required by the 3.8-day half-life of radon. As the time between collection and analysis ranged from 2 days to about 15 days, this correction was sometimes substantial. The radon activity decreases relative to the elapsed interval according to the equation $A = A_o e^{-\lambda t}$. A is the measured activity. A_o is the initial activity and $e^{-\lambda t}$ is the rate of decay where λ is the radon decay constant, and t is the elapsed time between collection and analysis. Rearranging, the radon activity at the time of sampling is given by the expression $A_o = Ae^{\lambda t}$.

In order to convert the measured activities in counts per minute into the standard expression of radon activity (picoCuries per liter), it is necessary to determine the efficiency of both the degassing system and the radon counter. A ^{226}Ra solution of known activity (solution #4950-D) was therefore purchased from the National Bureau of Standards. The radium solution was diluted to 1 liter and three splits of 130 ml each were removed and sealed in glass bubblers. These three samples were completely degassed of any radon and resealed, and new radon was allowed to grow into equilibrium with the radium. Knowing the quantity of radium in the solution and the rate at which radon is produced, it is possible to calculate how much radon is present in the glass bubblers at any time. By allowing the radon to grow into equilibrium with the radium and treating the standard as an ordinary water sample throughout the degassing and counting procedure, a comparison can then be made between the amount of radon actually counted and the amount of radon which was calculated to be

present for the chosen period of radon ingrowth. The numerical value resulting from the comparison is a measure of the efficiency of both the degassing and counting systems. It is expressed in counts per minute per picoCurie per liter. By dividing the measured count rate for each sample by this value, a radon concentration expressed in picoCuries per liter (pCi/l) is obtained. The results of the standardization are presented in Table A-1.

Three scintillation cells were used for the calibration. It is recognized that individual cells may differ in their counting efficiency, but time constraints did not permit individual calibration of each cell. Of the 12 values for cell constants shown in the table, those marked by a star were considered to have lost radon during the longer 6-day and 14-day ingrowth periods, probably due to evaporation or migration of radon through the rubber stopper. It was therefore decided that the samples which had a 3-day radon ingrowth period reflected a more accurate estimate of the efficiency of the system. Two samples from the 6-day ingrowth period gave results consistent with the 3-day ingrowth period and were also included. The average calibration factor of 0.195 ± 0.017 is, therefore, an average of the eight results which were most consistent. Further analysis of the ^{226}Ra standard will be carried out periodically to monitor the stability of the counting and degassing systems. The error associated with the average calibration value is the standard deviation of the eight cell-constant values. The error associated with the values in Tables 2-9 is derived from the standard deviation of the eight cell-constant values and the statistical counting error associated with the original counts per minute value.

Table A-1--Calibration of cells using a 856-pCi/l N.B.S. radium-226 standard.

Cell No.	^{222}Rn ingrowth time, days	Counts per minute (cpm)	pCi/l	Cell-constant, cpm/pCi/l	Average cpm/pCi/l
1	3	65.7 ± 2.6	354.8	0.185	
2	3	61.7 ± 2.6	354.8	0.174	
3	3	69.2 ± 2.7	354.8	0.195	
1	3	68.5 ± 2.7	369.4	0.185	
2	3	83.5 ± 3.0	369.4	0.226	
3	3	78.0 ± 2.9	369.4	0.211	
2	6	102.2 ± 3.3	561.2	0.182	
3	6	111.2 ± 3.4	561.2	0.198	
					0.195 ± 0.017
*1	6	83.5	561.2	0.15	
*2	14	108.7	778.7	0.14	
*2	14	125.0	778.7	0.16	
*3	14	128.4	778.7	0.16	

* Values which apparently lost radon during the ingrowth period and consequently were not used in the calculation of the cpm/pCi/l value.

APPENDIX B

DEFINITIONS OF RADIOCHEMICAL TERMS USED IN THE TEXT

Nuclide: Another term for atom. It is less general than the term atom and implies a unique constitution of the nucleus, specified by the number of protons (Z) and the number of neutrons (N). Addition of Z and N gives A, the mass number, which is specific for each nuclide.

Isotope: Nuclides or atoms which contain the same number of protons (Z) but different numbers of neutrons (N) in the nucleus are called isotopes of the element having atomic number Z. Because the isotopes of an element all have the same Z they all have similar chemical properties. The mass number A is unique for each isotope, depending on the value of N. Radon, for instance, has three naturally occurring isotopes ^{219}Rn, ^{220}Rn and ^{222}Rn. All have 86 protons (Z) in the nucleus, but the mass numbers (A) of 219, 220, and 222 indicate that there are 133, 134, and 136 neutrons respectively in the nuclei of these different radon atoms.

Half-life: The half-life of a radioactive nuclide is the length of time required for the radioactivity of that nuclide to be reduced by one-half. Each successive half-life reduces the remaining radioactivity by one-half. Half-lives vary widely in the naturally occurring radioactive nuclides, ranging from less than a second to over a billion years.

(pCi/l) picoCuries per liter: A standard unit of measure for the amount of radioactivity present in one liter of liquid produced by the radioactive decay of an element in the liquid. It is based upon the Curie, which is equivalent to a quantity of a radioactive element which can produce 3.7×10^{10} disintegrations per second. A picoCurie is equal to 10^{-12} Curie and is therefore 0.037 disintegrations per second or 2.22 disintegrations per minute. The number of picoCuries of radon is determined by counting the number of disintegrations detected from a fixed volume of water and within a given length of time by an instrument capable of recognizing the alpha radiation produced from disintegration of radon atoms (see Appendix A). Thus the unit (pCi/l) is only a measure of the amount of radioactivity present and is not a measure of the radiation exposure or dosage.

Equilibrium: Secular equilibrium is attained in closed radiochemical systems in which the parent element has a much longer half-life than the daughter. Equilibrium refers to the activity of each element in the radioactive parent-daughter relationship. Activity is defined as λN, or the decay constant (unique for each isotope) times the number of atoms (N). When equilibrium is attained, the activities are equal and $\lambda_P N_P = \lambda_D N_D$. The value of λ decreases as the half-life of the elements increases. If the system begins with only the parent element present, for example ^{226}Ra, and no daughter ^{222}Rn, the activity of the radon (λN) will increase to equal that of the radium. As long as the system remains closed, the radon will remain in equilibrium with the radium ($\lambda_P N_P = \lambda_D N_D$) and the activity of the system will decay with the half-life of radium.