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Long-Term Hydrological Monitoring Program Data

USEPA SF
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Amchitka Island Historical Analytical Data
EPA Long-Term Hydrological Monitoring Program
Tritium in Groundwater and Surface Water

(All values in pCi/L ± 2 σ)

Sample Location	1977[1]	1978[1]	1979[1]	1980[1]	1981[1]	1982	1983	1984	1985
Cannikin									
Cannikin Lake - South	100[3]	64	86	43	43	51 ± 5	51 ± 6	49 ± 5	36 ± 7
Cannikin Lake - North	40[3]	68	60	31	42	54 ± 6	30 ± 5	40 ± 5	39 ± 8
Well HTH-3	< 6[3]	84	77	44	57	62 ± 6	51 ± 6	48 ± 5	43 ± 6
Ice Box Lake	68[3]	100	18	50	48	47 ± 5	44 ± 5	45 ± 5	33 ± 7
White Alice Creek	83[3]	95	68	60	NS	62 ± 6	48 ± 5	38 ± 5	24 ± 7
Well AEC-1	NS	NS	91	89	NS	NS	NS	NS	NS
Pit South of SGZ	31[3]	96	47	27	39	48 ± 6	34 ± 5	18 ± 4	20 ± 7
DK-45 Lake	NS	NS	NS	NS	NS	NS	61 ± 6	42 ± 5	31 ± 6
Decon Pond	NS	NS	NS	NS	NS	NS	NS	NS	NS
Decon Sump	NS	NS	NS	NS	NS	NS	NS	NS	NS
Milrow									
Heart Lake	45[3]	89	41	27	37	61 ± 6	31 ± 5	23 ± 5	21 ± 6
Clevenger Creek	72[3]	99	55	45	43	73 ± 6	51 ± 5	47 ± 5	30 ± 8
Duck Cove Creek[2]	86[3]	110	65	48	51	63 ± 6	46 ± 5	29 ± 4	31 ± 7
Well W-2	77	130	NA	44	39	50 ± 6	41 ± 5	33 ± 4	24 ± 8
Well W-3	79	100	91	54	39	40 ± 6	33 ± 5	32 ± 5	25 ± 7
Well W-4	NS	100	48	NS	39	NS	NS	NS	31 ± 7
Well W-5	35	120	68	51	36	59 ± 6	38 ± 5	22 ± 4	NS
Well W-6	91	110	55	63	NS	58 ± 6	42 ± 5	22 ± 5	41 ± 7
Well W-7	NS	96	55	47	40	46 ± 6	44 ± 5	17 ± 4	30 ± 7
Well W-8	96	210	54	53	36	73 ± 6	40 ± 5	30 ± 4	31 ± 7
Well W-9	NS	NS	NS	NS	NS	NS	NS	NS	NS
Well W-10	27	75	58	67	42	67 ± 5	47 ± 5	43 ± 4	34 ± 7
Well W-11	88	110	120	110	79	82 ± 6	98 ± 6	110 ± 5	93 ± 7
Well W-12	NS	NS	NS	NS	NS	NS	NS	NS	NS
Well W-13	NS	70	69	70	52	71 ± 6	58 ± 5	54 ± 4	53 ± 7
Well W-14	NS	NS	NS	NS	NS	NS	NS	38 ± 4	26 ± 7
Well W-15	53	88	55	43	35	49 ± 5	37 ± 5	20 ± 4	22 ± 6
Well W-16	NS	NS	NS	NS	NS	NS	49 ± 5	NS	NS
Well W-17	NS	NS	NS	NS	NS	NS	NS	27 ± 5	26 ± 7
Well W-18	NS	91	37	140	28	58 ± 5	60 ± 6	54 ± 5	49 ± 7
Well W-19	NS	NS	NS	NS	NS	NS	NS	NS	NS

Sources: EPA, 1978-1996; DOE/NV, 1993

Amchitka Island Historical Analytical Data
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Tritium in Groundwater and Surface Water

(All values in pCi/L ± 2 σ)

Sample Location	1986	1987	1988	1989	1991	1993[4]			
						H-3	Gross α	Gross β	Cs-137
Cannikin									
Cannikin Lake - South	47 ± 7	37 ± 8	44 ± 11	28 ± 7	24 ± 4	21 ± 3.6	< 2.48	< 1.57	< 11.6
Cannikin Lake - North	36 ± 7	38 ± 8	34 ± 10	24 ± 6	20 ± 4	19 ± 3.4	< 2.26	< 1.35	< 9.77
Well HTH-3	50 ± 7	29 ± 9	40 ± 10	26 ± 9	28 ± 4	23 ± 3.6	< 3.04	< 1.49	< 10.3
Ice Box Lake	39 ± 7	27 ± 8	46 ± 10	42 ± 7	22 ± 4	20 ± 3.6	< 1.50	1.92 ± 0.64	< 10.7
White Alice Creek	49 ± 8	36 ± 8	19 ± 9	25 ± 6	18 ± 4	19 ± 3.2	< 1.18	1.45 ± 0.58	< 15.6
Well AEC-1	NS	NS	NS	NS	NS	NS	NS	NS	NS
Pit South of SGZ	28 ± 6	39 ± 9	38 ± 10	0.6 ± 5.5	19 ± 4	16 ± 3.2	3.36 ± 1.02	1.56 ± 0.52	< 14.4
DK-45 Lake	49 ± 8	38 ± 8	36 ± 9	28 ± 6	23 ± 6	17 ± 3.4	< 1.16	2.55 ± 0.63	< 16.9
Decon Pond	NS	19 ± 9	NS	NS	NS	NS	NS	NS	NS
Decon Sump	NS	18 ± 9	NS	NS	NS	NS	NS	NS	NS
Milrow									
Heart Lake	31 ± 7	22 ± 8	31 ± 9	54 ± 7	15 ± 4	16 ± 3	< 1.16	2.66 ± 0.64	< 11.4
Clevenger Creek	44 ± 8	36 ± 9	46 ± 10	41 ± 6	22 ± 4	22 ± 3.2	< 2.51	3.10 ± 1.11	< 7.84
Duck Cove Creek[2]	40 ± 8	29 ± 8	36 ± 10	23 ± 6	19 ± 6	16 ± 2.8	< 1.41	2.29 ± 0.70	< 9.08
Well W-2	28 ± 8	26 ± 8	29 ± 9	23 ± 7	18 ± 4	19 ± 3.6	NA	NA	NA
Well W-3	28 ± 8	29 ± 8	23 ± 9	29 ± 7	16 ± 6	15 ± 3.4	NA	NA	NA
Well W-4	31 ± 8	46 ± 9	NS	NS	NS	NS	NA	NA	NA
Well W-5	NS	NS	NS	21 ± 6	15 ± 4	18 ± 3.2	NA	NA	NA
Well W-6	NS	41 ± 8	NS	25 ± 7	17 ± 4	18 ± 3.4	NA	NA	NA
Well W-7	35 ± 7	48 ± 8	40 ± 11	NS	19 ± 6	16 ± 3.4	NA	NA	NA
Well W-8	41 ± 7	43 ± 8	32 ± 10	31 ± 7	20 ± 4	24 ± 4.2	NA	NA	NA
Well W-9	NS	NS	NS	NS	NS	NS	NA	NA	NA
Well W-10	35 ± 7	33 ± 9	34 ± 12	27 ± 7	22 ± 4	18 ± 3	NA	NA	NA
Well W-11	87 ± 8	100 ± 9	69 ± 12	65 ± 7	44 ± 6	36 ± 4	NA	NA	NA
Well W-12	NS	NS	NS	NS	NS	NS	NA	NA	NA
Well W-13	42 ± 7	53 ± 8	51 ± 11	32 ± 7	29 ± 4	18 ± 4	NA	NA	NA
Well W-14	33 ± 7	18 ± 8	NS	22 ± 7	19 ± 4	13 ± 3.2	NA	NA	NA
Well W-15	28 ± 7	18 ± 8	36 ± 10	27 ± 6	18 ± 4	19 ± 3.6	NA	NA	NA
Well W-16	NS	NS	NS	NS	NS	NS	NA	NA	NA
Well W-17	30 ± 8	NS	28 ± 11	25 ± 6	NS	NS	NA	NA	NA
Well W-18	52 ± 7	NS	50 ± 12	48 ± 6	27 ± 4	24 ± 3.6	NA	NA	NA
Well W-19	NS	NS	NS	21 ± 6	NS	NS	NA	NA	NA

Sources: EPA, 1978-1996; DOE/NV, 1993

Amchitka Island Historical Analytical Data
EPA Long-Term Hydrological Monitoring Program
Tritium in Groundwater and Surface Water

(All values in pCi/L ± 2 σ)

Sample Location	1977[1]	1978[1]	1979[1]	1980[1]	1981[1]	1982	1983	1984	1985
Long Shot									
Pond 1	NS	NS	NS	NS	NS	48 ± 6[3]	51 ± 6	23 ± 4	22 ± 6
Pond 2	NS	NS	NS	NS	NS	58 ± 6[3]	57 ± 6	26 ± 4	27 ± 7
Pond 3	NS	NS	NS	NS	NS	69 ± 6[3]	51 ± 5	56 ± 5	34 ± 7
Mud Pit 1	2000[3]	1800	1200	830	530	690 ± 200	600 ± 140	490 ± 9	380 ± 8
Mud Pit 2	2500	2300	1200	1100	850	850 ± 210	590 ± 140	580 ± 8	540 ± 11
Mud Pit 3	3400[3]	2300	1700	2000	1400	1000 ± 210	740 ± 150	710 ± 9	500 ± 10
Reed Pond	220[3]	97	53	44	36	70 ± 6	76 ± 6	59 ± 5	28 ± 6
Stream East of Long Shot	NS	NS	NS	NS	NS	NS	NS	660 ± 11	130 ± 7[3]
Well WL-1	120[3]	400	39	40	52	64 ± 6	59 ± 6	53 ± 5	25 ± 7
Well WL-2	730	1000	390	380	290	420 ± 9	290 ± 8	710 ± 9	240 ± 8
Well GZ-1	5300[3]	7300	4100	4700	4200	3800 ± 240	3800 ± 180	3200 ± 140	2800 ± 220
Well GZ-2	1800	900	580	400	240	320 ± 9	270 ± 8	220 ± 6	170 ± 8
Well EPA-1	1200	280	300	460	44	97 ± 6	820 ± 150	ND	320 ± 9
Background									
Clevenger Lake	NS	NS	NS	NS	NS	NS	NS	NS	NS
Constantine Spring	100[3]	110	99	70	68	94 ± 7	91 ± 6	65 ± 5	62 ± 7
Jones Lake	77[3]	85	49	42	37	67 ± 7	39 ± 5	33 ± 5	24 ± 7
Army Well 1	NS	110	88	68	48	72 ± 6	71 ± 6	46 ± 5	42 ± 7
Army Well 2	NS	NS	30	30	25	32 ± 6	26 ± 6	26 ± 5	20 ± 7
Army Well 3	NS	NS	120	89	67	79 ± 6	74 ± 5	62 ± 5	56 ± 7
Army Well 4	NS	NS	NS	NS	NS	82 ± 6[3]	77 ± 6	59 ± 5	53 ± 7
Site D Hydro Hole	NS	NS	NS	NS	57	100 ± 6	88 ± 5	73 ± 5	78 ± 8
Site E Hydro Hole	NS	NS	NS	NS	150	200 ± 7	170 ± 6	140 ± 6	NS
RX-Site Pumphouse	NS	NS	NS	NS	NS	NS	NS	NS	NS
TX-Site Springs	NS	NS	NS	NS	NS	NS	NS	NS	NS
TX-Site Water Tank House	NS	NS	NS	NS	NS	NS	NS	NS	NS

Sources: EPA, 1978-1996; DOE/NV, 1993

Amchitka Island Historical Analytical Data
EPA Long-Term Hydrological Monitoring Program
Tritium in Groundwater and Surface Water

(All values in pCi/L ± 2 σ)

Sample Location	1986	1987	1988	1989	1991	1993[4]			
						H-3	Gross α	Gross β	Cs-137
Long Shot									
Pond 1	33 ± 8	25 ± 8	38 ± 10	21 ± 5	14 ± 6	13 ± 3	< 1.54	2.02 ± 0.62	< 10.3
Pond 2	37 ± 7	28 ± 8	38 ± 11	18 ± 6	21 ± 6	12 ± 3.2	< 1.10	2.54 ± 0.61	< 11.9
Pond 3	38 ± 9	41 ± 8	56 ± 11	38 ± 6	27 ± 6	21 ± 3.4	< 1.35	2.42 ± 0.63	< 9.52
Mud Pit 1	310 ± 7	250 ± 9	250 ± 12	ND	192 ± 6	102 ± 3.8	< 1.27	2.09 ± 0.60	< 11.3
Mud Pit 2	410 ± 9	310 ± 9	280 ± 12	ND	243 ± 6	140 ± 4.6	< 2.33	2.76 ± 0.73	< 9.09
Mud Pit 3	590 ± 9	470 ± 10	420 ± 13	40 ± 6	282 ± 6	152 ± 4	< 1.29	2.03 ± 0.61	< 7.89
Reed Pond	37 ± 7	28 ± 8	28 ± 10	45 ± 7	23 ± 4	10 ± 2.2	< 1.40	3.52 ± 0.83	< 8.86
Stream East of Long Shot	NS	230 ± 9	530 ± 14	ND	190 ± 6	184 ± 5.6	< 1.79	4.02 ± 0.91	< 14.4
Well WL-1	41 ± 7	NS	28 ± 10	NS	17 ± 4	12 ± 2.6	< 2.27	4.26 ± 0.91	< 11.0
Well WL-2	320 ± 9	76 ± 9	180 ± 11	49 ± 10	78 ± 4	67 ± 3.2	< 1.60	3.30 ± 0.80	< 9.73
Well GZ-1	2300 ± 230	2400 ± 230	2100 ± 379	2300 ± 310	1128 ± 198	1350 ± 260	< 1.44	4.23 ± 0.83	< 15.2
Well GZ-2	150 ± 8	22 ± 9	81 ± 10	130 ± 8	65 ± 4	51 ± 3	< 2.13	6.65 ± 1.24	< 8.63
Well EPA-1	270 ± 9	67 ± 10	54 ± 10	34 ± 7	17 ± 6	11 ± 3.4	< 1.23	2.58 ± 0.62	< 11.8
Background									
Clevenger Lake	NS	35 ± 8	47 ± 10	NS	25 ± 6	20 ± 3.2	NA	NA	NA
Constantine Spring	65 ± 8	56 ± 8	53 ± 10	19 ± 6[3]	42 ± 6	26 ± 2.6	NA	NA	NA
Jones Lake	30 ± 7	25 ± 8	34 ± 10	23 ± 6	18 ± 4	13 ± 2.4	NA	NA	NA
Army Well 1	45 ± 6	44 ± 7	48 ± 10	33 ± 7	28 ± 4	16 ± 3.2	NA	NA	NA
Army Well 2	25 ± 6	26 ± 7	34 ± 10	16 ± 8	16 ± 4	6.6 ± 3	< 1.94	8.61 ± 1.39	< 8.39
Army Well 3	NS	NS	NS	NS	NS	NS	NS	NS	NS
Army Well 4	63 ± 6	63 ± 7	43 ± 11	50 ± 7	35 ± 4	24 ± 3.6	< 1.57	3.05 ± 0.77	< 10.1
Site D Hydro Hole	75 ± 6	63 ± 8	72 ± 10	NS	NS	NS	NA	NA	NA
Site E Hydro Hole	NS	NS	NS	NS	NS	NS	NA	NA	NA
RX-Site Pumphouse	NS	NS	NS	NS	18 ± 4	14 ± 2.8	NA	NA	NA
TX-Site Springs	NS	NS	NS	NS	24 ± 4	19 ± 3.4	NA	NA	NA
TX-Site Water Tank House	NS	NS	NS	NS	23 ± 4	NS	NA	NA	NA

ND = Not detected, MDA not provided; NS = Not sampled; NA = Not analyzed

[1] 2-sigma error not provided

[2] Duck Cove Creek listed as background location by EPA, but it drains the Milrow area

[3] Sample also had radionuclides detected by gamma spectroscopy. See accompanying table

[4] Tritium data are from the EPA LTHMP samples. Gross α, gross β, and Cs-137 data are from the samples IT split with EPA

Sources: EPA, 1978-1996; DOE/NV, 1993

Amchitka Island Historical Analytical Data
EPA Long-Term Hydrologic Monitoring Program
Gamma Emitters in Groundwater and Surface Water

(All values in pCi/L ± 2 σ)[1]

Sample Location	Year Reported	U-234	U-235	U-238	Sr-90	Ra-226	Pu-238	Pu-239
Cannikin								
Cannikin Lake - South	1977	0.074			1.8		0.041	
Cannikin Lake - North	1977				2.2			
Well HTH-3	1977	0.057		0.04	1.7			
Ice Box Lake	1977	0.049		0.06	1.6		0.029	
White Alice Creek	1977	0.019		0.023	2.3		0.042	
Pit South of SGZ	1977	0.034		0.034	2.3		0.043	
Milrow								
Heart Lake	1977	0.042			2		0.046	
Clevenger Creek	1977	0.038		0.044	1.5		0.034	
Duck Cove Creek[2]	1977	0.03		0.03				
Long Shot								
Pond 1	1982	0.18 ± 0.07		0.13 ± 0.05				
Pond 2	1982			0.064 ± 0.036		0.23 ± 0.13		
Pond 3	1982					0.15 ± 0.10		
Mud Pit 1	1977							0.03
Mud Pit 3	1977						0.032	
Reed Pond	1977				2.1			
Stream East of Long Shot	1985	0.12 ± 0.039		0.055 ± 0.025				
Well WL-1	1977					0.15	0.042	
Well GZ-1	1977	0.11		0.048	1.5		0.042	
Background								
Constantine Spring	1977	0.046	0.014	0.037				
	1989					0.11 ± 0.11		
Jones Lake	1977				0.70		0.042	
Army Well 4	1982	0.25 ± 0.10		0.21 ± 0.09		0.32 0.25		

[1] 2-sigma error not provided with 1977 data

[2] Duck Cove Creek is listed as a background location by EPA, but it drains the Milrow area

Note: Only detected activity values are included in the table

Source: EPA, 1978-1996

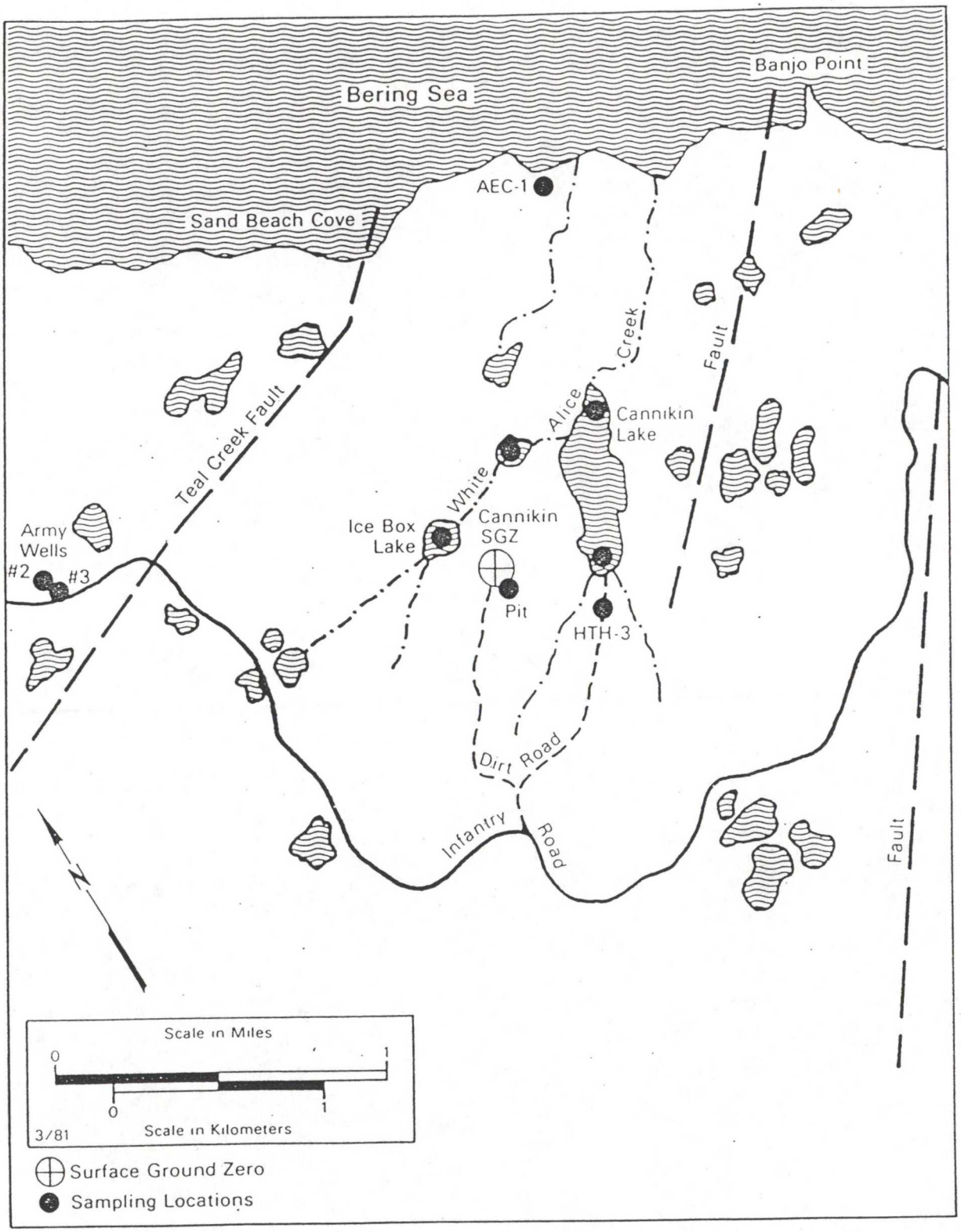

Figure E-2. LTHMP sampling locations for Project Cannikin.

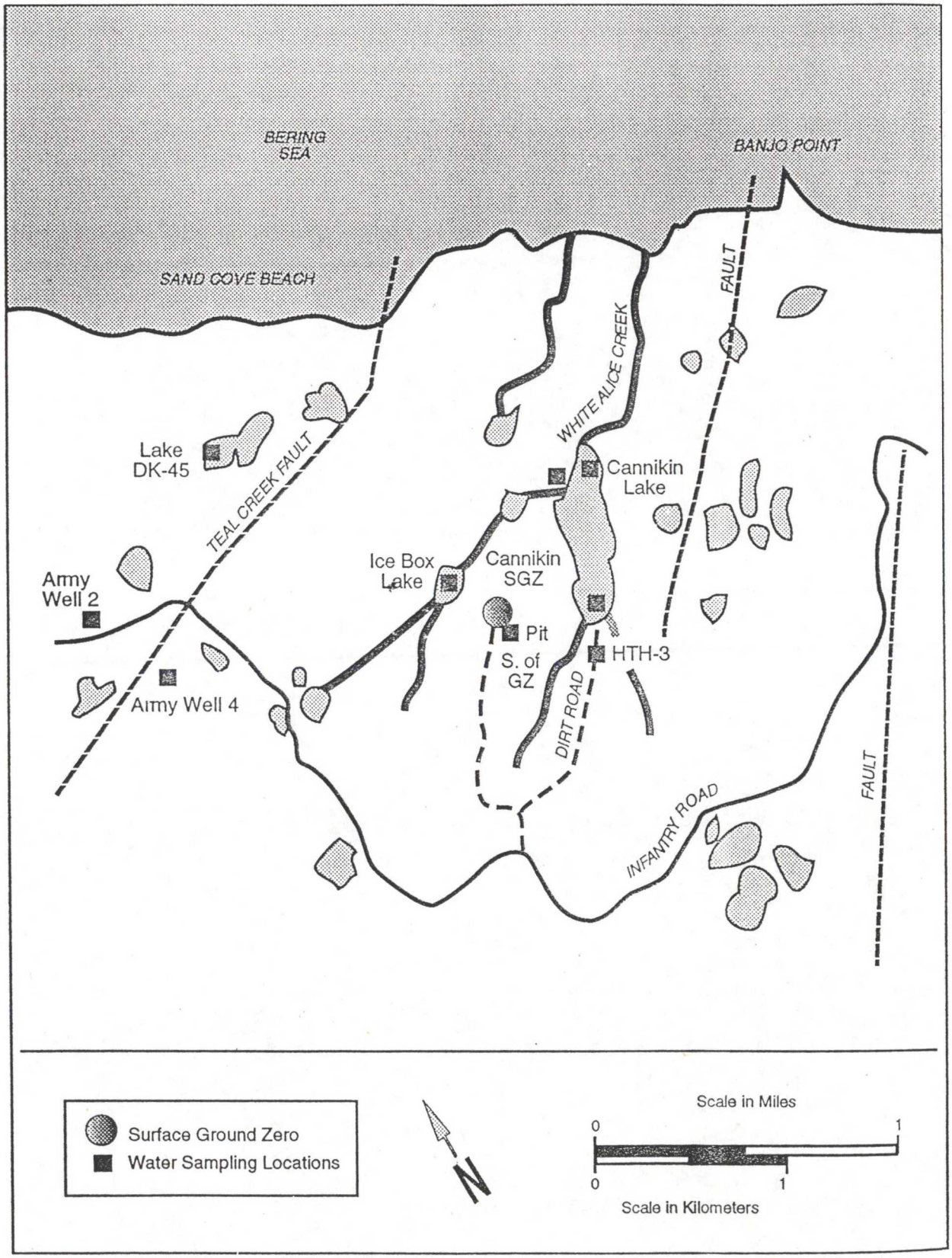

Figure 61. Long-Term Hydrological Monitoring Program sampling locations for Project CANNIKIN.

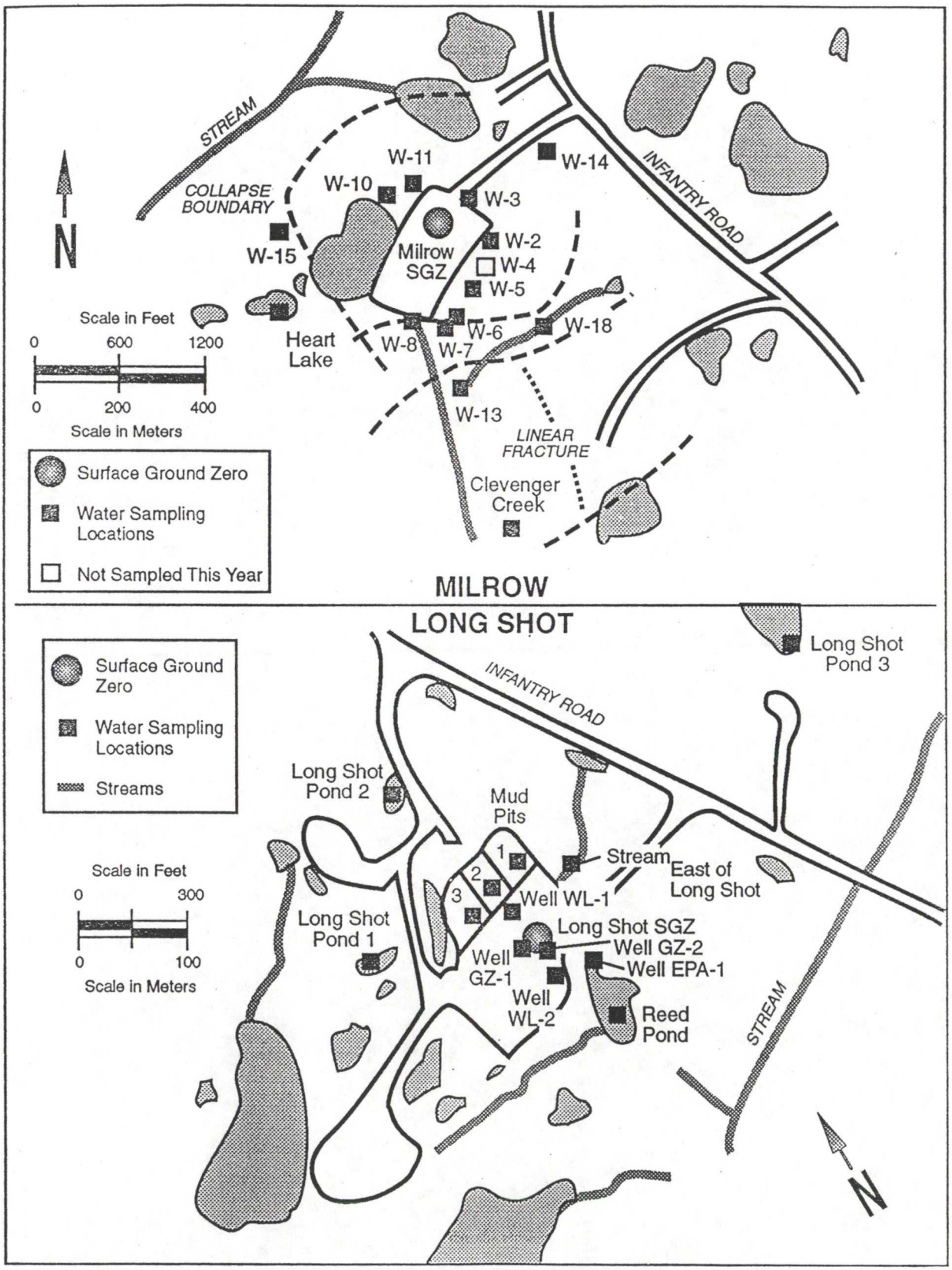

Figure 60. Long-Term Hydrological Monitoring Program sampling locations for Projects MILROW and LONGSHOT.

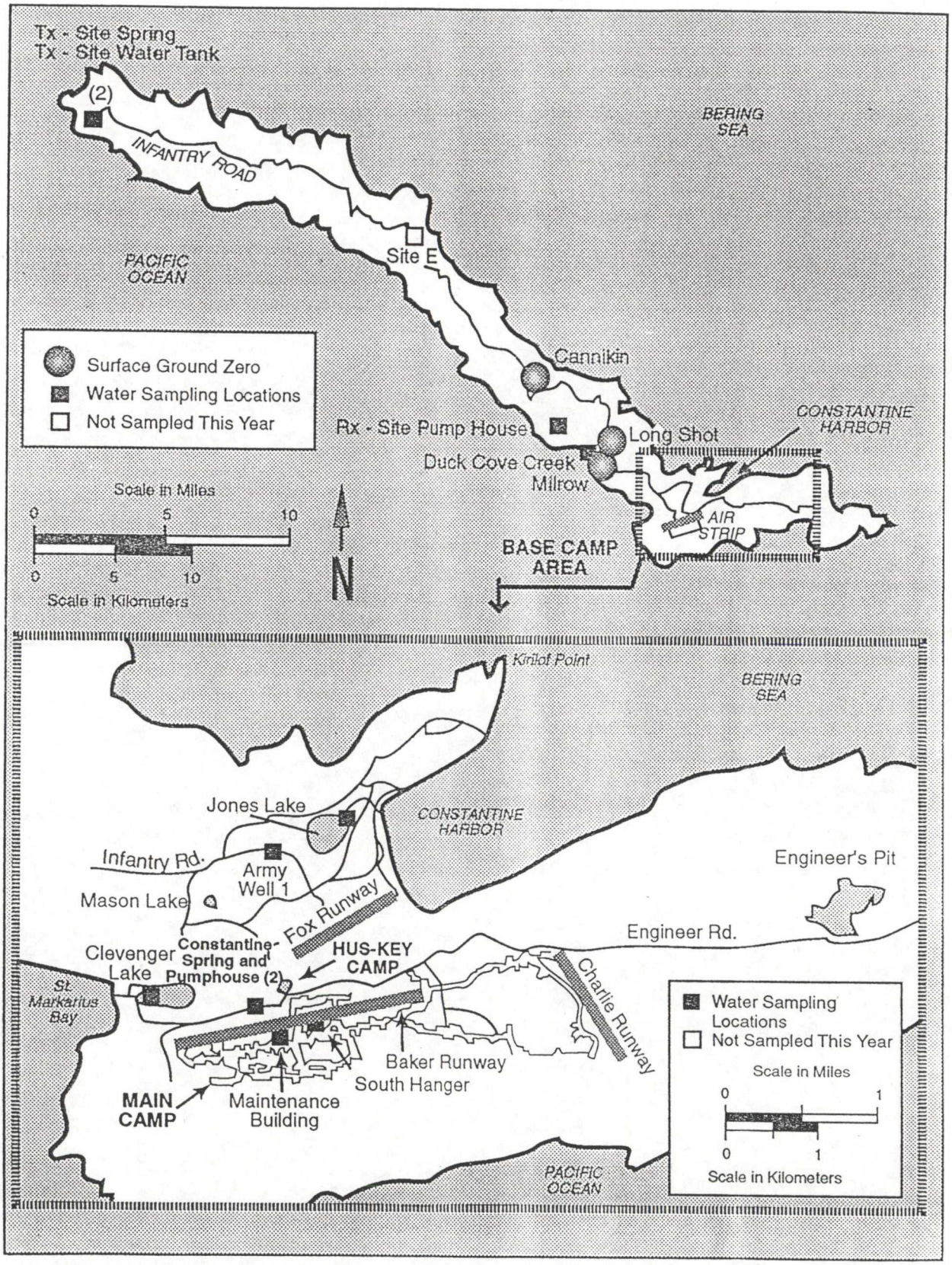

Figure 59. Amchitka Island and Background sampling location for the Long-Term Hydrological Monitoring Program.