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Cerro Prieto Geothermal Field, Mexico: chemical analyses and other data for 58 samples collected in 1977-1979

edited by

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PREFACE

By James D. Bliss

This report releases the results of selected chemical analyses by the USGS of fluids collected from geothermal power production wells at the Cerro Prieto Geothermal Field, Mexico. Cerro Prieto, the world's largest producing hot-water geothermal field, is located 32 km southeast of Mexicali, Baja California. Comisión Federal de Electricidad de México (CFE) gave permission for, and assisted in, sample collection. Data collection and reported analyses was made by the U.S. Geological Survey. Data collected in 1977 and 1978 where published previously by Ball and Jenne (1983) which was about half the data given here. This report also includes samples collected in 1979 which were not previously released. These activities, including this data release, are supported by the U.S. Department of Energy.

Analyses given in the following section were made by James W. Ball and E.A. Jenne. The data have been reviewed with the assistance of Cathy Janik, USGS, Menlo Park. Some, but not all, details from Ball and Jenne (1983) concerning collection, and preservation and analytical procedures are repeated here. Nehring and Trusdell (1977) also provide an outline of some of the issues involved in the difficult task of collecting samples from geothermal wells. The initial intent of the study was to provide basic data for use in determining how these fluids should be managed either in disposal or in reinjection. Some of the hot, corrosive brines were separated as two-phase (water and steam) samples under pressure using a coiled condenser tube submerged in an ice/water mixture (called "condensed" samples). It is not known if these were total flow samples. Other samples were collected from the brine sampling valve of the separators (called "flashed" samples). Analyses given in the following section area sorted by (1) well number, (2) date, and (3) sample type(s).

Analysis was by a Spectraspan III d.c. argon plasma emission spectrometer with a Spectraject III torch (Ball and Jenne, 1983). Elements were determined in two groups using interchangeable cassettes. Group one included B, Mn, Cu, Zn, Si, Zr, Be, Mn, Sr, Ti, Ca, Fe, Ba, K, Na, Rb, and Al. Group two included As, Se, Bi, Zn, Cd, Sb, Cu, Ni, Hg, Mo, Co, Cr, Fe, V, Tl, Li, and Pb. Ball and Jenne (1983) noted that analysis of B, Ca, Mg, Ba, and Sr generally gave precise results. Movement of the plasma or grating was observed to affect sensitivity over short time periods even while the instrument was carefully standardized and optimized. Sensitivity was also a function of sample concentration. All samples at the time of analysis contained a white precipitate (perhaps colloidal silica) thus the reported concentations may not accurately represent the concentrations present at the time of collection (Ball and Jenne, 1983). Additional details about specific elements are given in the section on "Evaluation of data" (Bliss, this volume) following the data table.

Chemical analyses and other data for 58 fluid samples collected in 1977 to 1979

by James W. Ball[2] and E.A. Jenne[3]

[2]U.S. Geological Survey, Menlo Park, Calif., now at University of Arizona, Tucson, Ariz.
[3]U.S. Geological Suvey, Menlo Park, Calif., current location unknown.

Table 1. Chemical analysis and other data for 58 fluid samples collected in 1977 and 1978

by James W. Ball and E.A. Jenne

Rec. No.	Well Number	Date yr/mo/dy	Sample type	Psep lb/sq in	Psep kg/sq cm	Log No.	Na mg/L	K mg/L
28	#244	780000	C		0.00	8W131	276	2.9
5	M-005	770429	C	83	5.83	8W143	7280	1290
6	M-005	780112	C	94	6.61	8W116	7010	1620
38	M-005	790130	C	95	6.68	9W102	6550	1400
51	M-005	790130	C, D	95	6.68	9W102	6830	1570
52	M-005	790130	C, D	95	6.68	9W102	6890	1580
7	M-008	770427	C	91	6.40	8W140	5640	1120
8	M-008	780111	C	98.5	6.92	8W117	6520	1270
35	M-008	790130	C	104	7.31	9W100	5500	1290
49	M-008	790130	C, D	104	7.31	9W100	5350	1160
9	M-011	770419	C	90	6.33	8W132	8090	1680
10	M-011	780112	C	87.5	6.15	8W145	7450	1690
42	M-011	790201	C	97.5	6.85	9W106	7020	1710
43	M-011	790201	C	97.5	6.85	9W106	6860	1700
56	M-011	790201	C, D	97.5	6.85	9W106	7170	1720
57	M-011	790201	C, D	97.5	6.85	9W106	7060	1710
40	M-014	790131	C	97.5	6.85	9W104	5500	1080
54	M-014	790131	C, D	95.7	6.73	9W103	5590	1020
11	M-019A	770427	C	95	6.68	8W141	7550	1680
12	M-019A	780116	C	94.1	6.62	8W118	7550	1660
29	M-019A	780116	F	0	0.00	8W119	8330	1870
13	M-021A	770422	C	100	7.03	8W137	7450	1590
30	M-021A	780111	C	93.5	6.57	8W120	7500	1450
14	M-026	770420	C	99.5	6.99	8W133	6090	1020
15	M-026	780117	C	106	7.45	8W121	6150	1040
31	M-026	780117	F	0	0.00	8W122	7300	1250
41	M-026	790131	C	106	7.45	9W105	4500	957
55	M-026	790131	C, D	106	7.45	9W105	4400	904
16	M-027	770421	C	97.5	6.85	8W136	5130	1080
17	M-027	780111	C	97.5	6.85	8W142	4050	773
32	M-027	780111	F	0	0.00	8W123	6420	1150
36	M-027	790130	C	99.5	6.99	9W101	5340	1110
37	M-027	790130	C	99.5	6.99	9W101	5230	1130
50	M-027	790130	C, D	99.5	6.99	9W101	4900	1010

Rec. No.	Ca mg/L	Mg mg/L	SiO2 mg/L	Li mg/L	B mg/L	Sr mg/L	Ba µg/L	Rb mg/L	Fe1 µg/L	Fe2 µg/L
28	40.1	3.86	36.8	<0.1	0.15	0.29	0.055	0.56	73.4	4932.0
5	355	0.54	723	20.7	15.1	0.83	0.430	15.60	1980.0	2500.0
6	412	0.46	804	15.7	16	0.80	0.559	15.50	710.0	592.0
38	375	0.512	826	18.7	13.9	7.53	0.518	7.12	180.0	292.0
51	396	<0.2	1070	18.3	16.2	8.32	0.557	7.54	159.0	<200.0
52	387	<0.2	1030	18.7	15.8	8.29	0.552	7.58	161.0	<200.0
7	285	0.31	740	16.4	12.2	0.65	0.765	11.20	633.0	648.0
8	317	<0.02	689	17.5	11.5	0.58	0.944	12.40	1100.0	1100.0
35	297	0.412	770	16.1	9.37	5.64	0.698	5.12	110.0	143.0
49	295	<0.2	1020	14	11.3	5.90	0.746	5.86	<150.0	<200.0
9	465	0.54	779	27.3	16.7	8.82	0.939	18.00	390.0	326.0
10	455	0.49	768	22.2	17.1	7.64	0.780	16.30	282.0	376.0
42	417	0.229	847	22.6	16.1	7.40	0.524	7.67	79.4	98.7
43	404	0.234	828	22.4	16	7.39	0.522	7.81	89.0	97.6
56	417	<0.2	1120	23.7	17.6	8.13	0.611	8.58	<150.0	<200.0
57	412	<0.2	1060	22.4	16.6	8.07	0.608	8.58	<150.0	<200.0
40	344	1.55	670	14.7	11.2	9.03	1.640	5.58	282.0	552.0
54	342	<0.2	849	15.2	12.5	9.78	1.720	5.52	278.0	<200.0
11	444	0.44	826	23.3	15.6	8.74	0.604	17.50	437.0	462.0
12	439	0.51	804	16.1	14.5	8.59	0.640	17.30	514.0	378.0
29	498	0.487	896	21.6	16.6	10.10	0.704	20.00	484.0	333.0
13	490	0.5	781	20.6	16.5	7.33	0.584	17.20	607.0	707.0
30	445	0.592	719	17.7	14.4	7.65	0.704	17.20	502.0	346.0
14	416	0.73	708	13.9	10.3	0.61	0.967	15.00	645.0	650.0
15	402	0.62	736	14.3	9.82	5.55	0.881	15.20	767.0	718.0
31	488	0.927	851	16.8	11.9	6.75	1.060	17.60	632.0	525.0
41	374	0.645	719	14.6	9.29	4.76	0.876	5.89	411.0	715.0
55	364	<0.2	883	12.1	9.88	5.30	0.977	5.69	577.0	211.0
16	270	<0.02	777	13.7	10.6	0.48	0.284	10.50	315.0	306.0
17	201	<0.02	603	11.1	8.13	0.37	0.220	8.50	525.0	524.0
32	289	<0.02	856	15.1	11.8	0.53	0.478	12.40	456.0	194.0
36	273	0.304	813	13.6	10.6	5.09	0.483	4.27	106.0	139.0
37	281	0.295	836	14.2	9.46	5.16	0.473	4.77	92.2	197.0
50	279	<0.2	1020	13.2	11	5.44	0.507	4.98	<150.0	<200.0

Rec.	Mn	Zn1	Zn2	Mo	Co	Cr	Pb	Ni	V	Cd
No.	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
28	26.00	31.0	<5.0	10.1	<5.0	<2.0	<20.0	<4.0	<5.0	<1.0
5	860.00	126.0	98.20	137.0	42.1	41.2	693	31.5	93.9	<1.0
6	801.00	93.1	10.80	149.0	26.1	17.8	739	25.1	78.8	2.18
38	780.00	<20.0	<5.0	104.0	12.3	11.9	591	10.3	41.7	<1.0
51	825.00	<200.0	<50.0	117.0	103.00	116	<200.0	54.1	110	<10.0
52	835.00	<200.0	<50.0	89.4	<50.0	58.7	<200.0	<40.0	72.6	<10.0
7	348.00	50.4	<5.00	116.0	41.1	33.8	554	29.6	75.4	9.5
8	435.00	65.2	<5.0	144.0	21.6	16.3	618	19.7	65.7	6.21
35	312.00	<20.0	<5.0	73.2	<5.0	7.56	379	<4.0	29.2	<1.0
49	277.00	<200.0	<50.0	58.6	56.5	46.5	235	<40.0	<50.0	<10.0
9	1020.00	128.0	42.00	127.0	39	36.3	679	32.5	93.3	<1.0
10	659.00	140.0	65.70	117.0	47.1	42.8	606	35.4	90.8	4.76
42	1290.00	<20.0	46.80	119.0	<5.0	<2.0	507	<4.0	<5.0	3.18
43	1270.00	21.1	30.90	124.0	<5.0	<2.0	523	<4.0	5.17	<1.0
56	1360.00	<200.0	<50.0	41.0	<50.0	<20.0	<200.0	<40.0	<50.0	46.9
57	1450.00	<200.0	<50.0	59.0	<50.0	<20.0	273.0	<40.0	<50.0	68
40	346.00	<20.0	<5.0	85.8	<5.0	6.1	530	15	27	<1.0
54	313.00	<200.0	<50.0	<30.0	<50.0	<20.0	<200.0	<40.0	<50.0	<10.0
11	1770.00	59.7	<5.0	141.0	62.4	57.7	741	45.1	105	12.3
12	1510.00	202.0	123.00	160.0	47.2	38.2	811	34.7	106	13.3
29	1.83	101.0	18.30	166.0	72.8	63.9	939	47.4	126	25.3
13	446.00	57.4	<5.0	160.0	58.3	56.3	684	40.2	99.8	18
30	0.45	69.5	<5.0	150.0	71.7	61.8	784	43.2	104	24.3
14	326.00	102.0	15.90	125.0	37	33.2	584	24.8	83	<1.0
15	320.00	35.7	<5.0	136.0	61.7	54.9	666	36.8	81.7	30.4
31	0.37	128.0	34.20	139.0	69.5	58.5	728	43.2	92	32.4
41	232.00	<20.0	<5.0	81.1	11.3	11.4	404	6.28	27.1	<1.0
55	212.00	<200.0	<50.0	<30.0	<50.0	<20.0	<200.0	<40.0	<50.0	<10.0
16	227.00	56.6	<5.0	122.0	54.2	49.5	532	32.5	83.3	15.2
17	253.00	50.5	13.10	104.0	32.9	26.7	437	23.9	58.7	6.65
32	0.32	36.3	<5.0	133.0	70.6	55.3	656	43.2	98.1	24.3
36	334.00	38.2	<5.0	68.6	<5.0	7.01	350	<4.0	28.4	<1.0
37	334.00	<20.0	<5.0	89.2	35.7	27.5	443	20.8	50.7	4.94
50	287.00	<200.0	<50.0	30.1	<50.0	<20.0	<200.0	<40.0	<50.0	25.1

Rec. No.	Cu1 µg/L	Cu2 µg/L	Tl µg/L	As mg/L	Se µg/L	Sb µg/L	Bi µg/L	Hg µg/L	Zr µg/L	Be µg/L	Ti µg/L
28	<10.0	<3.0	<4.0	<0.2	<30.0	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
5	<10.0	<3.0	113	960	335	449	<10.0	<2.00	<20.0	<2.00	<10.0
6	<10.0	<3.0	92.2	1050	201	439	<10.0	<2.00	<20.0	<2.00	<10.0
38	<10.0	<3.0	83.2	587	71.5	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
51	<100.	<30.0	283	<2.00	847	<2000.	833	<20.0	<200.	<20.0	<100.0
52	<100.	<30.0	193	2090	514	<2000.	505	55.1	<200.	<20.0	<100.0
7	<10.0	<3.0	102	320	439	574	<10.0	<2.00	<20.0	<2.00	<10.0
8	<10.0	<3.0	60.2	290	249	316	<10.0	<2.00	<20.0	<2.00	<10.0
35	<10.0	<3.0	60.2	<0.20	80.9	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
49	<100.	<3.0	77.5	<2.00	<300.	<2000.	355	95.6	<200.	<20.0	<100.0
9	<10.0	<3.0	138	1300	<30.0	249	<10.0	<2.00	<20.0	<2.00	<10.0
10	<10.0	<3.0	107	1220	392	730	<10.0	<2.00	<20.0	<2.00	<10.0
42	<10.0	3.11	26.5	<0.20	<30.0	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
43	<10.0	<3.0	33.4	<0.20	<30.0	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
56	<100.	<30.0	<40.	<2.00	1020	<2000.	345	<20.0	<200.	<20.0	<100.0
57	<100.	<30.0	52.7	<2.00	602	<2000.	431	<20.0	<200.	<20.0	<100.0
40	<10.0	<3.0	47.8	308	66.8	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
54	<100.	<30.0	<40.	<2.00	<300.	<2000.	<100.0	<20.0	<200.	<20.0	<100.0
11	<10.0	<3.0	143	1380	502	793	<10.0	<2.00	<20.0	<2.00	<10.0
12	<10.0	<3.0	117	1030	321	389	<10.0	<2.00	<20.0	<2.00	<10.0
29	<10.0	<3.0	199	1310	472	237	<10.0	<2.00	<20.0	<2.00	<10.0
13	<10.0	<3.0	145	3400	488	658	27	<2.00	<20.0	<2.00	<10.0
30	<10.0	<3.0	130	2290	418	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
14	<10.0	<3.0	118	3140	85.6	522	<10.0	<2.00	<20.0	<2.00	<10.0
15	<10.0	<3.0	102	2930	485	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
31	<10.0	<3.0	153	3430	288	201	<10.0	<2.00	<20.0	<2.00	<10.0
41	<10.0	<3.0	65	1430	61.2	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
55	<100.	<30.0	<40.	<2.00	<300.	<2000.	<100.0	<20.0	<200.	<20.0	<100.0
16	<10.0	<3.0	112	1040	540	574	12.5	<2.00	<20.0	<2.00	<10.0
17	<10.0	<3.0	73.2	760	367	484	32.7	<2.00	<20.0	<2.00	<10.0
32	<10.0	<3.0	145	520	245	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
36	<10.0	<3.0	60.4	<0.20	<30.0	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
37	<10.0	<3.0	123	<0.20	102	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
50	<100.	<3.0	<40.0	<2.00	<300.	<2000.	373	45	<200.	<20.0	<100.0

Rec. No.	Al µg/L
28	<10.0
5	<10.0
6	<10.0
38	168
51	<100.0
52	<100.0
7	<10.0
8	<10.0
35	55.7
49	<100.0
9	<10.0
10	<10.0
42	<10.0
43	<10.0
56	<100.0
57	<100.0
40	79.7
54	<100.0
11	<10.0
12	<10.0
29	<10.0
13	<10.0
30	<10.0
14	<10.0
15	<10.0
31	<10.0
41	170
55	208
16	<10.0
17	98.2
32	<10.0
36	78.85
37	63
50	<100.0

Rec. No.	Well Number	Date yr/mo/dy	Sample type	Psep lb/sq in	Psep kg/sq cm	Log No.	Na mg/L	K mg/L
18	M-029	770421	C	93.7	6.59	8W134	6210	1050
19	M-029	780113	C	92	6.47	8W124	5740	1060
20	M-030	770421	C	98	6.89	8W135	7440	1630
21	M-030	780117	C	97.8	6.88	8W125	7500	1570
33	M-030	780117	F	0	0.00	8W126	8140	1780
22	M-031	770422	C	93	6.54	8W138	5900	1230
23	M-031	780112	C	100	7.03	8W127	6680	1200
44	M-031	790201	C	102	7.17	9W107	5280	1150
58	M-031	790201	C, D	102	7.17	9W107	5510	1160
24	M-035	770426	C	102	7.17	8W139	6740	1690
25	M-035	780112	C	109	7.66	8W128	7700	1610
45	M-035	790201	C	99.5	6.99	9W108	5990	1500
59	M-035	790201	C, D	99.5	6.99	9W108	6450	1600
26	M-042	770429	C	96	6.75	8W144	6160	1340
34	M-042	780113	F	0	0.00	8W129	6630	1410
46	M-045	790201	C	97	6.82	9W109	7410	2450
60	M-045	790201	C, D	97	6.82	9W109	8550	2500
47	M-114	790202	C	110	7.73	9W110	5770	1030
48	M-114	790202	C	110	7.73	9W110	6040	1050
61	M-114	790202	C, D	110	7.73	9W110	6120	1100
62	M-114	790202	C, D	110	7.73	9W110	6120	1110
39	M-130	790131	C	106	7.45	9W103	7110	1800
53	M-130	790131	C, D	106	7.45	9W103	7570	1920
27	R-98	780000	C		0.00	8W130	169	4.85

Rec.	Ca	Mg	SiO2	Li	B	Sr	Ba	Rb	Fe1	Fe2
No.	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	µg/L
18	473	1.45	580	19.7	13.9	14.20	0.900	14.60	649.0	714.0
19	455	1.29	620	18.6	13.1	13.60	0.952	16.10	467.0	278.0
20	520	1.05	798	22	14.7	10.20	0.445	17.90	1420.0	1690.0
21	506	0.99	759	20	14.1	9.55	0.491	18.50	981.0	972.0
33	577	1.11	883	20.7	16	11.50	0.547	21.30	700.0	617.0
22	366	0.45	702	17.8	11.8	0.73	0.513	13.10	322.0	276.0
23	351	<0.02	734	16	12	7.56	0.588	14.70	450.0	243.0
44	328	0.314	725	13.7	10.6	6.25	0.522	4.99	<15.0	<20.0
58	329	<0.2	890	15.7	11.1	7.29	0.637	6.05	<150.0	<200.0
24	387	0.35	864	21.8	14.6	0.74	0.579	14.90	965.0	1140.0
25	368	0.21	894	18.8	14.4	0.72	0.557	16.60	6940.0	7030.0
45	339	<0.02	845	16.9	13.4	6.05	0.503	6.44	70.2	97.0
59	349	<0.2	1070	19	13.2	7.21	0.624	7.92	<150.0	<200.0
26	388	0.43	809	16.9	15.3	0.82	0.572	12.80	249.0	283.0
34	388	0.447	860	18.4	16.2	9.85	0.790	16.10	470.0	359.0
46	422	0.331	911	23.5	17.1	4.94	1.870	9.88	254.0	405.0
60	436	<0.2	1230	30.7	17.2	5.95	2.200	11.90	<150.0	<200.0
47	520	0.251	693	16.5	12.1	13.60	0.369	5.34	<15.0	91.5
48	527	0.239	702	17.3	12.4	13.80	0.373	5.41	<15.0	121.0
61	522	<0.2	890	20.4	12.2	13.90	0.456	6.42	<150.0	<200.0
62	520	<0.2	858	19.7	12.3	14.10	0.458	6.64	<150.0	<200.0
39	450	0.432	952	22.7	15.7	8.32	0.819	8.77	70.6	242.0
53	432	<0.2	1140	24.9	16.6	9.14	0.941	9.05	<150.0	<200.0
27	154	45.4	23.1	<0.1	0.22	0.18	0.104	1.71	447.0	342.0

Rec. No.	Mn µg/L	Zn1 µg/L	Zn2 µg/L	Mo µg/L	Co µg/L	Cr µg/L	Pb µg/L	Ni µg/L	V µg/L	Cd µg/L
18	520.00	111.0	58.40	120.0	40	43.5	711	30.6	98.9	<1.0
19	471.00	48.2	8.47	147.0	79.5	67.1	927	49.6	123	20.3
20	2120.00	137.0	16.00	135.0	62.4	60.6	716	40.2	113	7.6
21	2430.00	110.0	<5.0	155.0	75	61.1	843	51.7	123	13.3
33	2.93	448.0	306.00	167.0	96.1	75	966	61.3	147	16.3
22	142.00	335.0	270.00	123.0	51.2	46.6	609	33.5	87	21.8
23	192.00	41.6	<5.0	146.0	59.5	43.7	706	38.9	102	10.2
44	215.00	<20.0	22.00	84.1	<5.0	<2.0	347	<4.0	<5.0	<1.0
58	201.00	<200.0	<50.0	37.2	<50.0	<20.0	233.0	<40.0	<50.0	128
24	547.00	66.2	18.60	137.0	62.4	54.7	673	42.2	100	15.2
25	892.00	22.5	<5.0	163.0	65	45.3	748	46.4	120	2.18
45	563.00	<20.0	16.00	90.6	<5.0	<2.0	370	<4.0	<5.0	<1.0
59	517.00	<200.0	<50.0	33.8	<50.0	<20.0	<200.0	<40.0	<50.0	83.6
26	432.00	31.5	<5.0	104.0	39	33.6	560	<4.0	81.6	3.81
34	0.43	59.4	41.10	168.0	70.6	50.5	840	47.4	132	2.18
46	3740.00	<20.0	36.30	166.0	<5.0	2.56	629	5.88	29.3	<1.0
60	4250.00	<200.0	<50.0	<30.0	50.30	<20.0	<200.0	<40.0	<50.0	<10.0
47	223.00	<20.0	<5.0	161.0	24.4	38.7	785	19.3	42.5	<1.0
48	222.00	<20.0	<5.0	167.0	50.9	64.6	812	29.4	61.5	<1.0
61	227.00	<200.0	<50.0	<30.0	<50.0	<20.0	259	<40.0	<50.0	<10.0
62	226.00	<200.0	<50.0	<30.0	<50.0	<20.0	304	<40.0	<50.0	<10.0
39	1740.00	<20.0	<5.0	95.3	24.2	20.1	547	14.2	39.6	<1.0
53	1740.00	<200.0	<50.0	<30.0	<50.0	<20.0	<200.0	<40.0	<50.0	<10.0
27	359.00	<20.0	33.40	93.9	36.1	27.9	318	20.7	55.3	182

Rec. No.	Cu1 µg/L	Cu2 µg/L	Tl µg/L	As mg/L	Se µg/L	Sb µg/L	Bi µg/L	Hg µg/L	Zr µg/L	Be µg/L	Ti µg/L
18	<10.0	<3.0	132	890	279	595	<10.0	<2.00	<20.0	<2.00	<10.0
19	<10.0	<3.0	165	530	294	<200.0	19.3	<2.00	<20.0	<2.00	<10.0
20	<10.0	<3.0	165	1030	469	793	<10.0	<2.00	<20.0	<2.00	<10.0
21	<10.0	<3.0	157	940	174	445	<10.0	<2.00	<20.0	<2.00	<10.0
33	<10.0	<3.0	245	1100	303	608	<10.0	<2.00	<20.0	<2.00	<10.0
22	<10.0	<3.0	118	1120	467	678	19.6	<2.00	<20.0	<2.00	<10.0
23	<10.0	<3.0	118	990	215	649	<10.0	<2.00	<20.0	<2.00	<10.0
44	<10.0	3.84	<4.0	201	<30.0	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
58	<100.	<30.0	<40.	<2.00	1110	<2000.	304	<20.0	<200.	<20.0	<100.0
24	<10.0	<3.0	143	960	481	824	<10.0	<2.00	<20.0	<2.00	<10.0
25	<10.0	<3.0	137	970	167	723	<10.0	<2.00	<20.0	<2.00	<10.0
45	<10.0	<3.0	28.9	513	<30.0	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
59	<100.	<30.0	<40.	<2.00	1220	<2000.	275	<20.0	<200.	<20.0	<100.0
26	<10.0	<3.0	99.1	990	275	400	<10.0	<2.00	<20.0	<2.00	<10.0
34	<10.0	<3.0	205	840	191	931	<10.0	<2.00	<20.0	<2.00	<10.0
46	<10.0	5.03	94.1	240	<30.0	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
60	<100.	<30.0	<40.	<2.00	<300.	<2000.	<100.0	<20.0	<200.	<20.0	<100.0
47	<10.0	<3.0	139	1170	152	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
48	<10.0	<3.0	131	836	184	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
61	<100.	<30.0	<40.	2870	<300.	<2000.	<100.0	<20.0	<200.	<20.0	<100.0
62	<100.	<30.0	<40.	<2.00	<300.	<2000.	<100.0	<20.0	<200.	<20.0	<100.0
39	<10.0	<3.0	116	522	<30.0	<200.0	<10.0	<2.00	<20.0	<2.00	<10.0
53	<100.	<30.0	<40.	<2.00	<300.	<2000.	<100.0	<20.0	<200.	<20.0	<100.0
27	<10.0	<3.0	67.2	<0.2	156	640	68.8	13.6	<20.0	<2.00	<10.0

Rec. No.	Al µg/L
18	<10.0
19	<10.0
20	<10.0
21	<10.0
33	<10.0
22	<10.0
23	<10.0
44	<10.0
58	<100.0
24	<10.0
25	<10.0
45	<10.0
59	<100.0
26	<10.0
34	<10.0
46	45.5
60	<100.0
47	39.6
48	<10.0
61	<100.0
62	<100.0
39	151
53	<100.0
27	<10.0

Evaluation of data

by James D. Bliss

INTRODUCTION

The data in Table 1 (see Ball and Jenne, this volume) includes 58 samples with 31 elements for 16 wells. Two samples (#244, R-98) were from unknown sites. Samples were collected from 1977 to 1979; each record of analysis includes an identifier (record number), well number, date of collection, sample type, pressure of fluid separation, and analytical laboratory log number. Analyses were carried out for for Na, K, Ca, Mg, Fe, Mn, Si and Al and for trace elements including Li, B, Sr, Ba, Rb, Zn,Mo, Co, Cr, Pb, Ni, V, Cd, Cu, Tl, As, Se, Bi, Hg, Zr, Be, and Ti. Sampling and analystical procedures are described in Ball and Jenne (1983), Ball and others (1978), and Johnson and others (1979). Table 2 gives the limits of detection for each element and the percent of the samples which were below those limits. Table 3 gives the mean (geometric mean if lognormal), standard deviation (geometric standard deviation if lognormal), minimum, maximum, and count for each element in the study. No attempt was made to correct for truncated distributions. The mean, standard deviation (if three or more observations), minimum, maximum, and count for each element by geothermal well is given in a series of tables as follows:

Well Number	Table No.	Well Number	Table No.
M-5	4	M-8	5
M-11	6	M-14	7
M-19A	8	M-21A	9
M-26	10	M-27	11
M-29	12	M-30	13
M-31	14	M-35	15
M-42	16	M-45	17
M-114	18	M-130	19

See the next section for a discussion on rules used in well numbering. Well locations are shown on figure 1.

GEOTHERMAL WELL NUMBERING RULES

Most geothermal wells are numbered in accordance with the designation used by CFE. Standard well numbers are prefixed with "M-" (e.g, M-5, etc.); a suffix of "A" signifies that the well was deepened or redrilled on the same well pad (e.g, M-19A). The previous well (e.g, M-19) is abandoned or no longer exists. Two samples (R-98, 244-C) have well numbers not recognized and may be for samples not collected at wells but may be either be internal standards. They may have been included in the data set in error or where analysis from samples collected from other sites (perhaps surface springs?) in or adjacent to Cerro Prieto geothermal field. Both samples were reported as wells in Ball and

Jenne (1983). They were included at the table for the sake of completeness. Well designation (number of samples collected in parenthesis if more than one) include M-5 (5), M-8 (4), M-11 (6), M-14 (2), M-19A (3), M-21A (2), M-26 (5), M-27 (6), M-29 (2), M-30 (3), M-31 (4), M-35 (4), M-42 (2), M-45 (2), M-114 (4), and M-130 (2).

SAMPLE COLLECTION TYPE AND DATE

Several codes are used in the table to indicate sample type. They include "C" to indicate that the fluids were separated as a two-phase (water and steam) sample under pressure using a coiled condenser tube submerged in an ice/water mixture (also called "condensed" samples). Other samples, designated as "F", were collected where the pressurized brine was flashed at one atmosphere through a brine sampling valve of the separator (also called "flashed" samples). Some condensed samples were diluted in the field (also called condensed and diluted) and designed with a second code "D". Dates were checked by Cathy Janik using the original field notebooks and are by year, month, and day. Pressure of fluid separation originally reported in pounds per square inch at the gauge is converted to kilograms per square centimeter. Both values are found in the table.

CONDENSED AND FLASHED SAMPLES

Wells nos. M-19A, M-26, M-27 and M-30 had both condensed and flashed samples collected in Jan., 1978. One other flashed sample was collected in 1978 at well M-42 but without a corresponding condensed sample and can not be used directly to examine differences in chemistry of condensed and flashed samples. Since most of the solutes are in the liquid phase, the addition of liquid from the relatively pure condensed gases in condensed samples can be viewed as diluting the samples. For most elements this is true and is shown using the ratios of concentrations of flashed samples to condensed (fig. 2). The bulk of the dissolved solutes are Na (position a, fig. 2), K (b), and Ca (c),and the mean ratios of condensed to flashed concentrations for these elements are essentially identical at 1.2. Similar ratios with similar variables are also found for Mg (d), SiO_2 (e), Li (f), B (g), Sr (h), Rb (j), Mo (o), and Pb (r). Somewhat higher ratios (but equal to or less than 1.5) with more variability are found for Ba (i), Co (p), Cr (q) ,Ni (s), V (t), and Se (x). The highest ratio (2.2) is for Zn (1) (n) followed by Cd (u) at 2.0 and Tl (v) at 1.7. The elements with high ratios also have large variabilities and may reflect low precision in their determination.

Fe concentrations determined using cassette 1 and 2 exhibit flashed/condensed ratios all less than 1 (fig. 2, position k, l). For Mn (fig. 2, position m), the ratio is approaching zero and clearly anomalous from the other elements considered. While Mn is detected in the range of 0.25 to 3 µg/L for flashed samples, the corresponding range in condensed samples is between 250 to 2500 µg/L! The Mn content of well 42 flashed sample is the same as Mn content of all other flashed samples. For 1 µg/L of Mn detected in the flashed sample, about 830 µg/L will be found in the condensed sample. These results may suggest that most of the Mn is carried in the vapor phase for the four wells considered in the study. Manganese contained in pipes, etc. may be source of the Mn found in the steam phase..

DATA ANALYSIS

Data evaluation using bar graphs, box-and-whisker plots, scatter plots, and a few basic statistics has helped to identify a variety of problems in computer data files (e.g, values in mg/L mixed with values in µg/L) which have been corrected in the preparation of the data (Ball and Jenne, this volume) or identified in this section. Ball and Jenne (1983) also suggest that the analytical results of samples collected in 1977-1978, B, Ca, Mg, and Sr gave the best results in terms of precision. Samples collected in 1977-1978 were noted at the time of analysis as containing a "white, precipitate, presumably colloidal silica" (Ball and Jenne, 1983) which may significantly affect silica content as well as some other elements. Variability in the data set can be related to sample collection, handling, and storage procedures; chemical analysis; errors introduced during data entry, storage and manipulation; or changes in fluid chemistry related to geothermal processes in the reservoir or during extraction. Some of the complications in analytical method are outlined in Ball and Jenne (1983). It may not always be possible to separate these effects. However, samples which have several values that are outlier should be considered possible candidates for exclusion in subsequent data analysis. For some sets of data, correlation between variables is made and samples with values which appear to be outliers on scatter plots can be identified. Several outliers were identified and were found to be values in records 27 and 28. In view of this, these two records were removed from subsequent data sets used to prepare figures and and statistical summaries. As a general rule, outliers should not necessarily be rejected as they can represent departures from the typical situation with important scientific consequences. The small number of samples collected for each well suggests that care should be taken in interpretation.

Changes in concentrations with time were noted where statistically significant at the 1 percent level. Other changes occur in the data set but are not reported here. Elements with more than 25 percent of observations less than detection limits are not evaluated in detail but are summarized at the end of the report. This includes Zn, Co, Cr, Ni, V, Cd, Cu, As, Se, Sb, Bi, Hg, and Al. Zr, Be, and Ti have no values above the detection limits.

Na

All samples have values for Na (Table 1, Ball and Jenne, this volume). The Na concentrations in table 1 (fig. 3) have a distribution not significantly different from normal (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). Of the elements reported, Na has the highest concentration (fig. 4). The mean Na content of 6480 mg/L (Table 3) is slightly more than 4.5 times the concentration of the second highest element, K.

The Na content of individual wells (fig. 5; tables 4-19) is extremely variable for this data set. Mean Na greater than 7000 mg/L include wells M-11, M-130, M-19A, M-21A, M-30, and M-45. Na content greater than 6000 but less than 7000 mg/L include M-35, M-42, and M-5. Wells with less than or about equal to 6000 mg/L Na include M-114, M-14, M-26, M-27, M-29, M-31, and M-8. Noteworthy reduction in Na concentrations occurred with time in 1977-1979 in well M-11 (~7 percent per annum, Table 6).

K

All samples have values for K (Table 1, Ball and Jenne, this volume). K concentrations show a distribution (fig. 6) not significantly different from lognormal (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). Of the elements reported, K has the second highest concentration (fig. 4). The geometric mean K content is 1360 mg/L (Table 3)

The K content of individual wells (fig. 7; tables 4-19) is extremely variable. One well, M-45, appears to be an outlier from the rest of the wells with a mean K concentration of 2480 mg/L based on two samples. Well M-45 also had the highest Na content (fig. 7). Otherwise wells tend to group with concentrations greater than 1400 mg/L (nos. M-11, M-130, M-19A, M-21A, M-30, M-35, M-5) or less than 1200 mg/L (nos. M-114, M-14, M-26, M-27, M-29, M-31). Only two wells (nos. M-8, M-24) have K concentrations between 1200 to 1400 mg/L. A noteworthy increase in K concentrations occurred in well M-11 (~20 percent per annum, Table 6). This is unusual inasmuch as most changes observed in concentrations are commonly to lower values as for K in well M-31 (~6 percent per annum).

Ca

All 56 samples have values for Ca (Table 1, Ball and Jenne, this volume). Ca concentrations (fig. 8) have a distribution not significantly different from normal (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). Of the elements reported, Ca has the fourth highest concentration (fig. 4) following Na, K, and SiO_2. The mean Ca content is 398 mg/L (Table 3).

The Ca content of individual wells (fig. 9; tables 4-19) is extremely variable. Wells have Ca concentrations between 250 to 550 mg/L. Wells with higher Na and K tend to have higher Ca also. However, well M-45 which has the highest Na (fig. 5) and K (fig. 7) has Ca concentrations typical to many other wells (fig. 9). Noteworthy reduction in Ca concentrations occurred with time in wells M-11, M-26, and M-35 (~7 percent per annum in all cases; Tables 6, 10, 15). In well 31 the reduction in Ca concentration was essentially the same at 6 percent (Table 14).

Mg

Thirty six samples have values for Mg (Table 1, Ball and Jenne, this volume). Mg concentrations (fig. 10) have a distribution not significantly different from lognormal (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). Of the elements reported, Mg has a concentration typical of several other elements and is shown on two figures, one with concentrations in mg/L (fig. 4) and µg/L (fig. 23). Note that 1000 µg/L is equal to 1 mg/L. The mean Mg content is 0.50 mg/L (Table 3).

The Mg content of individual wells (fig. 11; tables 4-19) is variable for this data set. Most wells have Mg concentrations between 0.2 to 0.6 mg/L and commonly only one or two observations above the limit of detection (Table 2). The well with the highest Mg is M-14 but it is a single observation only. Other wells with higher Mg concentrations include M-29, M-30, and M-26 (fig. 11). Noteworthy reduction in Mg concentrations occurred with time in well. M-11 (~50 percent per annum Tables 6).

SiO_2

All samples have values for SiO_2 (Table 1, Ball and Jenne, this volume). SiO_2 concentrations (fig. 12) shows that the data have a distribution not significantly different from lognormal (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). Of the elements reported, SiO_2 has the third highest concentration (fig. 4). The geometric mean SiO_2 content is 826 mg/L (Table 3).

The SiO_2 content of individual wells (fig. 13; tables 4-19) is variable for this data set. Most wells have SiO_2 concentrations between 600 to 1000 mg/L . The wells with the highest SiO_2 are M-45 and M-130 of which the former was also noted as having high Na and K concentrations. No noteworthy changes in SiO_2 concentrations occurred with time in 1977-1979 (Tables 4, 6, 10-11, 14, 15).

Li

All samples have values for Li (Table 1, Ball and Jenne, this volume). Li concentrations (fig. 14) shows that the data have a distribution not significantly different from normal (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The data are slightly positively skewed (fig. 14). Of the elements reported, Li has the fifth highest concentration (fig. 4). The mean Li content is 18.4 mg/L (Table 3).

The Li content of individual wells (fig. 15; tables 4-19) is variable for this data set. Most wells have Li concentrations between 12.5 to 25 mg/L. The well with the highest Li is M-45 which was also noted as having high concentrations of several other elements. No noteworthy changes in Li concentrations occurred in these wells over the time period (Tables 4, 6, 10-11, 14, 15).

B

All samples have values for B in Table 1 (Ball and Jenne, this volume). B concentrations (fig. 16) have a distribution not significantly different from lognormal (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). B has the sixth highest concentration (fig. 4) and the geometric mean B content is 13.2 mg/L (Table 3).

The B content of individual wells (fig. 17; tables 4-19) is variable. Most wells have B concentrations between 9 to 17 mg/L. The well with the highest B is M-45 which was also noted as having high concentrations of several other elements. Noteworthy reduction in B concentrations occurred with time in well M-35 (~6 percent per annum, Tables 15).

Sr

All samples have values for Sr (Table 1, Ball and Jenne, this volume). Sr concentrations (fig. 18) have a distribution not significantly different from normal (at the 1 percent level), despite a somewhat skewed appearance, of otherwise using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). Sr has the eighth highest concentration (fig. 4) and the mean Sr content is 6.74 mg/L (Table 3).

The Sr content of individual wells (fig. 19; tables 4-19) is variable. Most wells have Sr concentrations between 2 to 11 mg/L. Wells with the highest Sr are nos. M-114 and M-29. Noteworthy increase in Sr concentrations occurred with time in 1977-1979 in well M-5 (~91 percent per annum, Table 4).

Rb

All samples have values for Rb (Table 1, Ball and Jenne, this volume). Rb concentrations (fig. 20) have a distribution significantly different from normal or lognormal (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The distribution may be bimodal. Rb has the seventh highest concentration (fig. 4) and the mean Rb content is 11.2 mg/L (Table 3).

The Rb content of individual wells (fig. 21; tables 4-19) is variable. Most wells have Rb concentrations between 5 to 16 mg/L. Three wells (M-19A, M-21A, M-30) have the highest concentrations of Rb. Noteworthy decreases in Rb concentrations occurred with time in wells M-5 (~49 percent per annum, Table 4), M-11 (~54 percent per annum, Table 6) Ma-26 (~49 percent per annum, Table 10), M-27 and (-50 percent per annum, Table 11).

Ba

All samples have values for Ba (Table 1, Ball and Jenne, this volume). Ba concentrations (fig. 22) have a distribution not significantly different from lognormal (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Ba content is 0.65 mg/L (Table 3). Ba concentrations are comparable to As, Mg (condensed only), Fe, Pb, Se, Sb and Bi (figs. 4, 23) some of which have numerous observations below detection limits (Table 2).

The Ba content of individual wells (fig. 24; tables 4-19) is variable. Most wells have Ba concentrations between 0.3 to 1 mg/L. Two wells (M-19A, M-45) have higher concentrations of Ba. Noteworthy decreases in Ba concentrations occurred with time in 1977-1979 in well M-11 (~32 percent per annum, Table 6)

Fe

Fe was analyzed using two cassettes (designated Fe(1), and Fe(2)); the results varied as much as ±30 percent of the mean for the two values in the 1977-1978 samples (Jenne and Ball, 1983). Usually the value is expected to be 14 percent of the of the mean Fe of the two values based on data in Table 1 (see Ball and Jenne, this volume). The 95 percent confidence interval for Fe concentration of means was between 10 and 19 percent of the mean of the two values on the two cassettes. The maximum difference was 55 percent; the minimum was 0 percent. A comparison of the Fe values (fig. 23) between the two cassettes (after being transformed to log base 10) using a paired t-test suggests that there is no a significant difference in Fe concentrations (at the 1-percent level of confidence) made by the two cassettes for 1977-1979.

About a quarter of the samples have values below the detection limits for Fe (Table 2). Statistical analysis of the Fe(A) and Fe(B) values (fig. 25) shows that the data have a distribution not significantly different from lognormal (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Fe(A) and Fe(B) contents are 389 and 397 mg/L, respectively (Table 3). Fe concentrations are comparable to As, Ba, Mg (condensed only), Pb, Se, Sb and Bi (figs. 4, 23); also some of these elements also have numerous observations below detection limits (Table 2).

The Fe contents of individual wells have been combined (i.e, Fe(A) with Fe (2)) (fig. 26; tables 4-19). Three wells (M-114, M-130, M-45) lacked observations above detection limits (Table 2). Most wells have Fe concentrations between 100 µg/L and 1 mg/L. Noteworthy decreases in Fe concentrations occurred with time in 1977-1979 in wells M-5 (~150 percent per annum, (Fe(A) only; Table 4), and M-11 (~80 percent per annum, (Fe(A) only; Table 6).

Mn

All samples have values for Mn (Table 1, Ball and Jenne, this volume). Unlike other elements, the six flashed samples are orders-of-magnitude lower than condensed samples and are handled separately (see previous section on "CONDENSED AND FLASHED SAMPLES" for a discussion comparing these two sample types). Statistical analysis of the Mn concentrations (fig. 27) has a distribution not significantly different from lognormal (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The geometric mean Mn content is 553 µg/L (Table 3). Mn concentrations are comparable to As, Ba, Mg (condensed only), Fe, Pb, Se, Sb and Bi (figs. 4, 23) some of which have numerous observations below detection limits (Table 2).

Mn content of individual wells is given in figure 28 (also see Tables 4-19). Most wells had Mn concentrations between 100 to 1000 µg/L. Four wells, (M-11, M-130, M-19A, M-31, M-45) have concentrations greater than 1000 µg/L. A noteworthy increase in Mn concentration occurred with time in well M-11 (~24 percent per annum, Table 6) while a noteworthy decrease in the same time interval occurred in well M-26 (~29 percent per annum, Table 10).

Mo

Mo concentrations greater than detection limits were observed in 50 samples (Table 1, Ball and Jenne, this volume). Mo concentrations (fig. 29) have a distribution not significantly different from a normal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Mo content is 117 µg/L (Table 3). Mo concentrations are comparable to Zn (A),V, and Tl (fig. 23) of which some elements have numerous observations below detection limits (Table 2).

The Mo content of individual wells is given in figure 30 (also see tables 4-19). Most wells have Mo concentrations between 60 to 160 µg/L. Two wells (M-114, M-45) have the highest mean concentrations of Mo. No noteworthy changes in Mo concentrations occurred in wells with time (Tables 4, 6, 10-11, 14, 15).

Pb

Pb concentrations greater than detection limits were observed in 47 samples (Table 1, Ball and Jenne, this volume). Pb concentrations (fig. 31) have a distribution not significantly different from a normal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Pb content is 602 µg/L (Table 3). Pb concentrations are comparable to As, Ba, Mg, Fe, Mn, Se, Sb, and Bi (figs. 4, 23); some of which have numerous observations below detection limits (Table 2).

The Pb content of individual wells is given in figure 32 (also see tables 4-19). Most wells have mean Pb concentrations between 400 to 850 µg/L. No noteworthy changes in Pb concentrations occurred in wells with time in 1977-1979 (Tables 4, 6, 10-11, 14, 15).

Tl

Tl concentrations greater than detection limits was observed in 45 samples (Table 1, Ball and Jenne, this volume). Statistical analysis of the Tl concentrations (fig. 33) shows that the data have a distribution not significantly different from a normal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Tl content is 120 µg/L (Table 3). Tl concentrations are comparable to Zn (1), Mo, V, and Al (fig. 23) some of which have numerous observations below detection limits (Table 2).

The Tl content of individual wells is given in figure 34 (also see tables 4-19). Most wells have Tl concentrations between 70 to 160 µg/L. Noteworthy decreases in Tl concentration occurred with time in 1977-1979 in well M-11 (~82 percent per annum, Table 6) and in well M-26 (~27 percent per annum, Table 10).

Other elements

Elements with 25 percent or more observations less than the detection limits (Zn, Co, Cr, Ni, V, Cd, Cu, As, Se, Sb, Bi, Hg, and Al) are summarized here and are given in the same order as elements are listed in Table 1. The statistics are not adjusted for truncation. See Figure 23 and Table 3 for summary statistics for each element and Tables 4-19 for concentrations found in individual wells.

Zn, like Fe and Cu, were analyzed using two cassettes. Ball and Jenne (1983) noted that Zn values (e.g, designated Zn(A), and Zn(B)) tend to be lower on cassette B. A comparison of the Zn values (fig. 23) between the two cassettes (after transformed to log base 10) using a paired t-test suggests that Zn(A) was significantly higher than Zn(B) (at the 1-percent level of significance) made by the two cassettes for 1977-1979. Usually the value is expected to be 45 percent of the mean Zn of the two values based on data in Table 1 (see Ball and Jenne, this volume). The 95 percent confidence interval for Zn concentration of means was between 32 and 58 percent of the mean of the two values on the two cassettes. The maximum difference was 79 percent; the minimum was 11 percent. See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for Zn(A) and Zn (B).

Co concentrations above detection levels were observed in 37 samples. Co concentrations have a distribution not significantly different from a normal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Co content is 52.0 µg/L (Table 3). Co concentrations are comparable to Zn (B), Bi, and Hg (fig. 23) of which some elements have numerous observations below detection limits (Table 2). See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for Co.

Cr concentrations above detection levels were observed in 41 samples. Cr concentrations shows have a distribution not significantly different from a normal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Cr content is 43.0 µg/L (Table 3). Cr concentrations are comparable to Zn (B), Ni, Bi, and Hg (fig. 23) of which some elements have numerous observations below detection limits (Table 2). See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for Cr.

Ni concentrations above detection levels were observed in 36 samples. Ni concentrations have a distribution not significantly different from a normal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Ni content is 33.5 µg/L (Table 3). Ni concentrations are comparable to Zn (2), Co, and Bi (fig. 23) of which some elements have numerous observations below detection limits (Table 2). See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for Ni.

V concentrations above detection levels were observed in 41 samples. V concentrations shows that the data have a distribution not significantly different from a normal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean V content is 81.1 µg/L

(Table 3). V concentrations are comparable to Zn (A), Bi and Al (fig. 23) of which some elements have numerous observations below detection limits (Table 2). See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for V.

Cd concentrations above detection levels were observed in 31 samples. Cd concentrations have a distribution not significantly different from a lognormal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Cd content is 13.3 µg/L (Table 3). Cd concentrations are low, and not comparable to other elements (fig. 23). See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for Cd.

Cu, like Fe and Zn, was analyzed using two cassettes. All concentrations for one cassette are below detection limits (Table 2). For the second cassette, where the results were designated as Cu (B), 3 samples had concentrations above detection levels. The mean Cu (B) content of these three observations is 4.0 µg/L (Table 3). Cu (B) concentrations are not comparable to any other element observed (fig. 23). See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for Cu (B).

As was detection levels in 39 samples and concentrations have a distribution not significantly different from a lognormal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The geometric mean As content is 964 µg/L (Table 3). It ranks ninth in concentration among the elements analyzed. As concentrations are comparable to Ba and Mn (fig. 23). See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for As.

Se concentrations above detection levels were observed in 40 samples. Se concentrations have a distribution not significantly different from a lognormal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Se content is 294 µg/L (Table 3). Se concentrations are comparable to Ba (fig. 4), Fe, Mn, Pb, Bi, and Al (fig. 23) of which some elements have numerous observations below detection limits (Table 2). Noteworthy decreases in Se concentration occurred (based on just three observations) with time in 1977-1979 in well M-27 (~86 percent per annum, Table 11). See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for Se.

Sb concentrations above detection levels were observed in 24 samples. Sb concentrations shows that the data have a distribution not significantly different from a normal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Sb content is 552 µg/L (Table 3). Sb concentrations are comparable to Ba (fig. 4), Mg, Fe, Mn (condensed), and Pb (figs. 4, 23) of which some elements have numerous observations below detection limits (Table 2). See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for Sb.

Bi concentrations above detection levels were observed in 13 samples. Bi has a distribution not significantly different from a normal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Bi content is 272 µg/L (Table 3). Bi concentrations have a wide range (fig. 23). See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for Bi.

Hg concentrations above detection levels were observed in 3 samples. The mean Hg content of the three observations is 65 µg/L (Table 3). Hg concentrations are comparable to V and Zn(A) (fig. 23) of which some elements have numerous observations below detection limits (Table 2). See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for Hg.

Al concentrations above detection levels were observed in 11 samples. Al have a distribution not significantly different from a normal distribution (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). The mean Al content is 105 µg/L (Table 3). Al concentrations are comparable to Hg, Bi, Tl, V, Mo, and Zn(A) (fig. 23) of which some elements have numerous observations below detection limits (Table 2). See Table 3 for summary statistics and Tables 4-19 for concentrations found in individual wells for Al.

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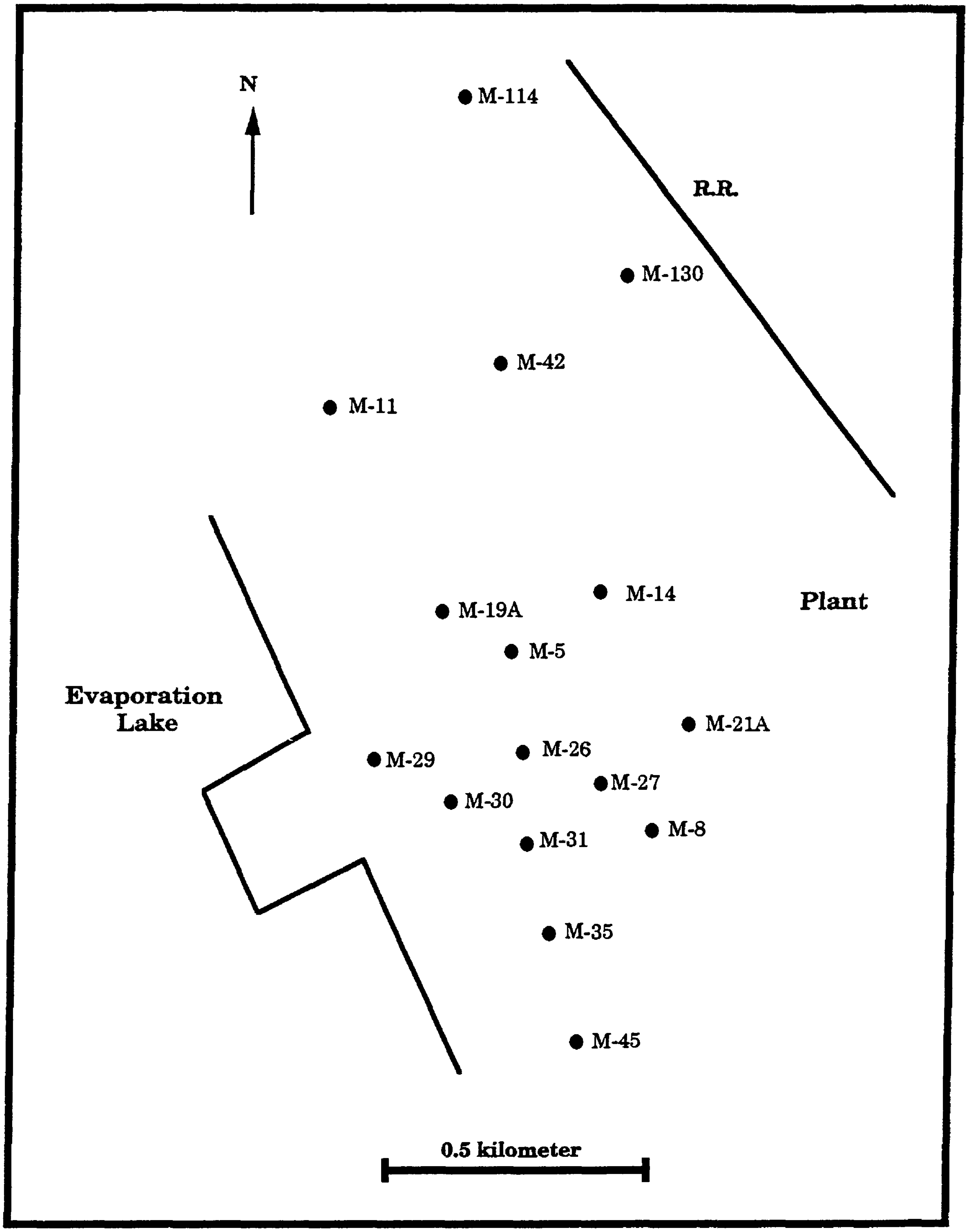


Figure 1. Location of selected geothermal wells in the Cerro Prieto geothermal field, Mexico

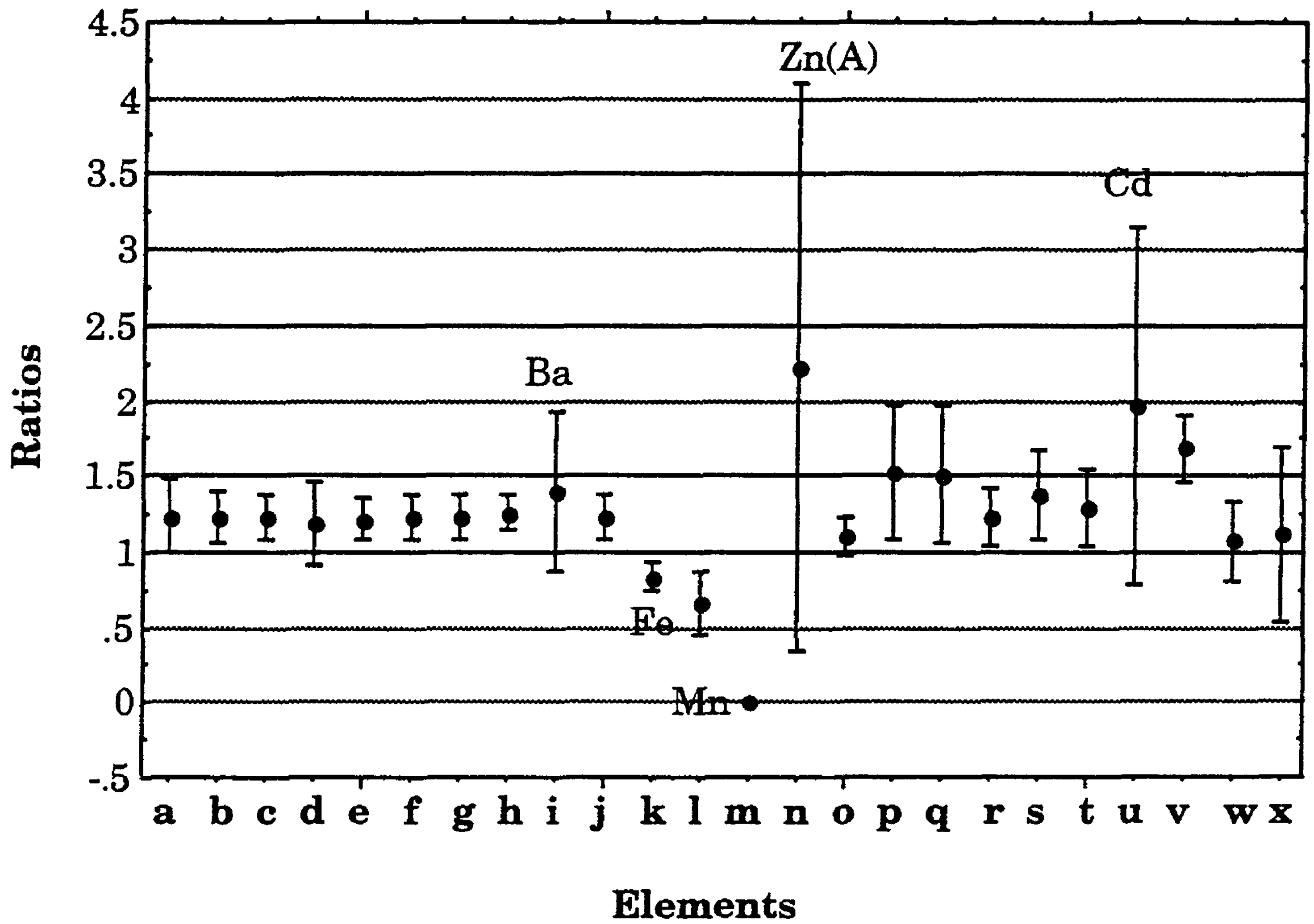


Figure 2. Ratio of concentrates in four flashed samples over corresponding condensed samples in well nos. M-19A, M-26, M-27 (missing Mg value), and M-30; Elements assigned to alphabetic codes are as follows: a--Na; b--K; c--Ca; d--Mg; e--SiO2; f--Li; g--B; h--Sr; i--Ba; j--Rb; k--Fe(A); l--Fe (B); m--Mn; n--Zn(A); o--Mo; p--Co; q--Cr; r--Pb; s--Ni; t--V; u--Cd; v--Tl; w--As; x--Se. Error base are one standard deviation from means.

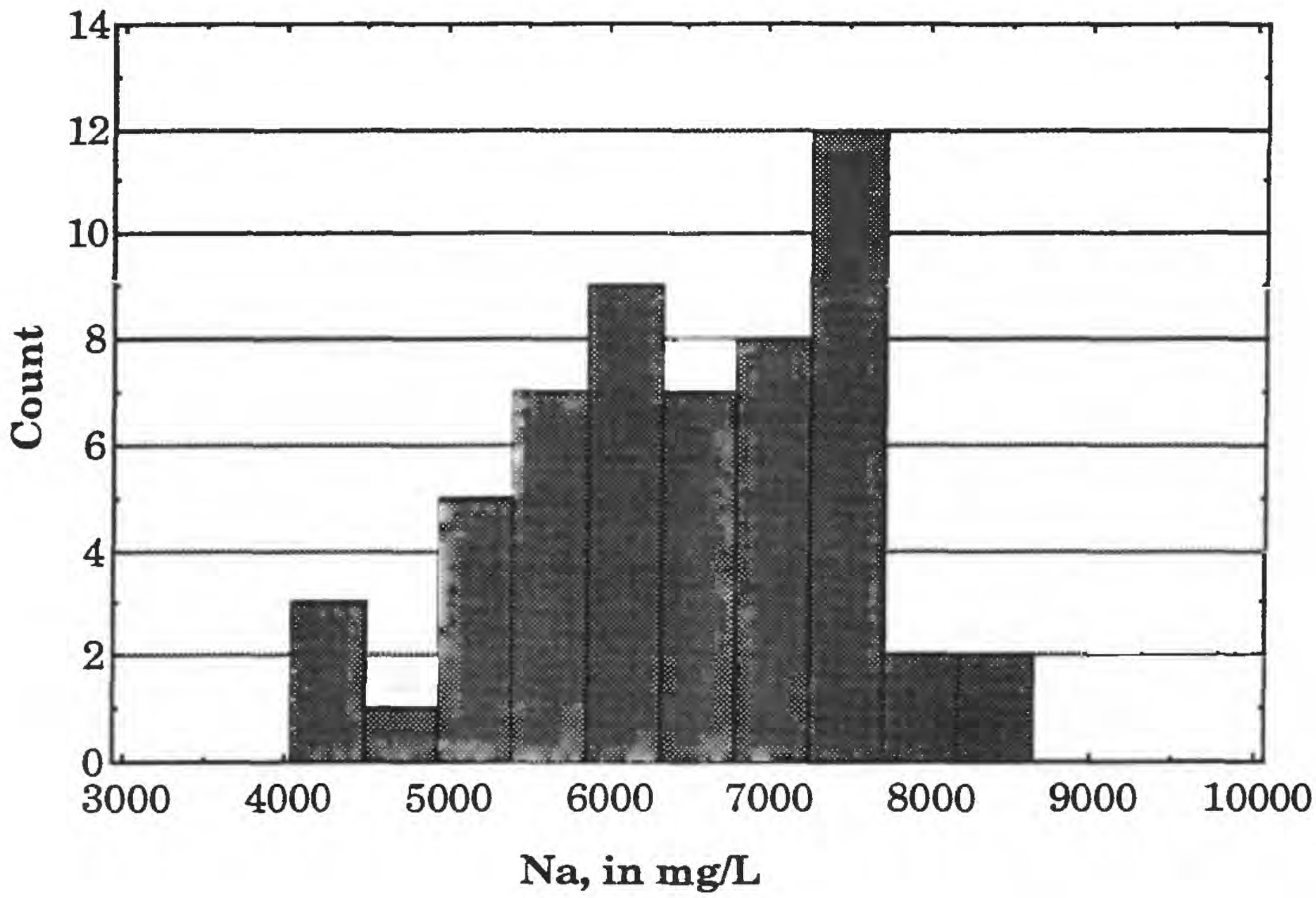


Figure. 3. Bar diagram giving Na content (mg/L) in samples listed in Table 1 (see Ball and Jenne, this volume) collected from 16 wells at Cerro Prieto geothermal field in 1977-1979. See Table 3 for summary statistics.

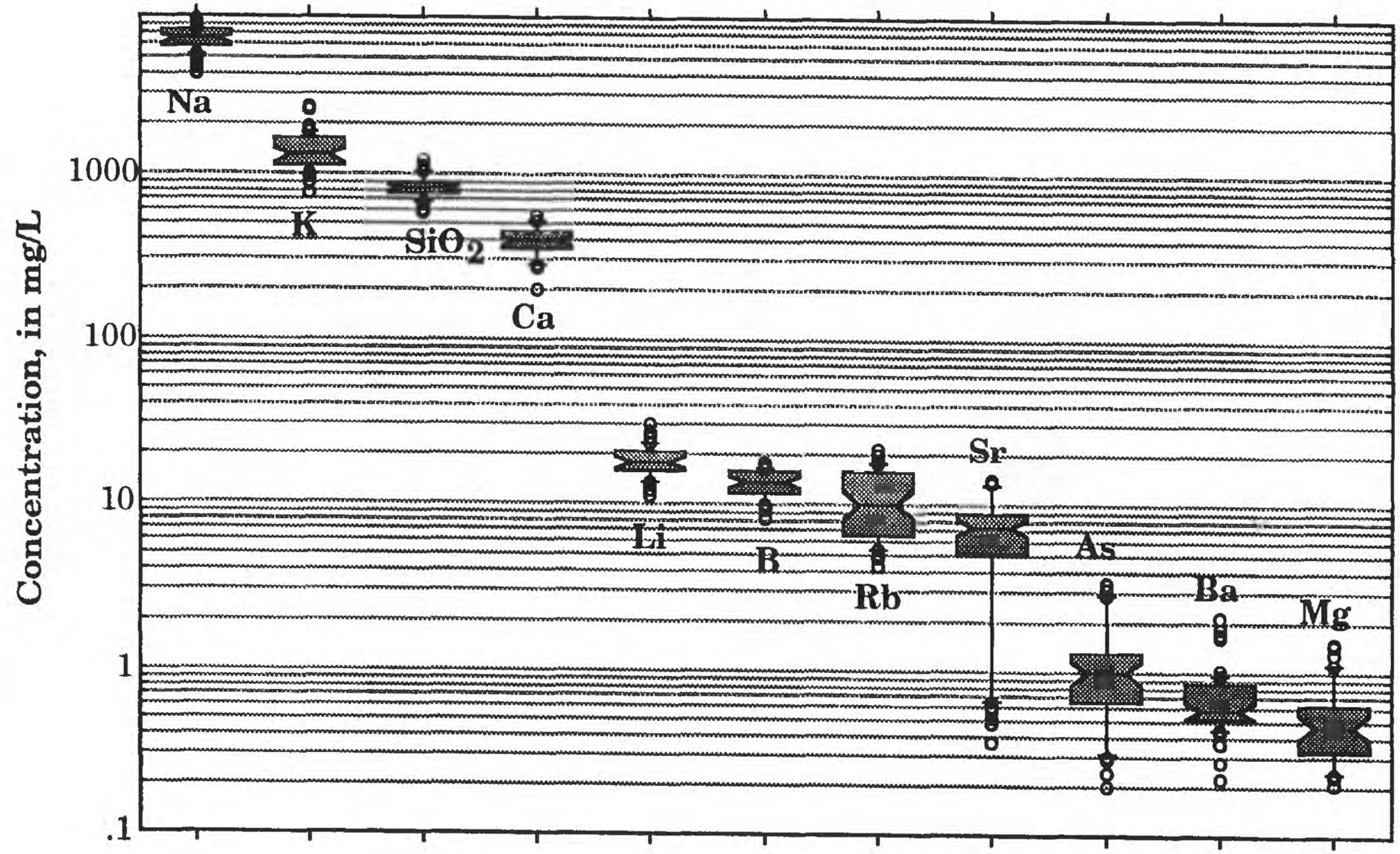


Figure 4. Notched box-and-whisker plots of Na, K, Ca, SiO2, Ca, Li, B, Rb, Sr, As, Ba, and Mg content of 56 samples collected in 1977-1979 from 16 wells at the Cerro Prieto geothermal field, Mexico. Five horizontal lines on the boxes and whiskers give the 10, 25, 50, 75, and 90th percentiles. The boxes are notched at the median and return to full width at the lower and upper 95 percent confidence interval values. Values outside of the 10th and 90th percentiles and shown as points.

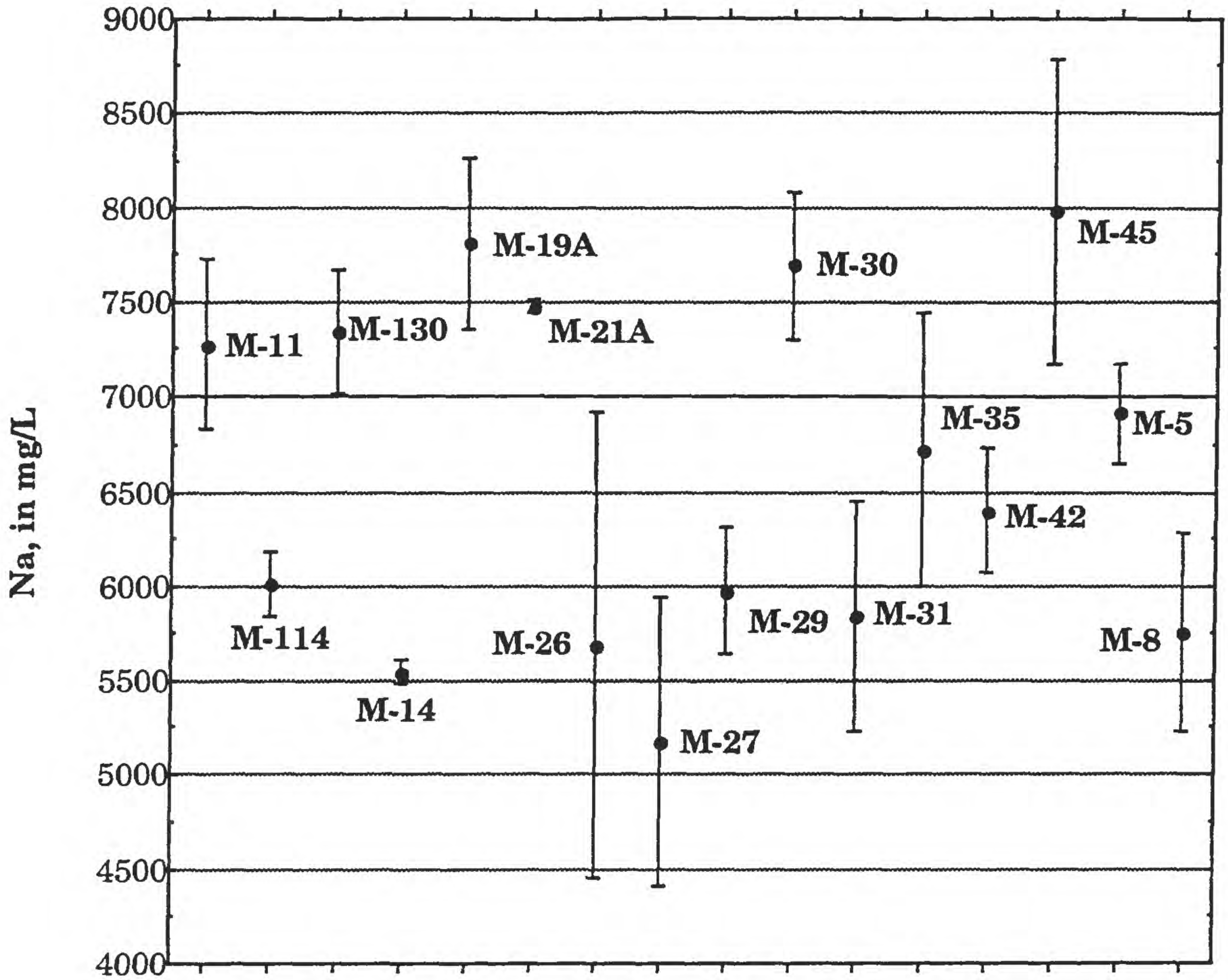


Figure 5. Na content by geothermal well in the study at the Cerro Prieto geothermal field, Mexico for samples collected in 1977-1979. All sample types included. Error bars are one standard deviation from means.

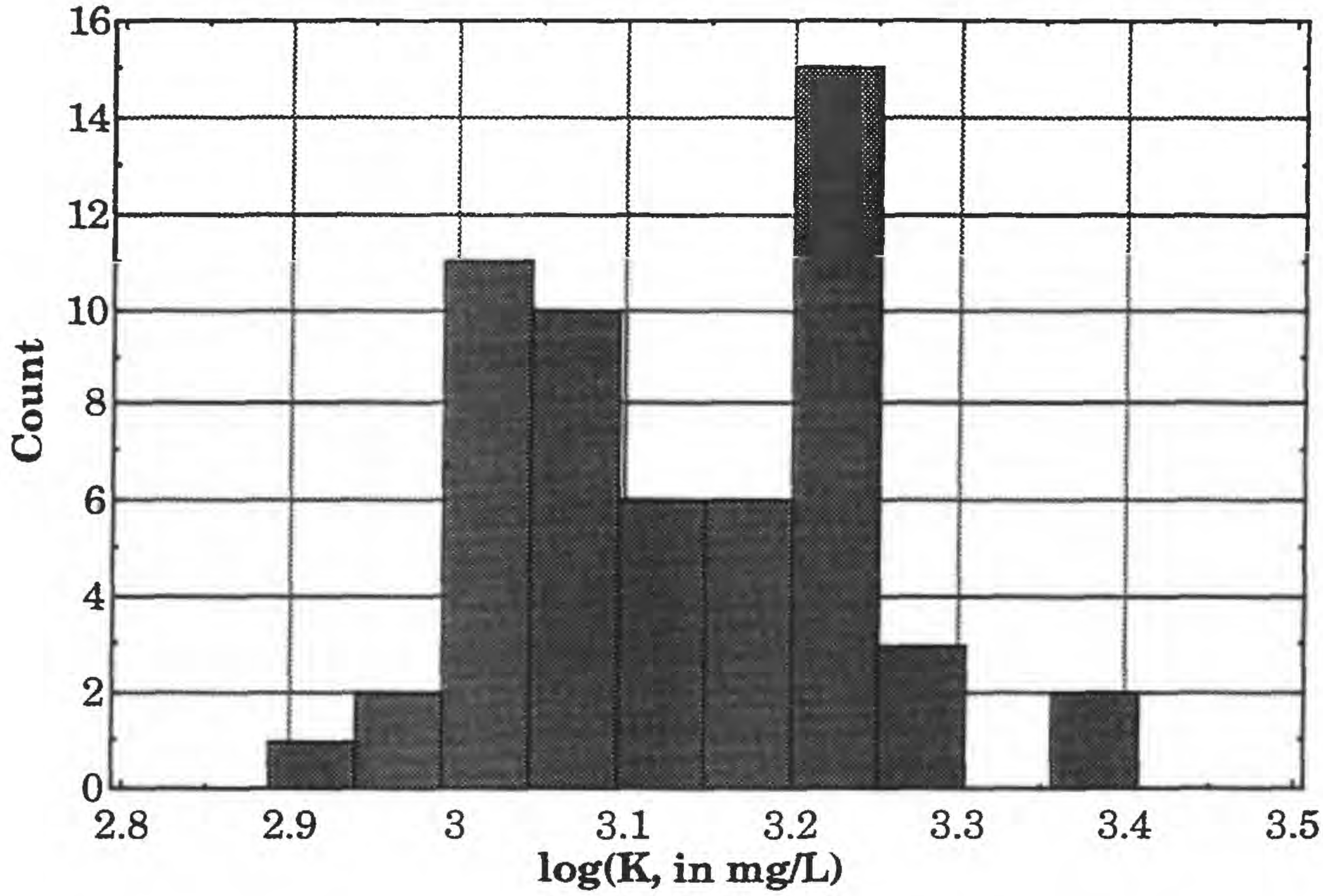


Figure 6. Bar diagram giving K content (mg/L) in samples listed in Table 1 (see Ball and Jenne, this volume) and collected from 16 wells at the Cerro Prieto geothermal field, Mexico, in 1977-1979. See Table 3 for summary statistics.

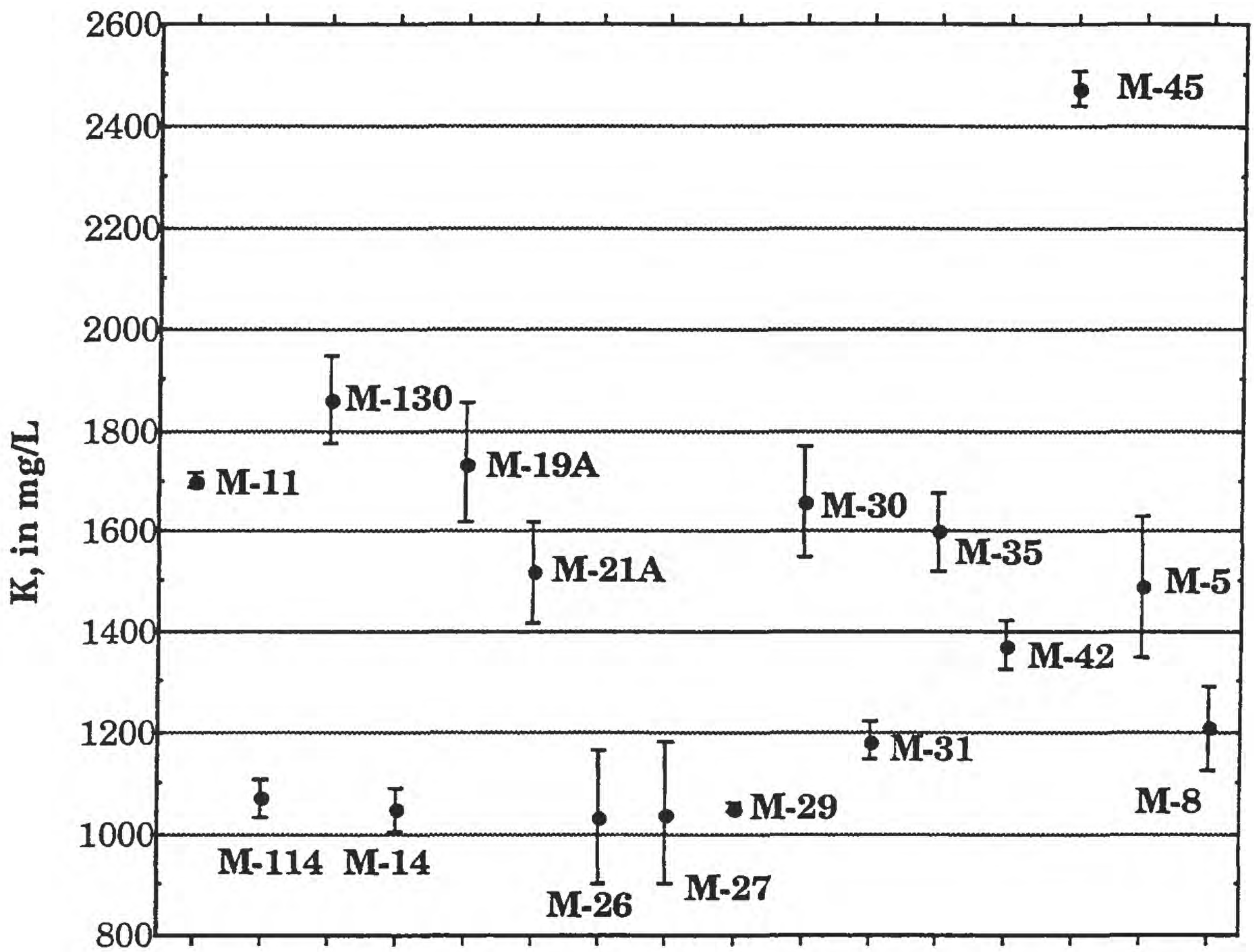


Figure 7. K content by geothermal well. See tables 4-19 for summary statistics for each well. All sample types included. Error bars are one stardard deviations from means.

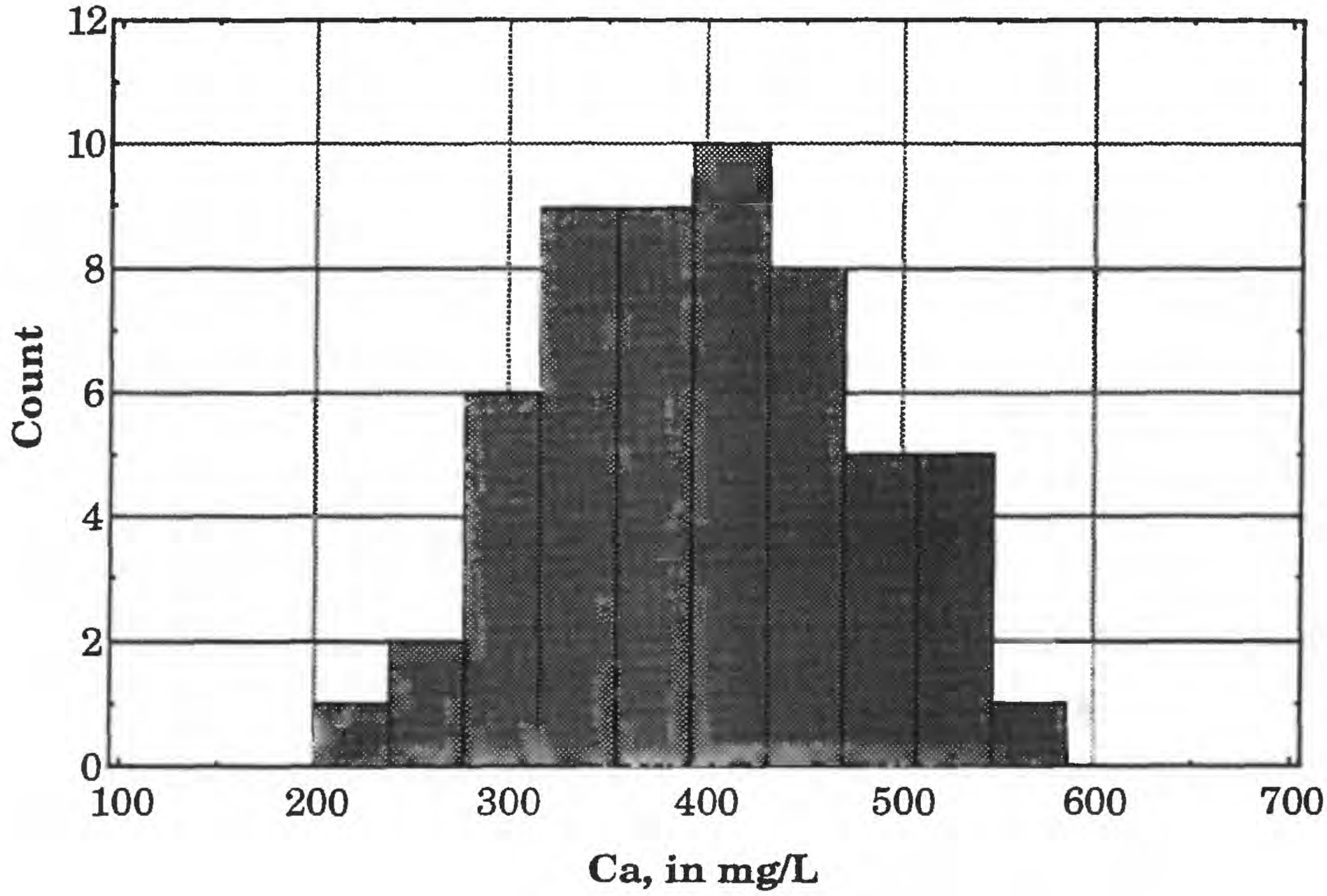


Figure 8. Bar diagram giving Ca concentrations (mg/L) in samples listed in Table 1 (see Ball and Jenne, this volume) collected from 16 wells at Cerro Prieto geothermal field in 1977-1979. See Table 3 for summary statistics.

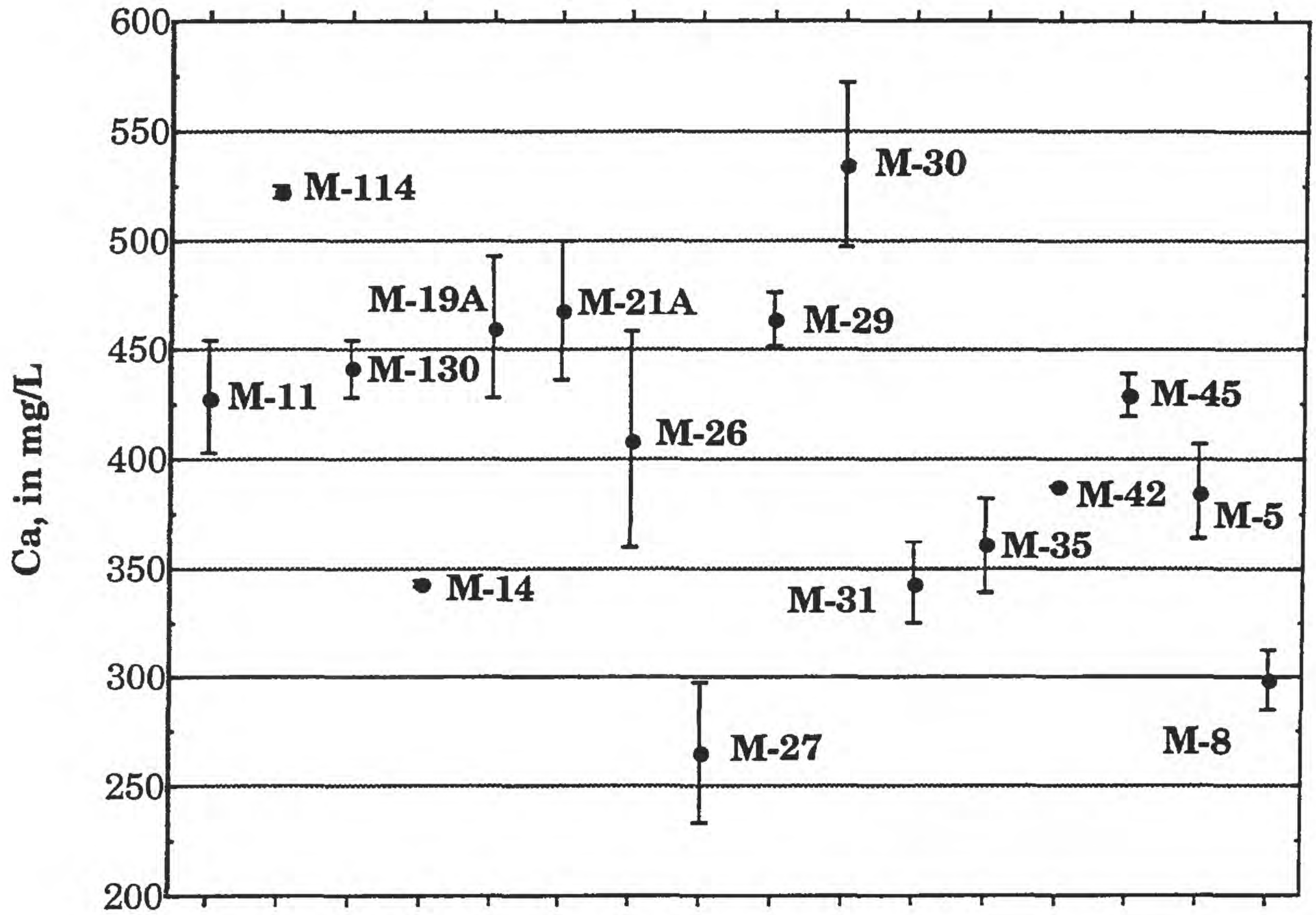


Figure 9. Ca content (mg/L) by geothermal well. See table 4-19 for summary statistics for individual wells. All sample types included. Error bars are one standard deviation from means.

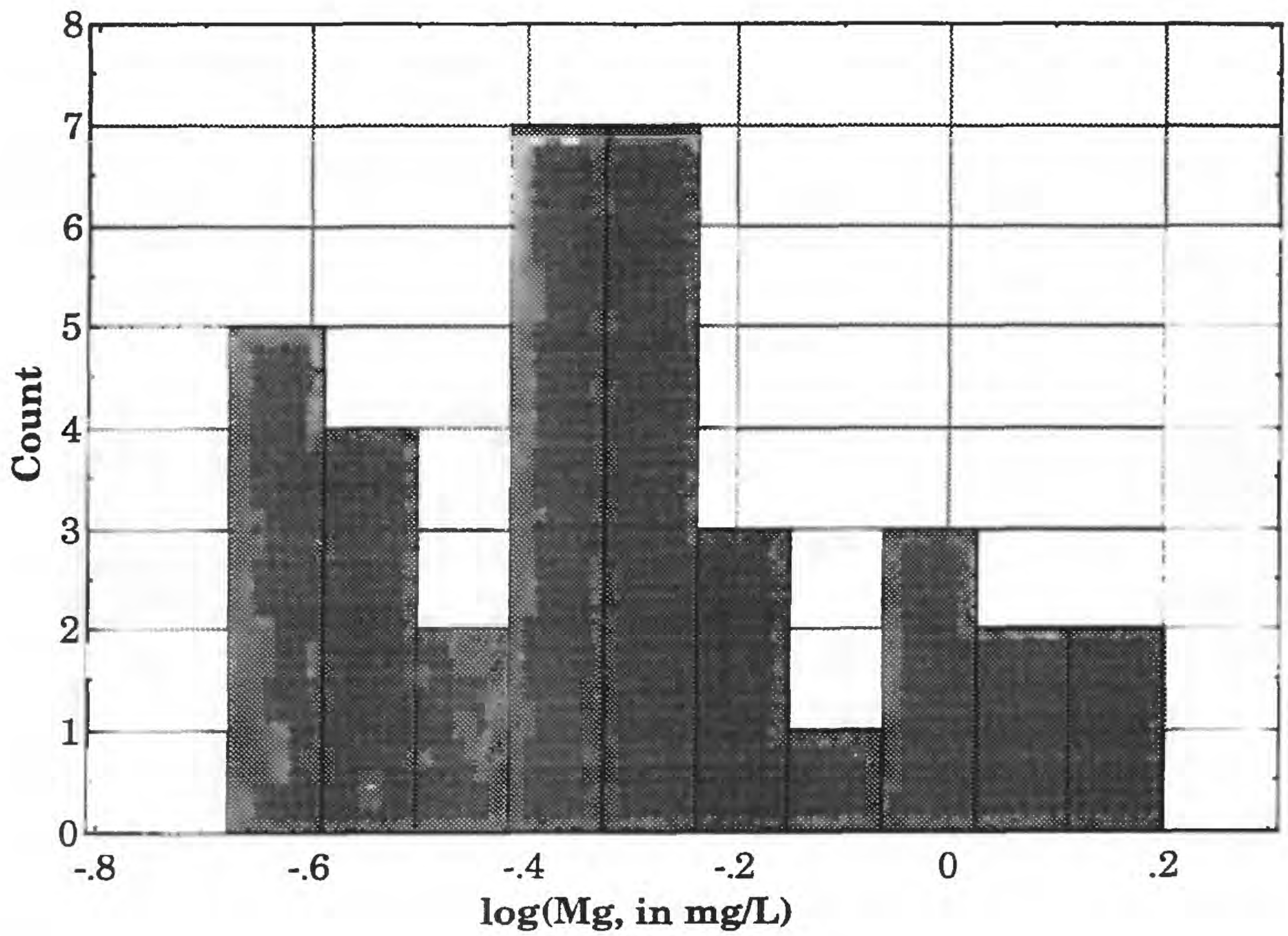


Figure 10. Bar diagram giving Mg content (mg/L) in 36 samples listed in Table 1 (see Ball and Jenne, this volume) and collected from 16 wells at the Cerro Prieto geothermal field in 1977-1979. See Table 3 for summary statistics.

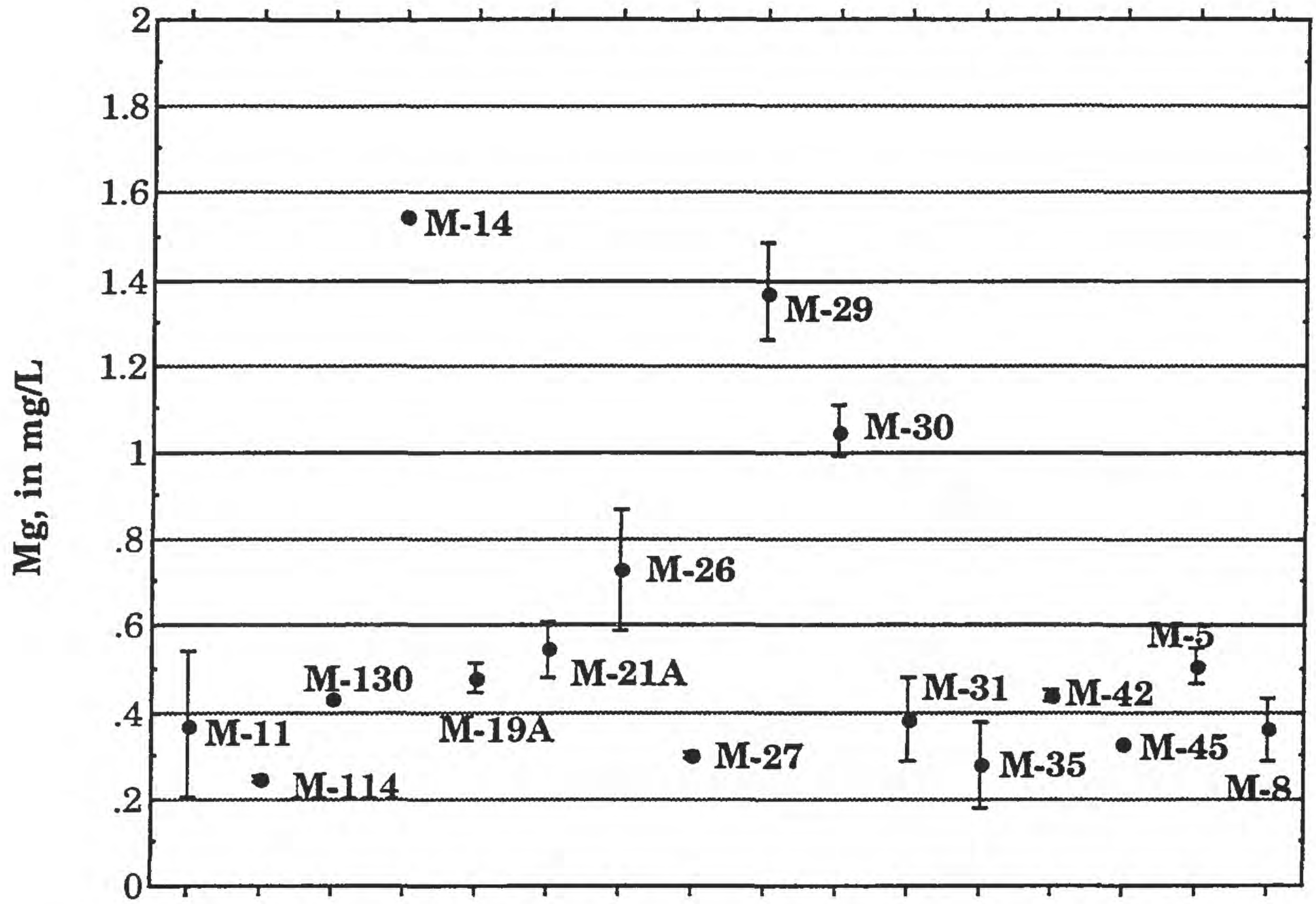


Figure 11. Mg content (mg/L) by geothermal well. See table 4-19 for summary statistics of individual wells. All sample types included. Error bars are one standard devation from means.

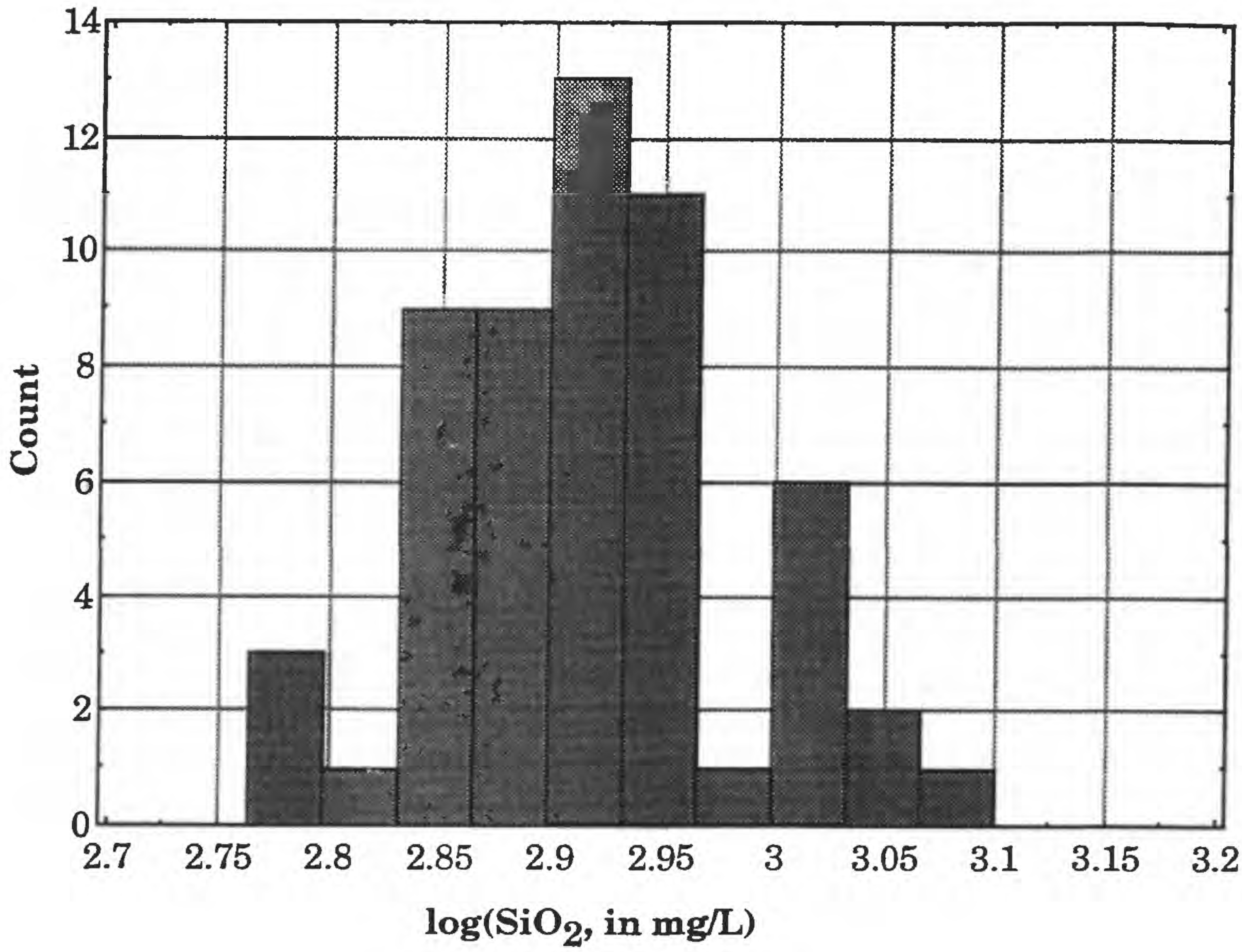


Figure 12. Bar diagram giving SiO2 content (mg/L) in 56 samples listed in Table 1 (see Ball and Jenne, this volume) and collected from 16 wells in the Cerro Prieto geothermal field in 1977-1979. See Table 3 for summary statistics.

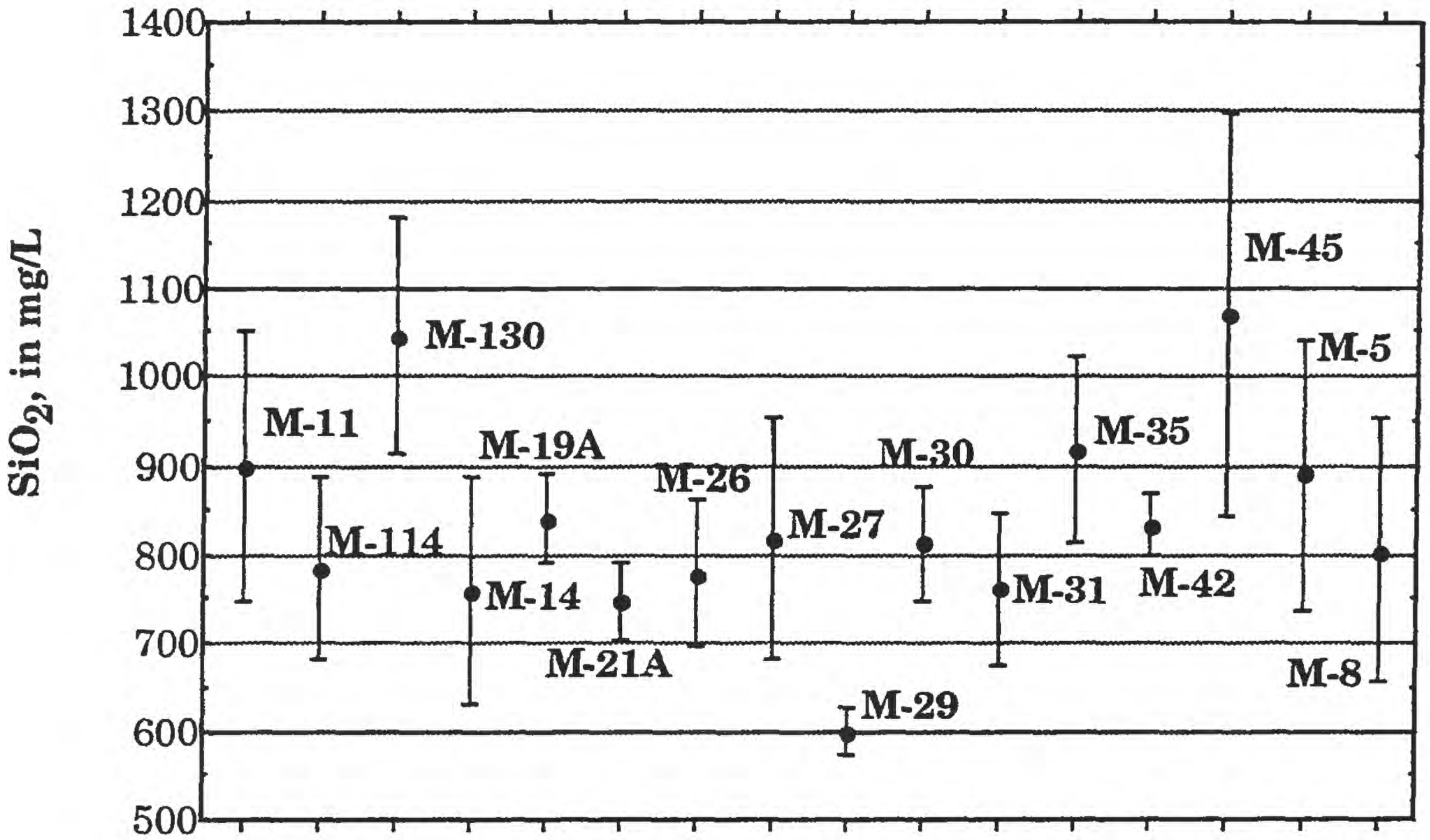


Figure 13. SiO2 content by geothermal well. See Tables 4-19 for summary statistics of individual wells located on figure 1. All sample types included. Error bars are one standard devation from means.

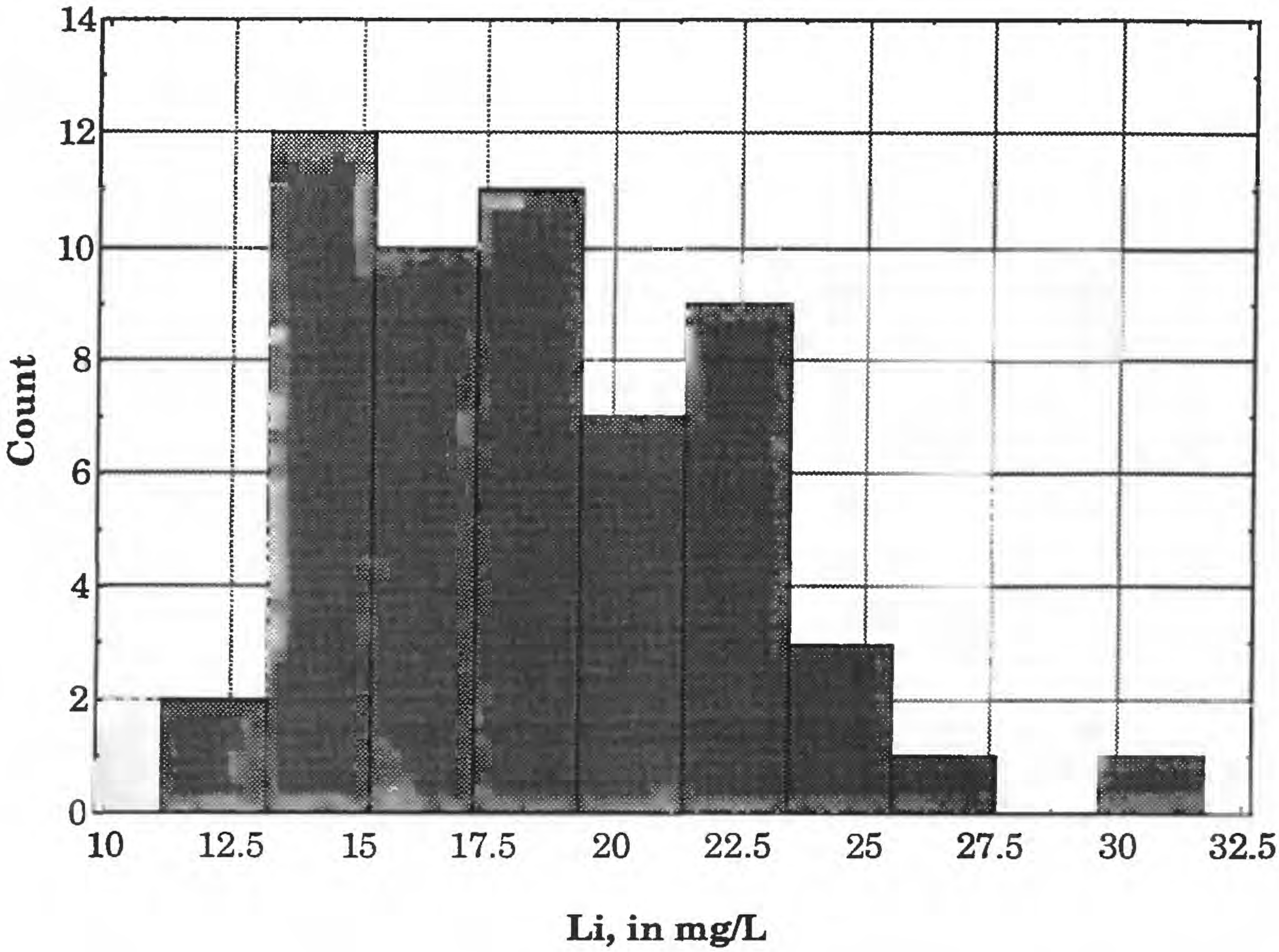


Figure 14. Bar diagram giving Li content (mg/L) in 36 samples listed in Table 1 (see Ball and Jenne, this volume) and collected from 16 wells in the Cerro Prieto geothermal field during 1977-1979. See Table 3 for summary statistics.

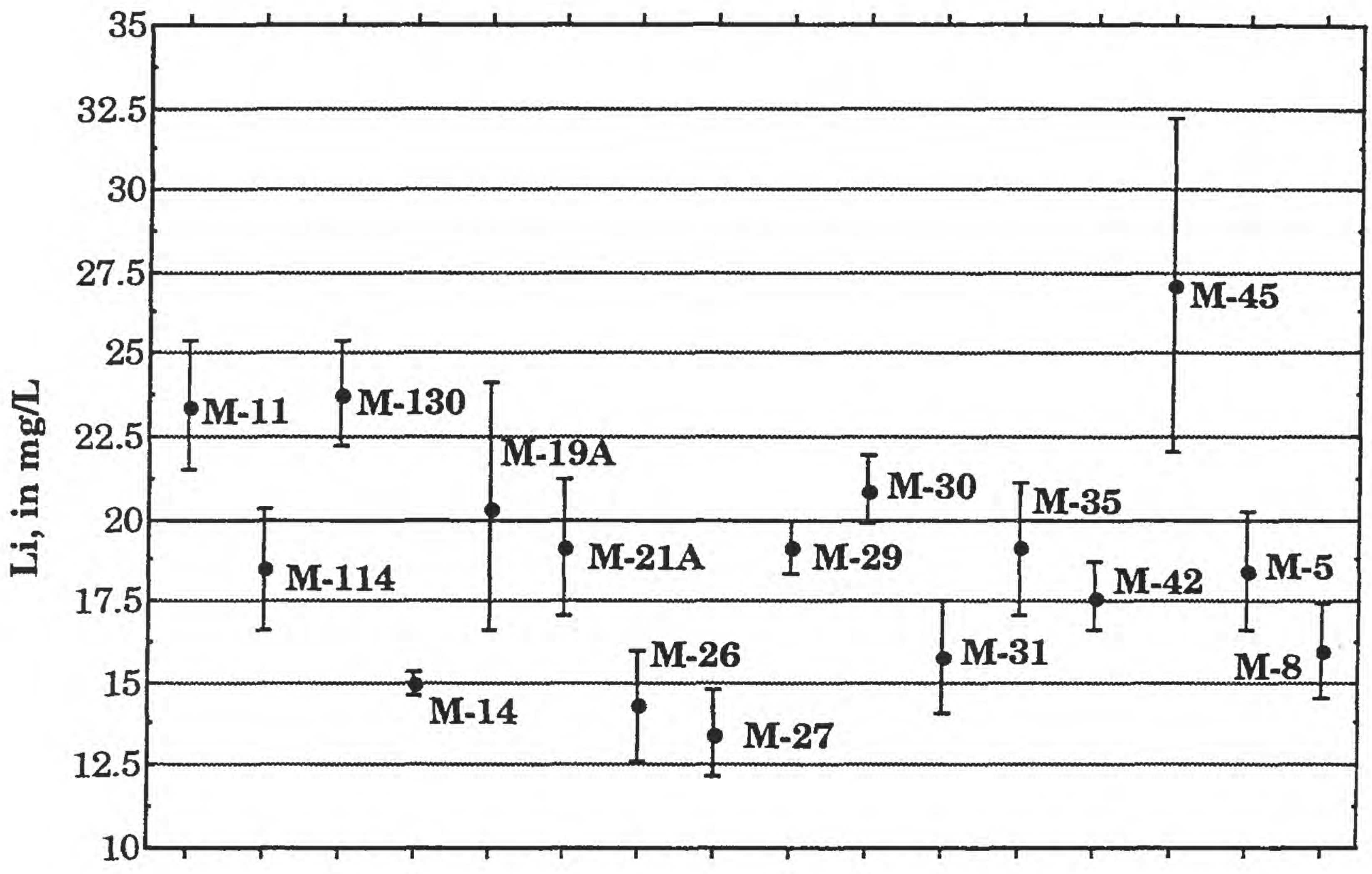


Figure 15. Li content (mg/L) by geothermal well. See Tables 4-19 for summary statistics of individual wells located on figure 1. All sample types included. Error bars are one standard deviation.

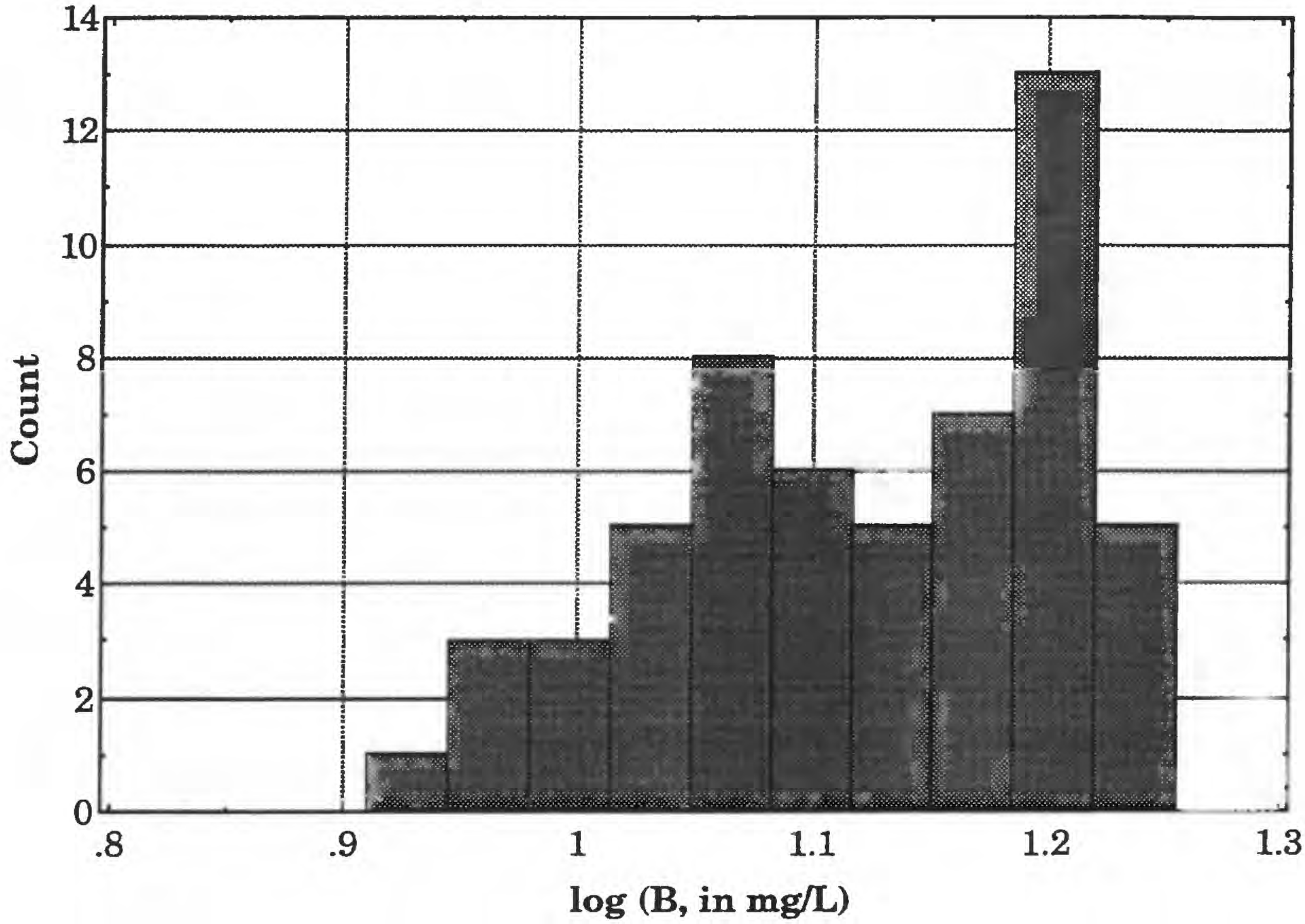


Figure 16. Bar diagram giving B content (mg/L) in 36 samples listed in table 1 (see Ball and Jenne, this volume) and collected from 16 wells in the Cerro Prieto geothermal field, Mexico, during 1977-1979. See Table 3 for summary statistics.

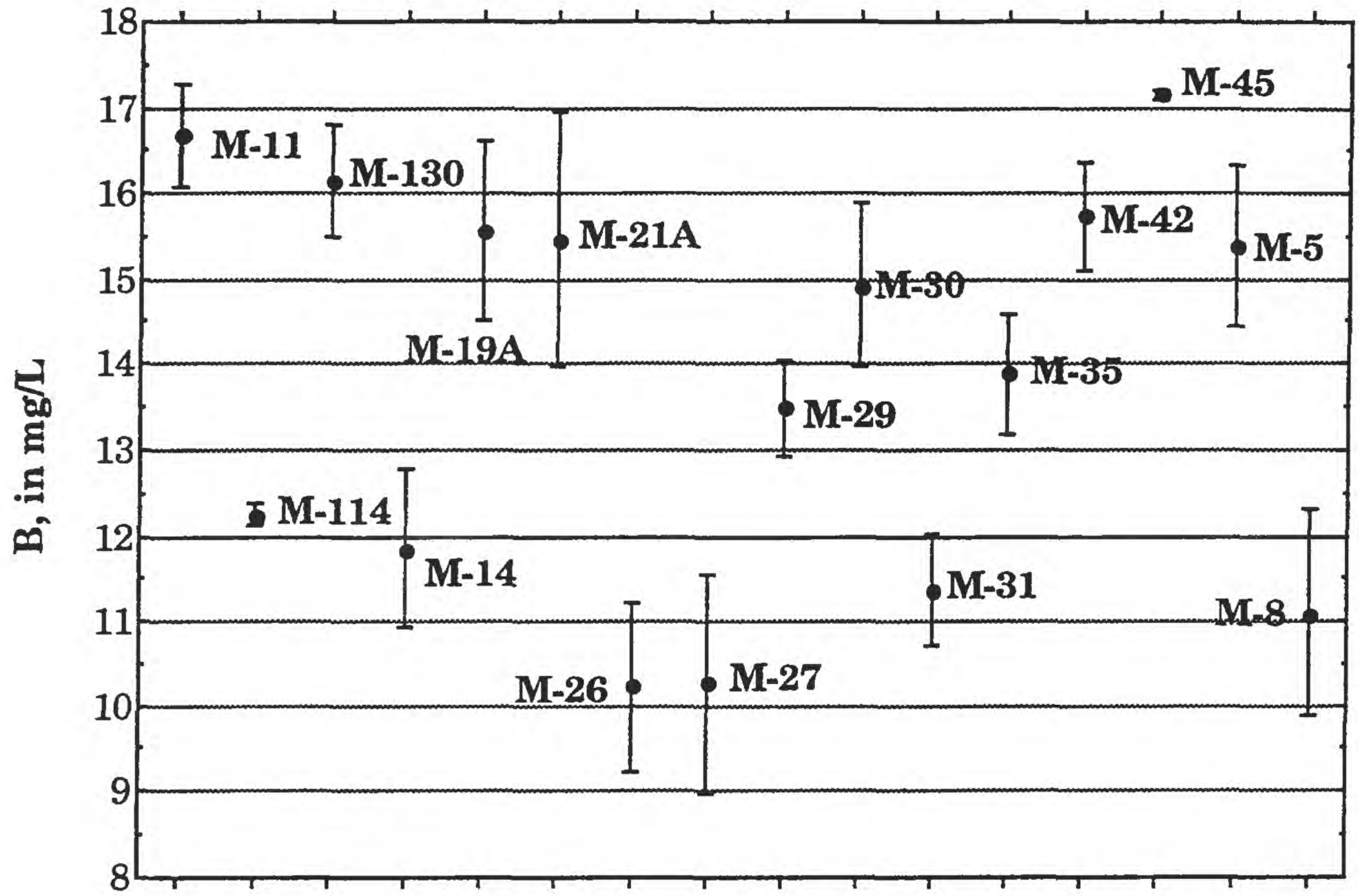


Figure 17. B content (mg/L) by geothermal well. See Tables 4-19 for summary statistics of individual wells located on figure 1. All sample types included. Error bars are one standard deviation.

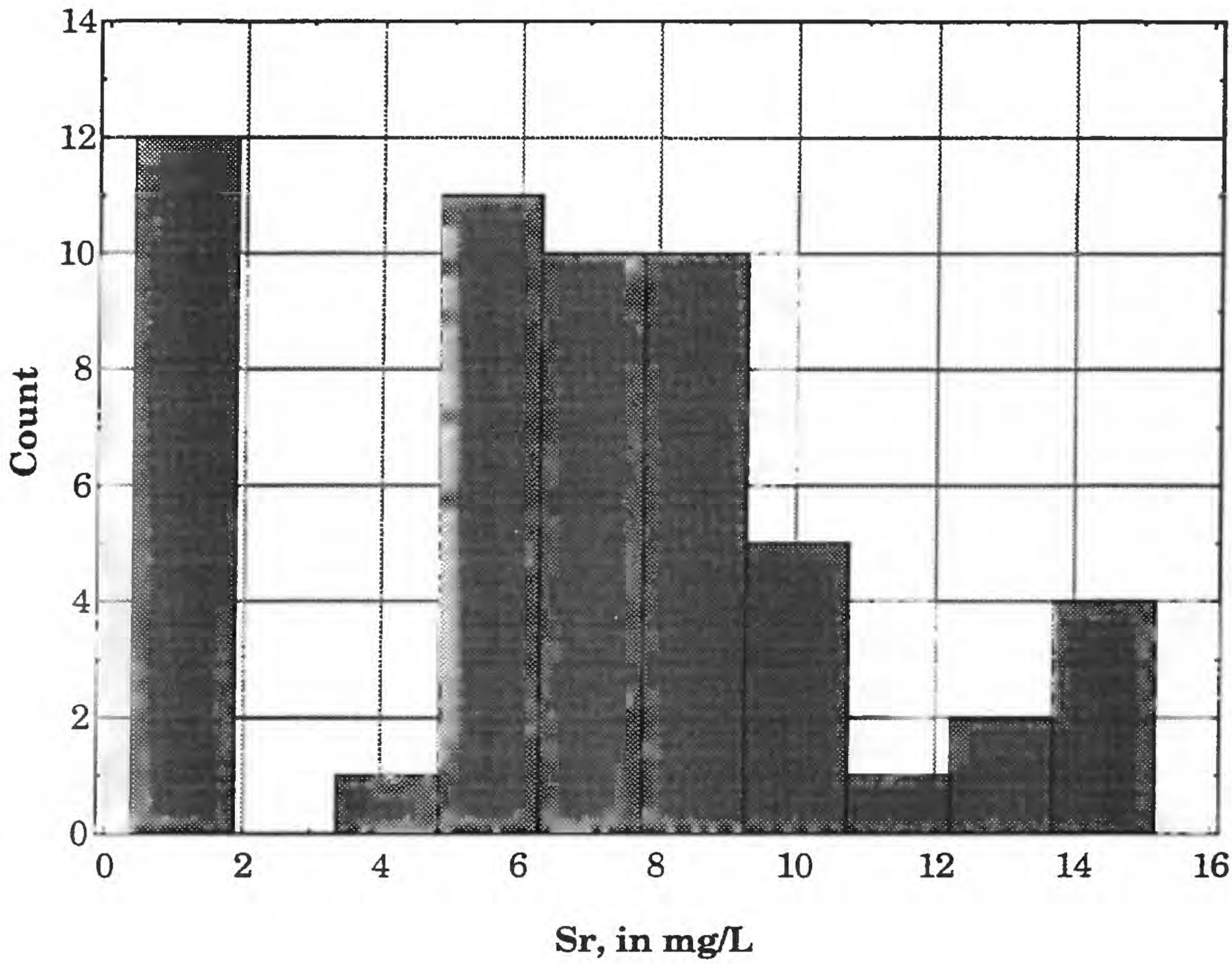


Figure 18. Bar diagram giving Sr content (mg/L) in 36 samples listed in Table 1 (see Ball and Jenne, this volume) and collected from 16 wells in the Cerro Prieto geothermal field, Mexico, during 1977-1979. See Table 3 for summary statistics.

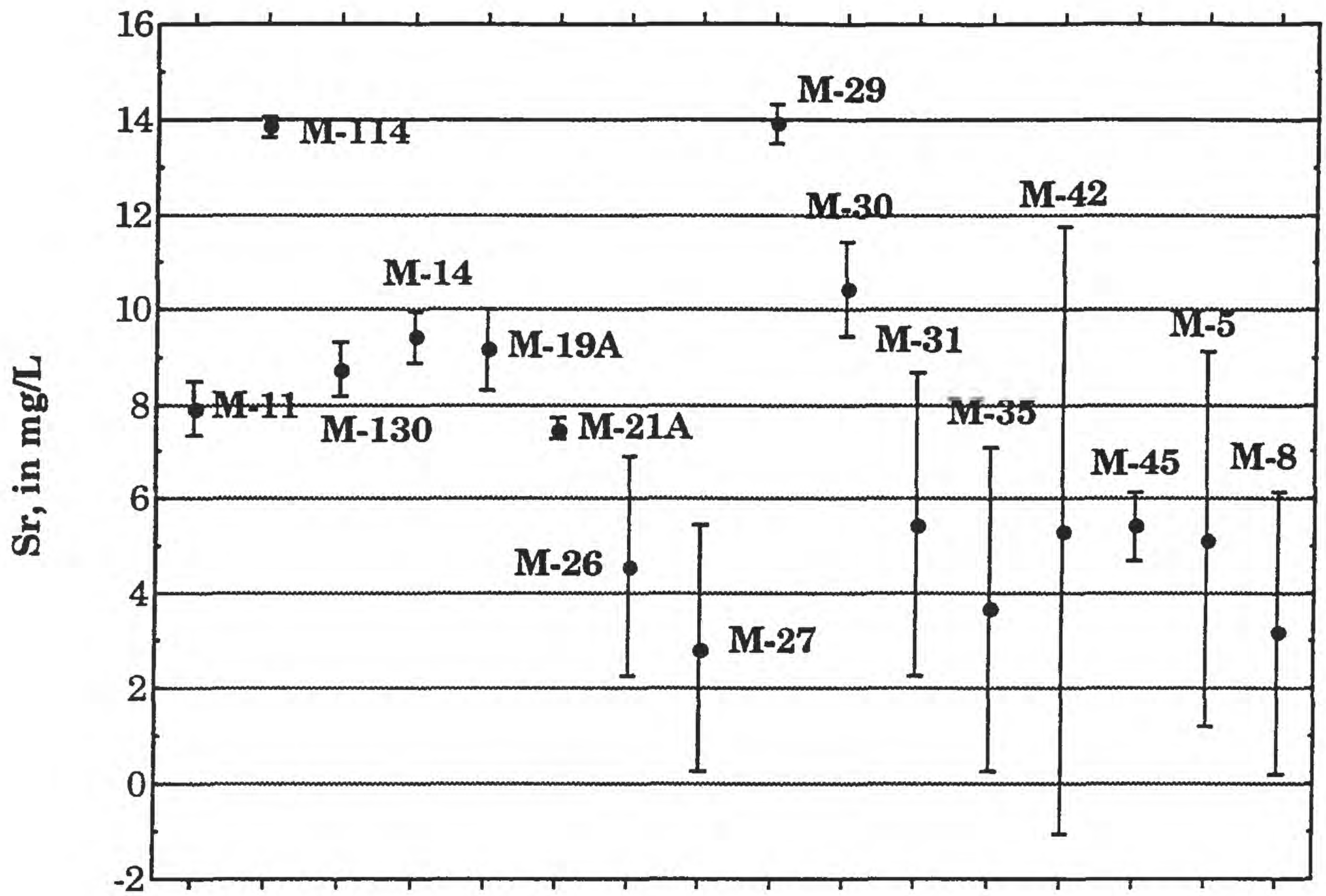


Figure 19. Sr content (mg/L) by geothermal well. See Tables 4-19 for summary statistics of individual wells located in figure 1. All sample types included. Error bars are one standard deviation.

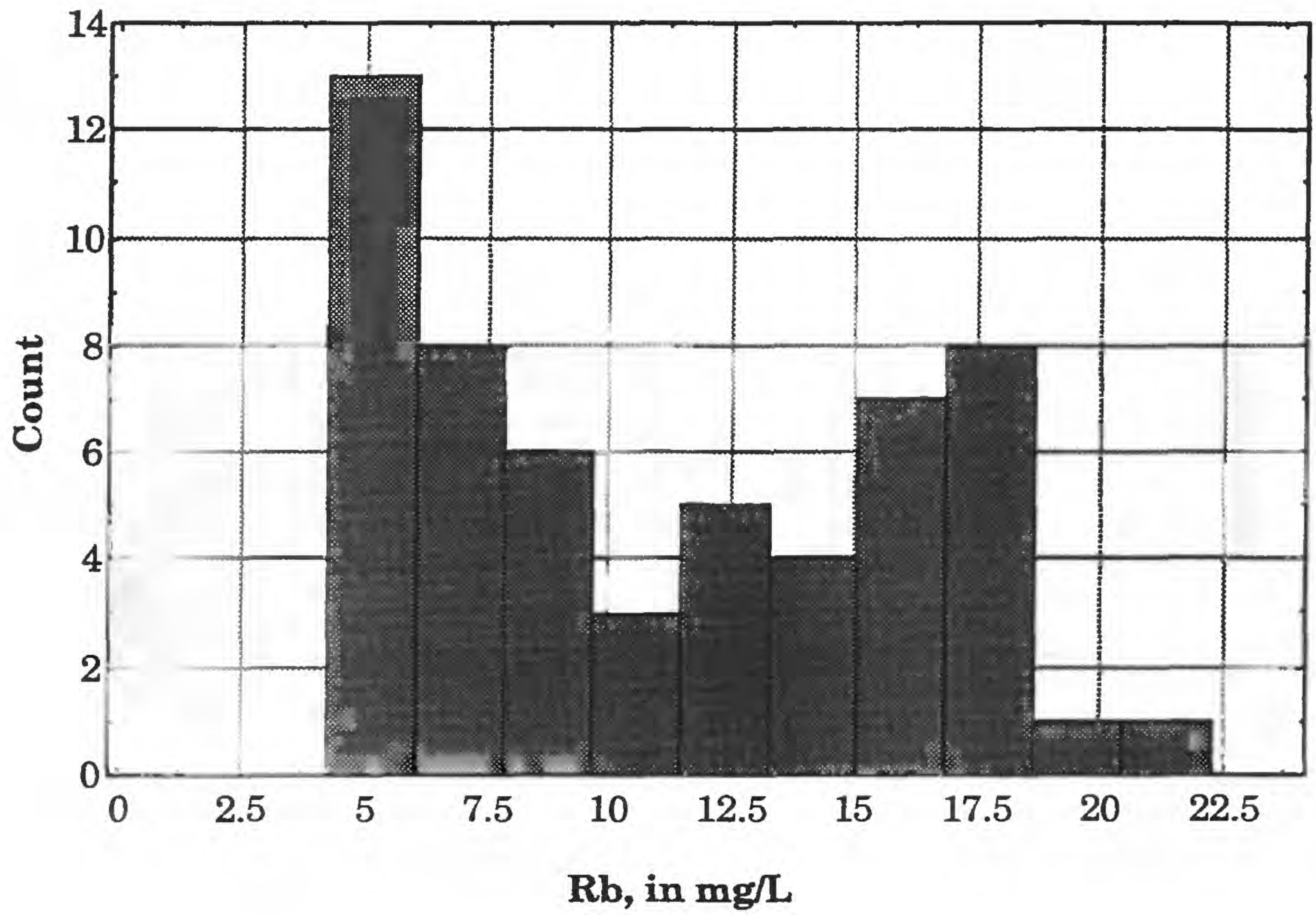


Figure 20. Bar diagram giving Rb content (mg/L) in 36 samples listed in Table 1 (see Ball and Jenne, this volume) and collected from 16 wells in the Cerro Prieto geothermal field, Mexico, in 1977-1979. See Table 3 for summary statistics.

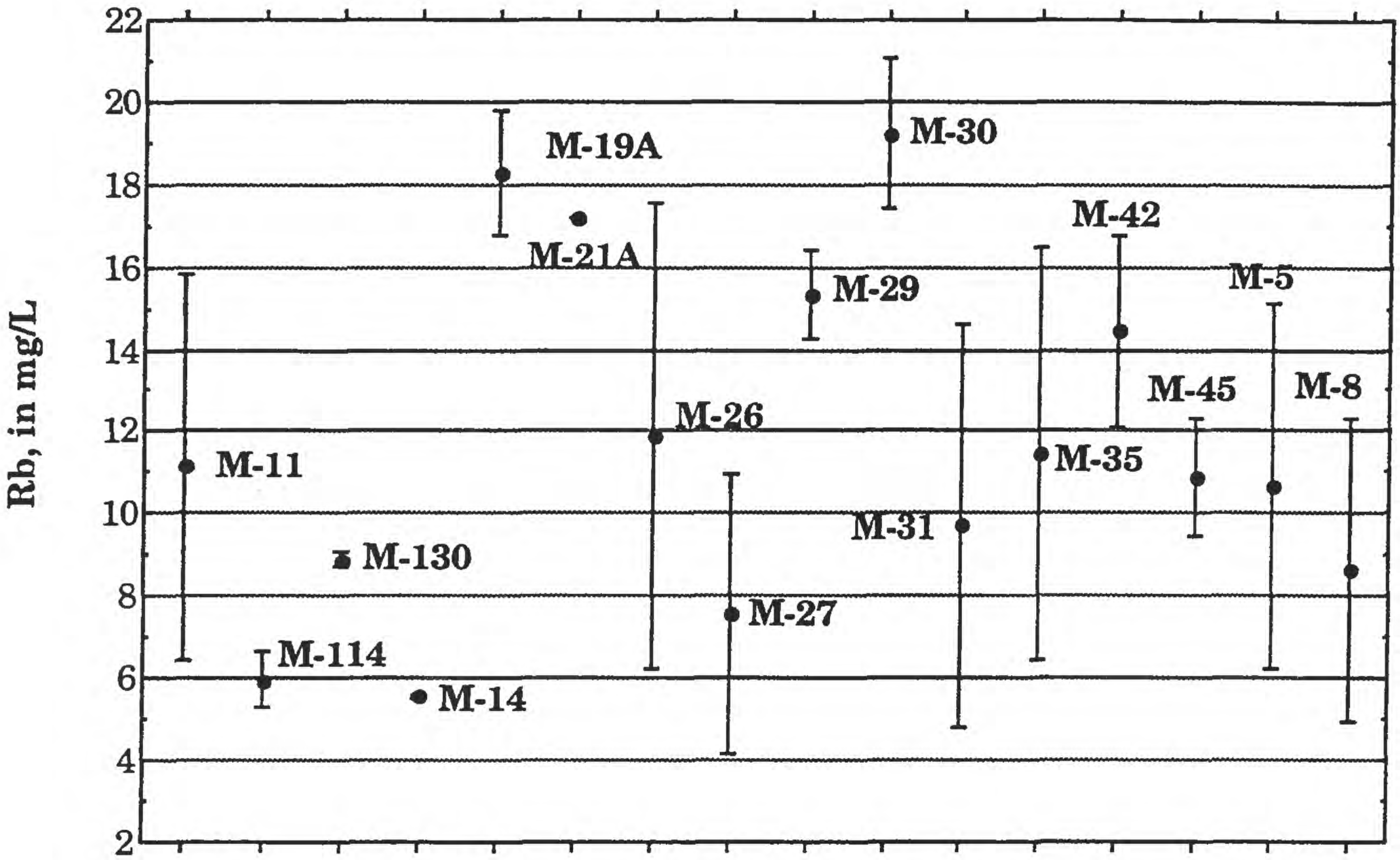


Figure 21. Rb content (mg/L) by geothermal well. See Tables 4-19 for summary statistics of individual wells. All sample types included. Error bars are one standard deviation from mean.

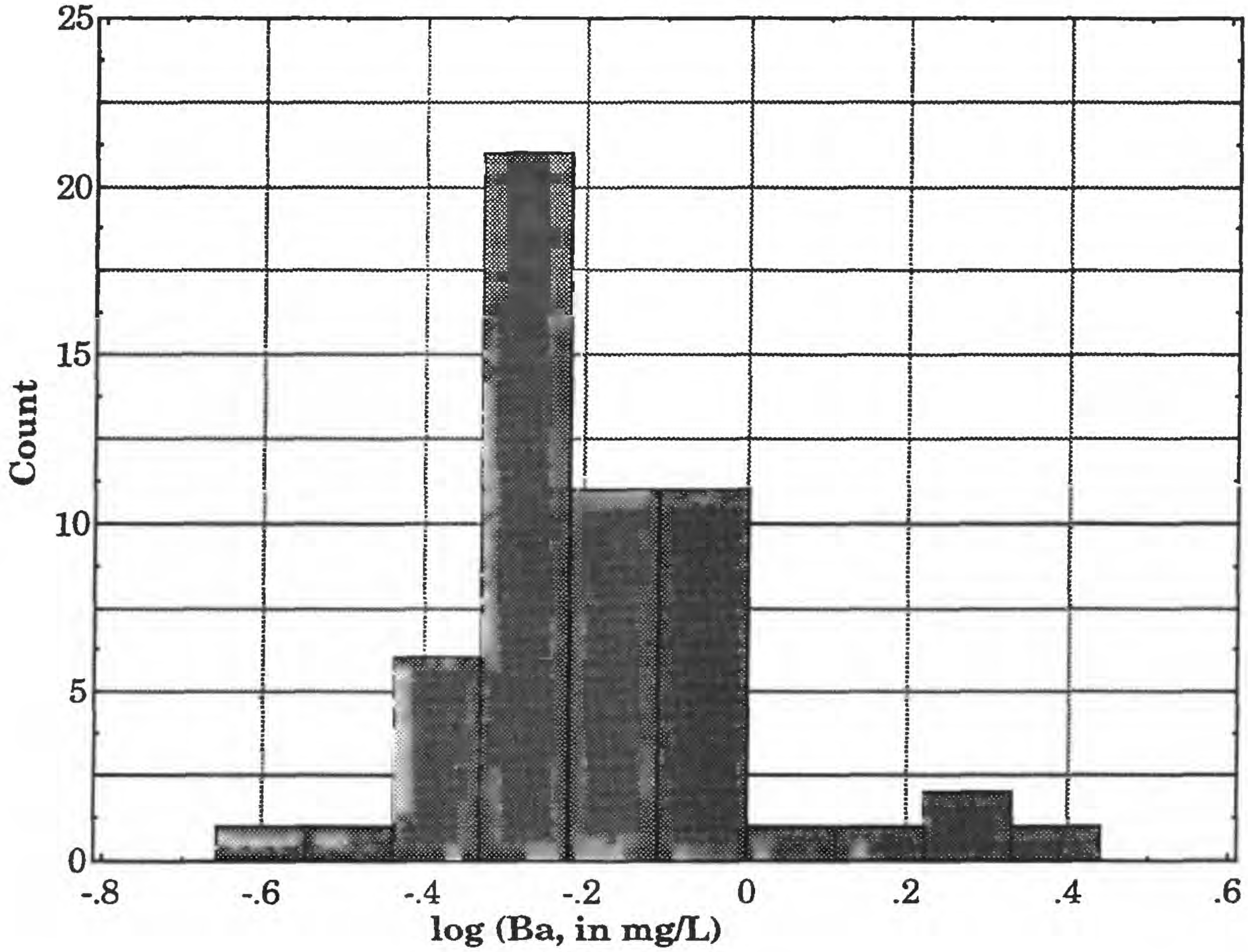


Figure 22. Bar diagram giving Ba content (mg/L) in 36 samples listed in Table 1 (see Ball and Jenne, this volume) and collected from 16 wells in the Cerro Prieto geothermal field in 1977-1979. See Table 3 for summary statistics.

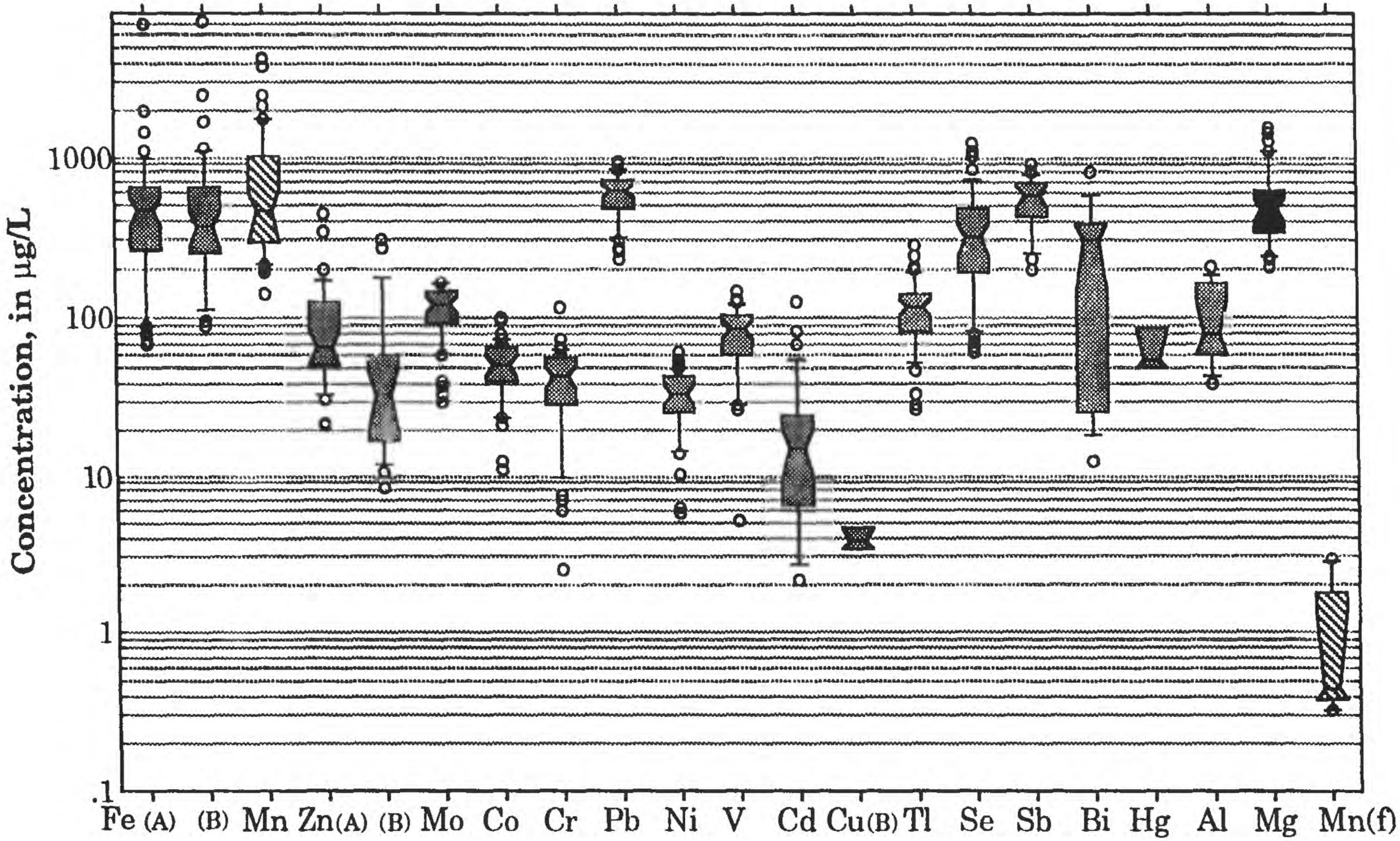


Figure 23. Notched box-and-whisker plots of of trace and other elements content (µg/L) for samples listed in Table 1 (see Ball and Jenne, this volume) of 56 samples collected in 1977-1979 from 16 geothermal wells at the Cerro Prieto geothermal field, Mexico. Some elements have observations below detection limits (Table 2). Five horizontal lines on the boxes and whishers give the 10, 25, 50, 75, and 90th percentiles. The boxes are notched at the median and return to full width at the lower and upper 95 percent confidence interval values. Values outside of the 10th and 90th percentiles are shown as points. Mn(f) is for flashed samples; Mn is for condensed ones (both box plots with diagonal bands). Note that the line for 1000 µg/L is equal to 1 mg/L (see Figure 4 elements with concentrations greater than 1 µg/L; Mg included on both figures (solid box plot above)).

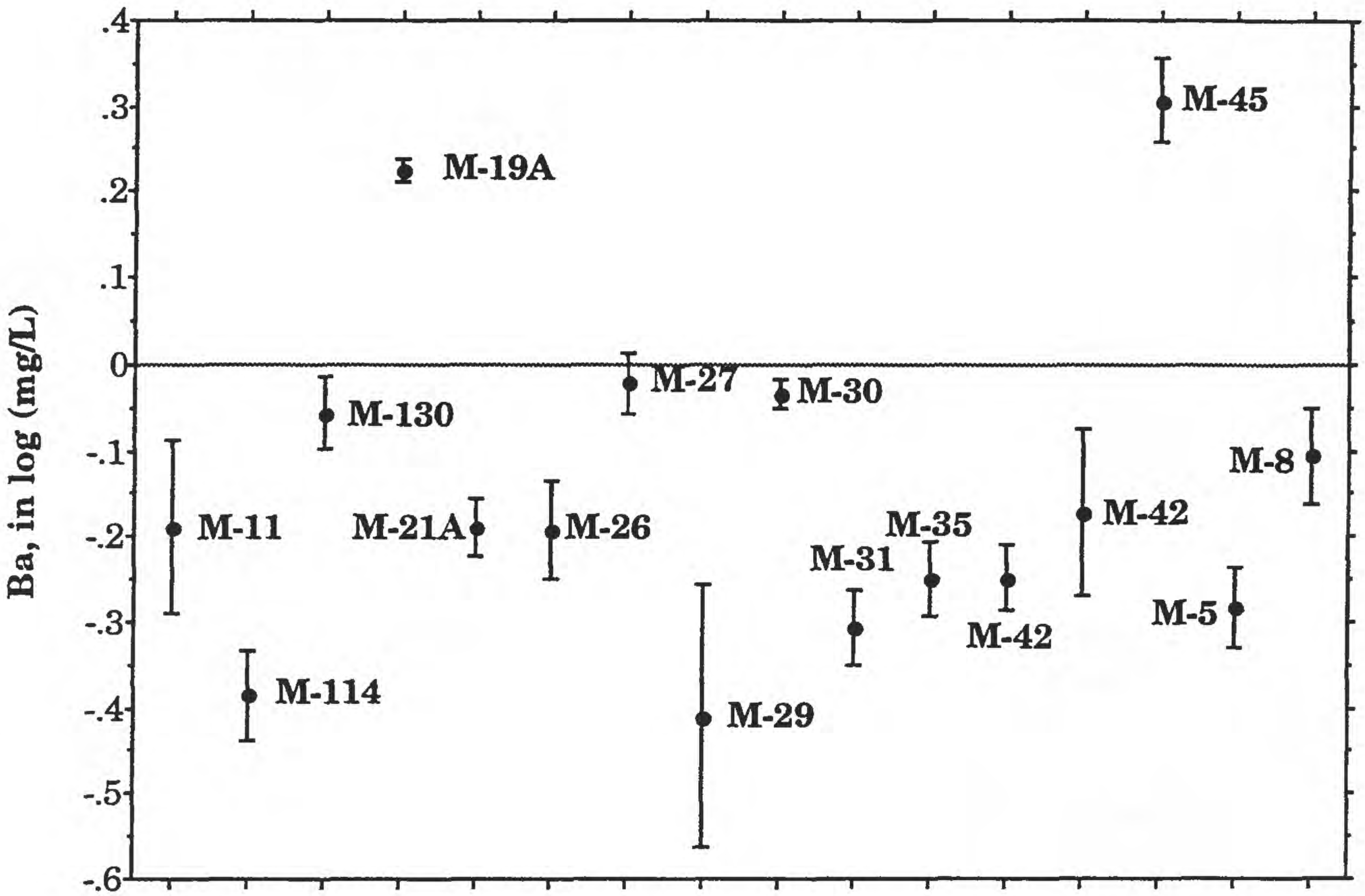
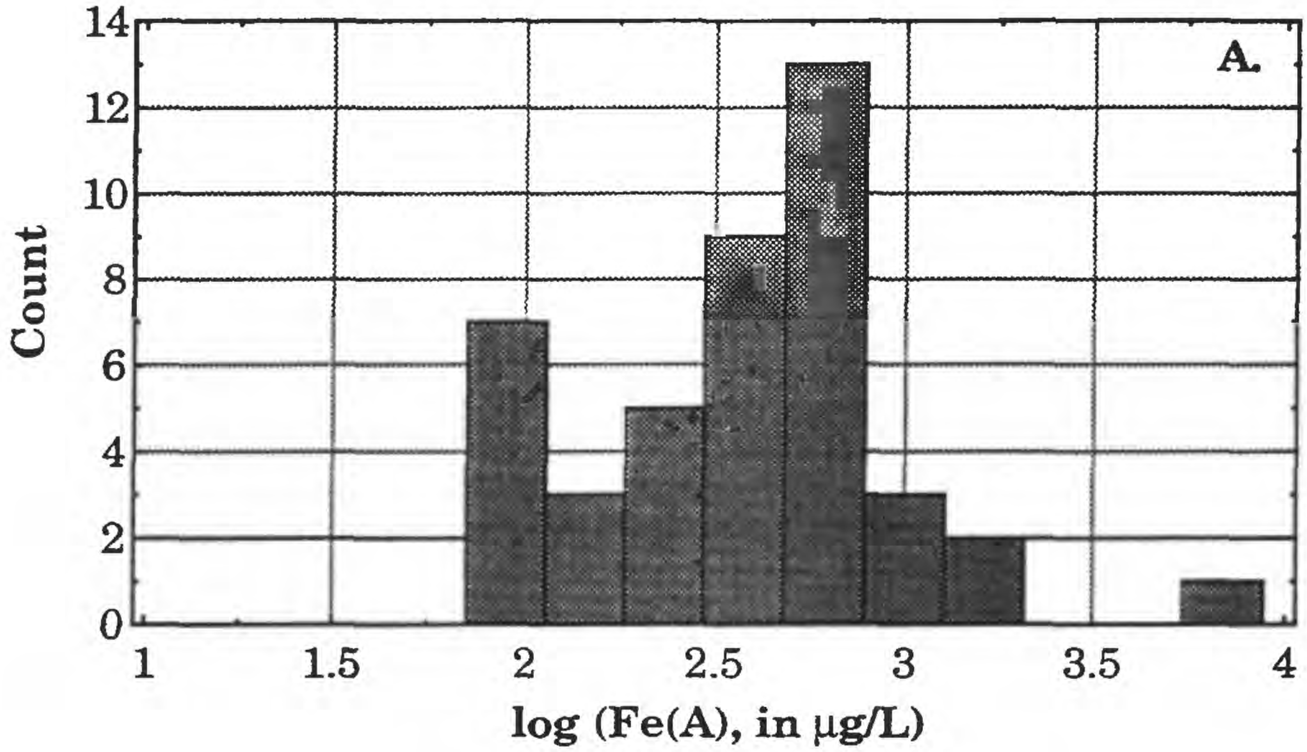


Figure 24. Ba content (mg/L) by geothermal well. See Tables 4-19 for summary statistics of individual wells. All sample types included. Error bars are one standard devation from mean.



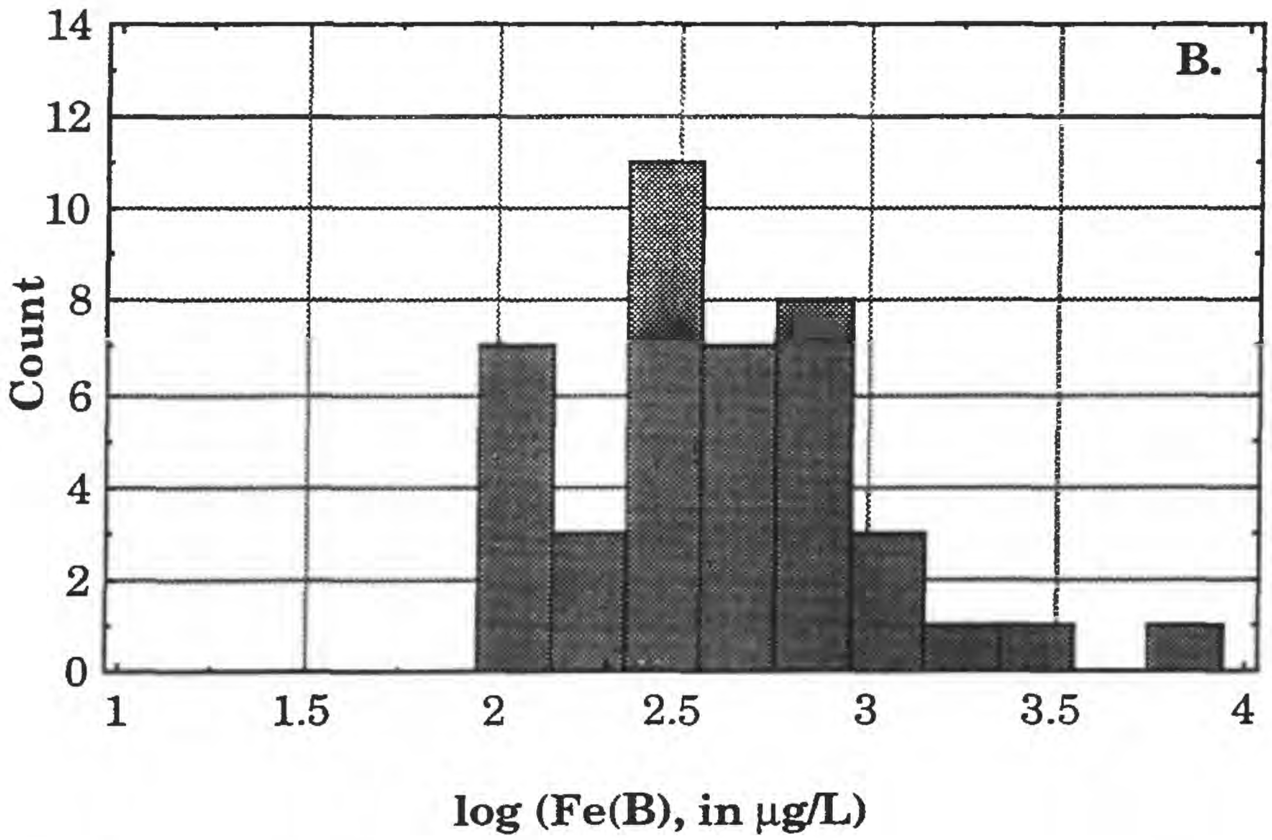


Figure 25. Bar diagrams giving Fe content in samples analyzed by two cassettes with Fe results designated as Fe(A) (see A. above) and Fe (B) (see B. above) and listed in Table 1 (see Ball and Jenne, this volume) and collected from 16 wells at the Cerro Prieto geothermal field, Mexico in 1977-1979. See Table 3 for summary statistics.

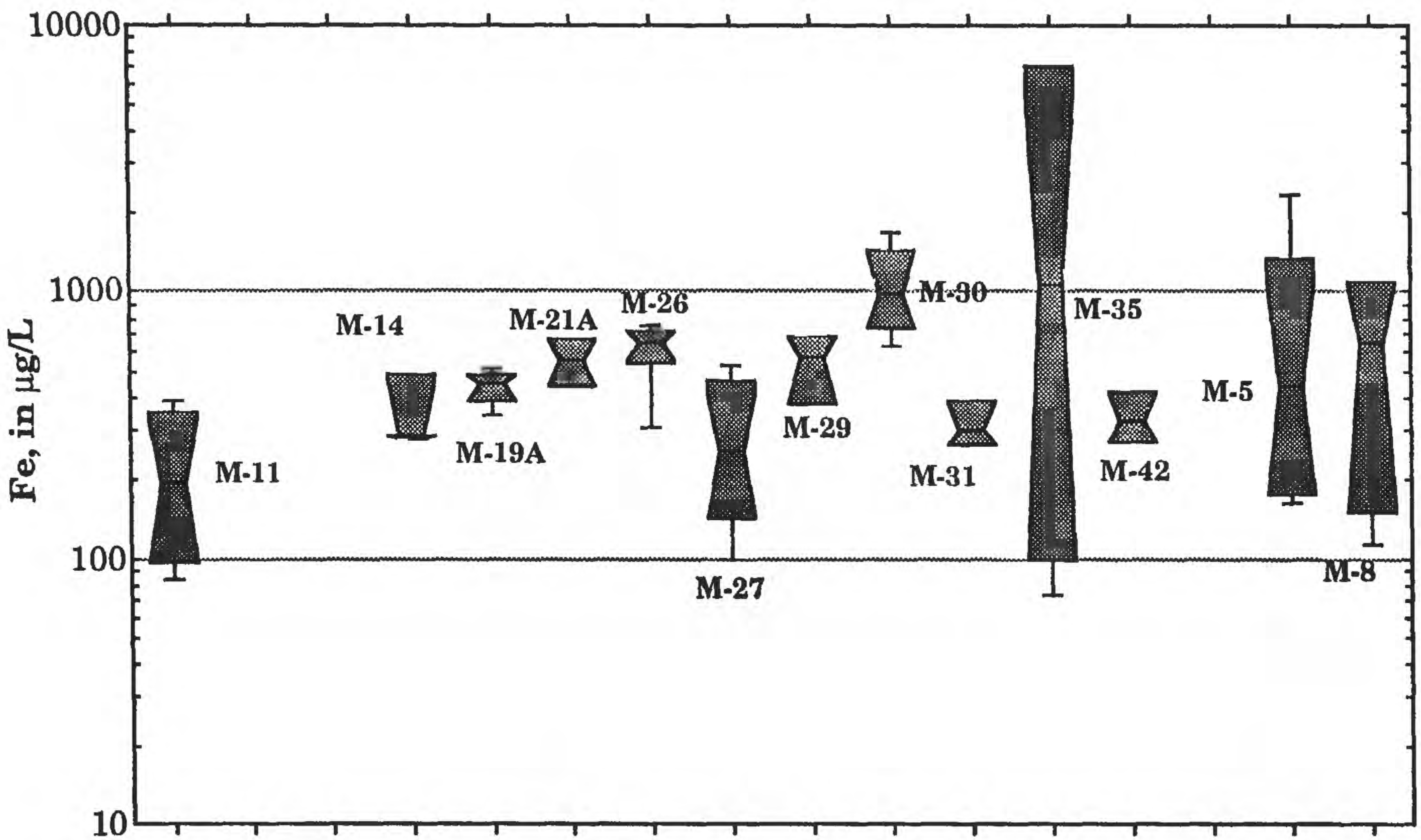


Figure 26. Notched box-and-wisker plots of the distribution of Fe content (µg/L) (combined Fe (A) and Fe (B)) by geothermal well. Five horizontal lines on the box give the 10, 25, 50, 75, and 90th percentiles. The boxes are notched at the median and return to full width at the lower and upper 95 percent confidence interval values. See Tables 4-19 for summary statistics for each well. All sample types in included.

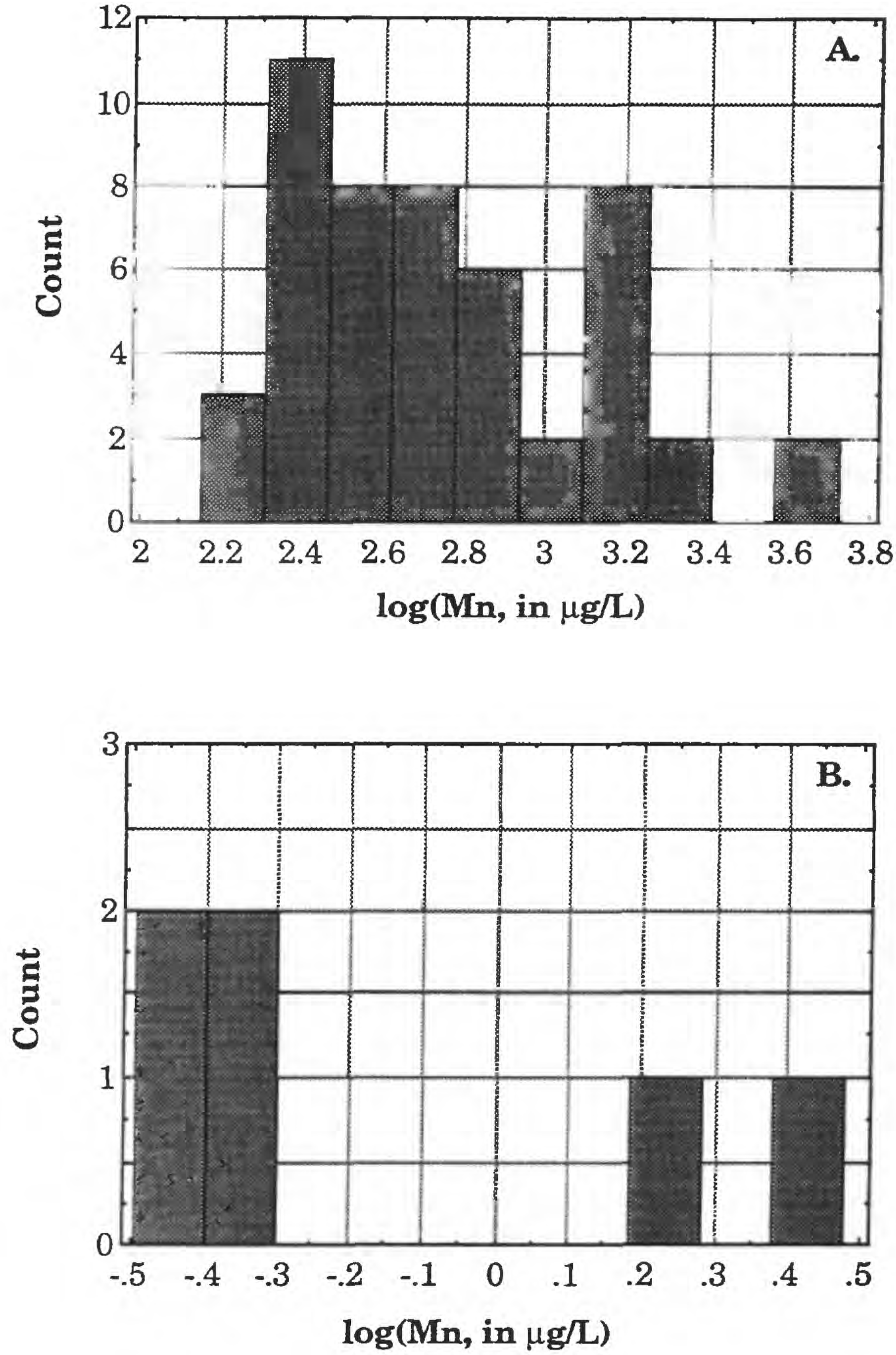


Figure 27. Bar diagrams giving Mn content (µg/L) in condensed (A.) and flashed (B.) samples listed in Table 1 (see Jenne and Ball, this volume) and collected from wells in the Cerro Prieto geothermal field, Mexico, in 1977-1979. See Table 3 for summary statistics.

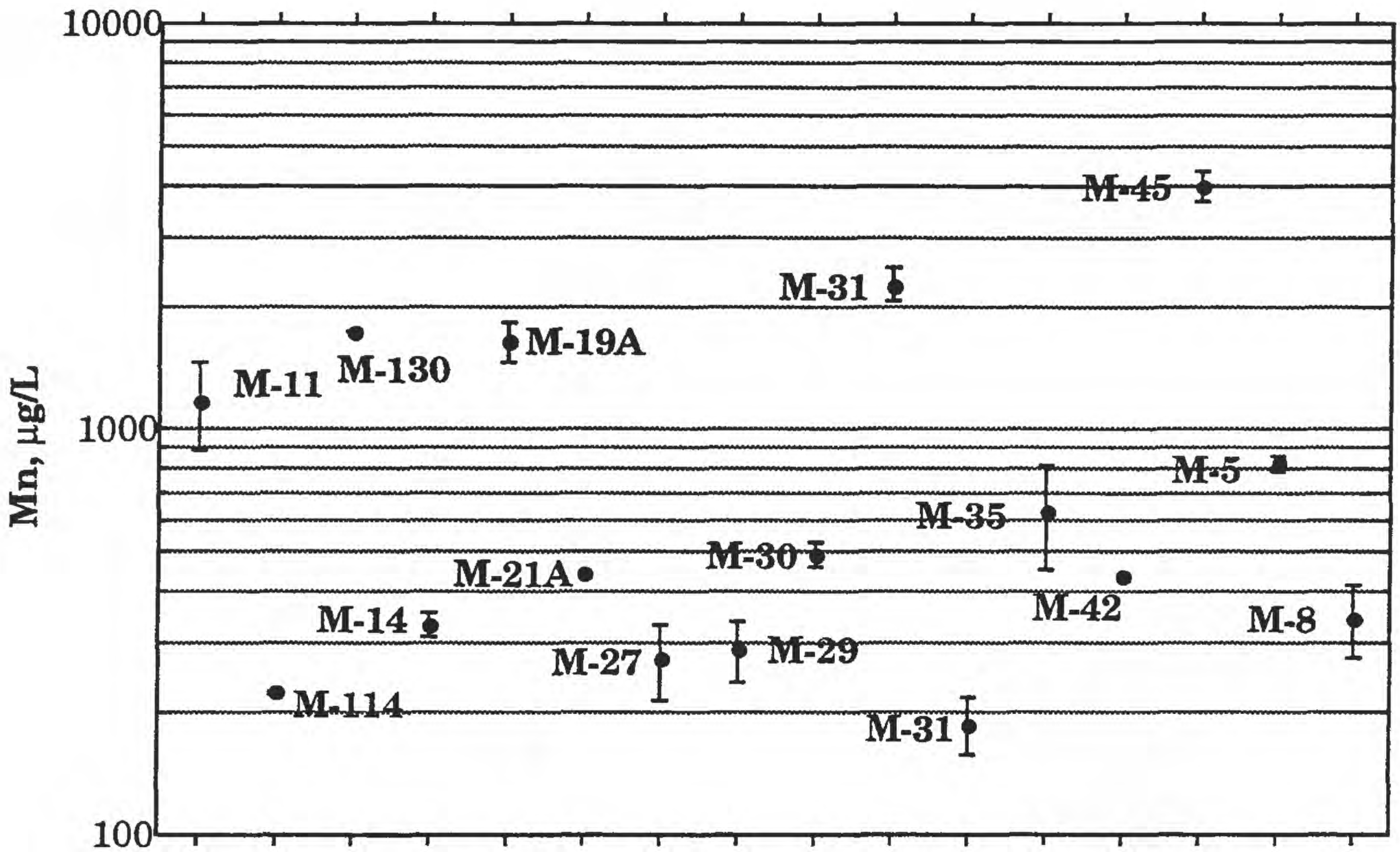


Figure 28. Distribution of Mn content (condensed samples only) by well. See Tables 4-19 for summary statistics for each well. All other sample types included. Error bars are one standard deviation from means.

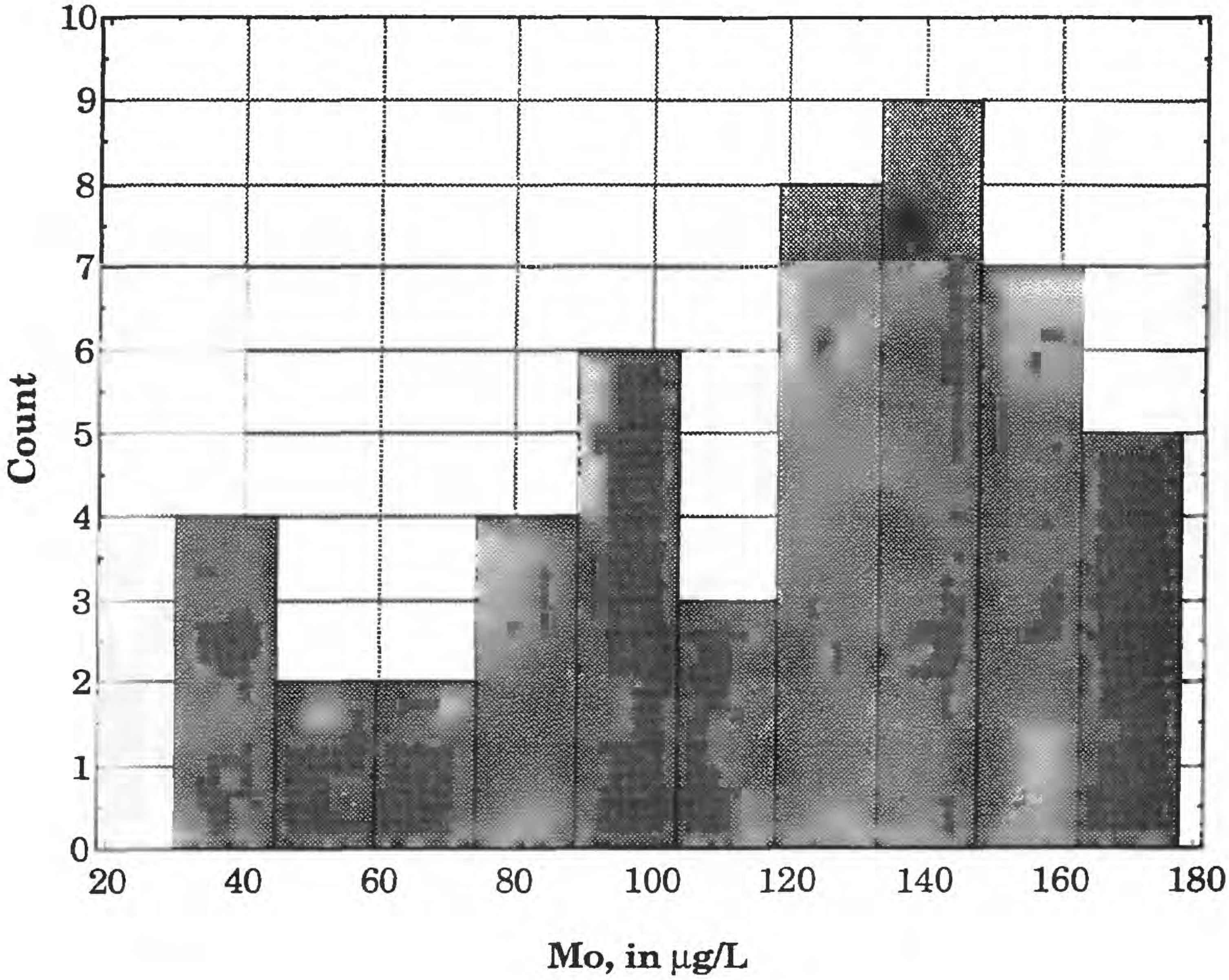


Figure 29. Bar diagram giving Mo content (mg/L) in 50 samples listed in Table 1 and collected from 16 wells in the Cerro Prieto geothermal field, Mexico, in 1977-1979. See Table 3 for summary statistics.

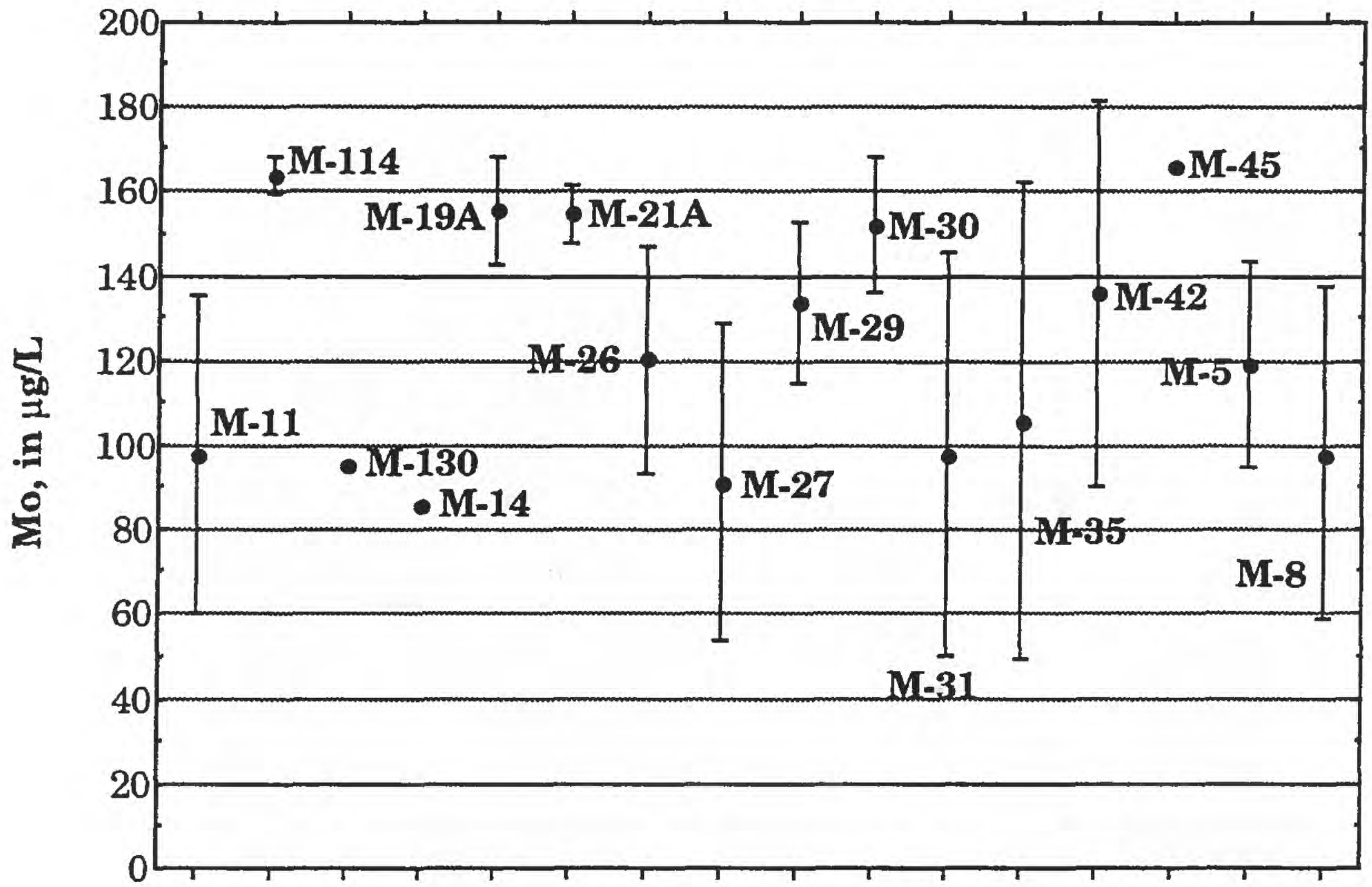


Figure 30. Distribution of Mo content (µg/L) by geothermal well. See Tables 4-19 for summary statistics of individual wells. All sample types included. Error bars are one standard deviation from mean.

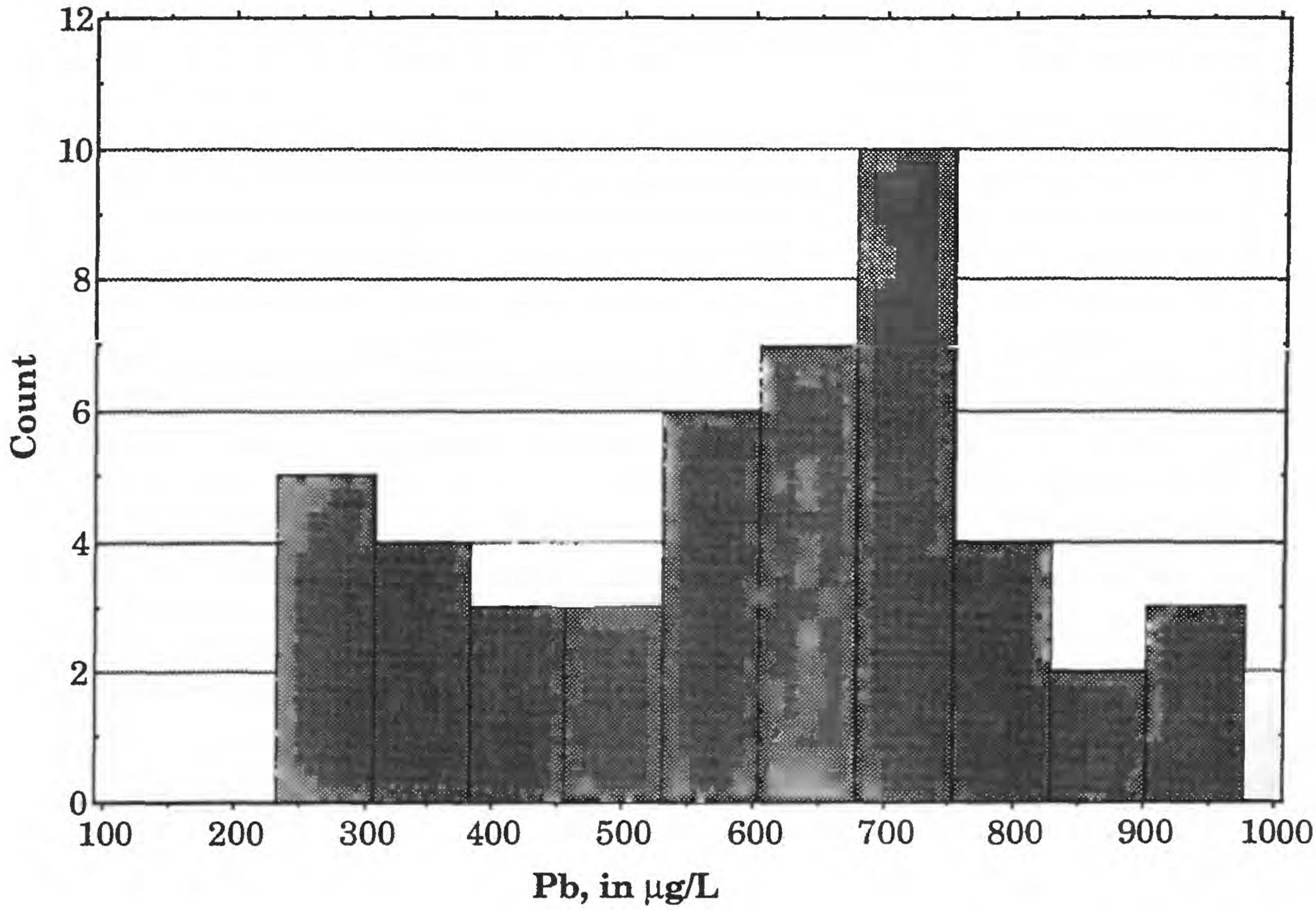


Figure. 31. Bar diagram giving Pb content (µg/L) in 47 samples listed in Table 1 and collected from 16 wells in the Cerro Prieto geothermal field, Mexico, in 1977-1979. See Table 3 for summary statistics.

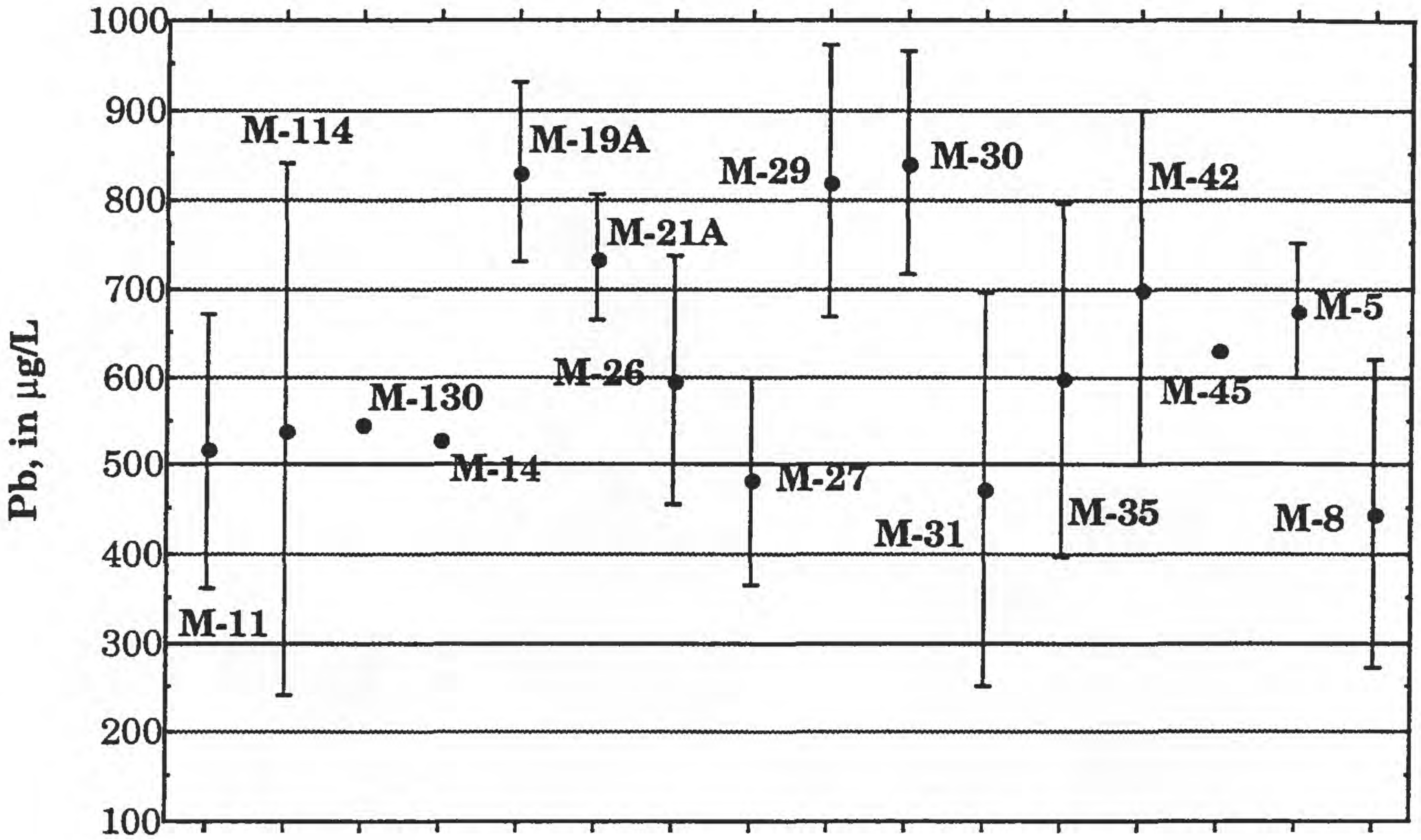


Figure 32. Pb content (µg/L) by geothermal well. See tables 4-19 for summary statistics of individual wells. All sample types included. Error bars are one standard deviation from mean.

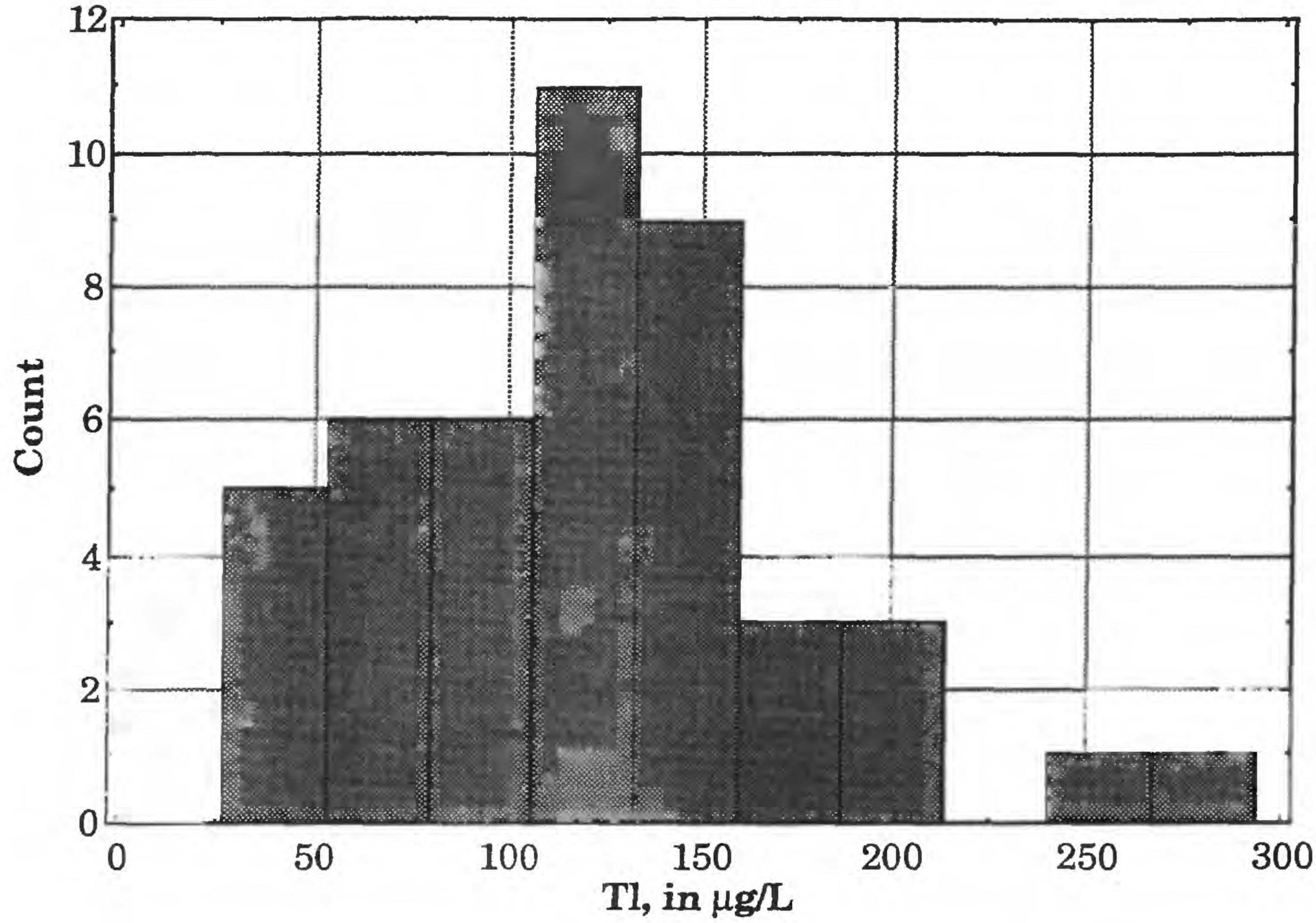


Figure 33. Bar diagram giving Tl content (µg/L) in 45 samples collected from 16 wells listed in Table 1 and collected in the Cerro Prieto geothermal field, Mexico, during 1977-1979. See Table 3 for summary statistics.

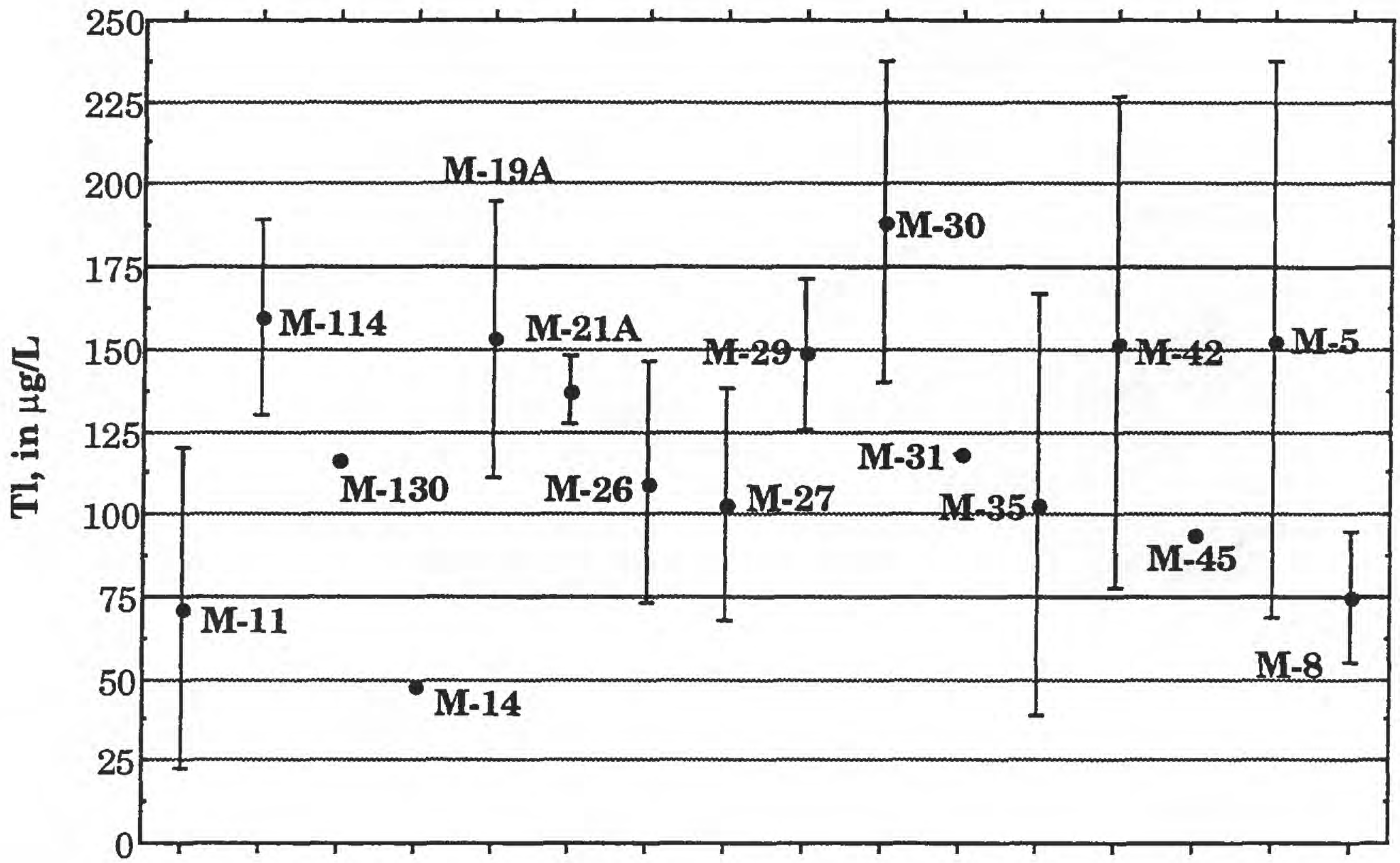


Figure 34. Tl content (µg/L) by geothermal well. See Tables 4-19 for summary statistics of individual wells located on figure 1. All sample types included. Error bars are one standard deviation from means.

Table 2. Limits of detection for elements (exclustive of sample nos. R-98, 244-C). Number of samples reported below each threshold given in parenthesis (n=). Order of elements is as given in Table 1 (Ball and Jenne, this volume). Percent samples computed using total sample count of 56.

Element	Thresholds reported in analyses	Percent below detection limit
Na	All values above limit of detection	0.
K	All values above limit of detection	0.
Ca	All values above limit of detection	0.
Mg	<200. (n=14), <20.0 (n=6) mg/l	36.
Si	All values above limit of detection	0.
Li	All values above limit of detection	0.
B	All values above limit of detection	0.
Sr	All values above limit of detection	0.
Ba	All values above limit of detection	0.
Rb	All values above limit of detection	0.
Fe(1)	<150 (n=10), <15.0 (n=3) µg/l	23.
Fe(2)	<200. (n=13), <20.0 (n=1) µg/l	25.
Mn	All values above limit of detection	0.
Zn(1)	<200. (n=14), <20. (n=12) µg/l	46.
Zn(2)	<50. (n=14), <5. (n=21) µg/l	63.
Mo	<30. (n=6) µg/l	11.
Co	<50. (n=11), <5. (n=8) µg/l	32.
Cr	<20. (n=11), <2. (n=4) µg/l	27.
Pb	<200. (n=9) µg/l	16.
Ni	<40. (n=13), <4. (n=7) µg/l	36.
V	<50. (n=12, <5. (n=3) µg/l	27.
Cd	<10. (n=9), <1. (n=16) µg/l	45.
Cu(1)	<100. (n=14), <10. (n=42) µg/l	100.
Cu(2)	<30. (n=12), <3. (n=41) µg/l	95.
Tl	<40. (n=10), <4. (n=1) µg/l	20.
As	<2.0 (n=12), <0.2 (n=5) µg/l	30.
Se	<300. (n=8), <30. (n=8) µg/l	29.
Sb	<2000. (n=14),<200. (n=18) µg/l	57.
Bi	<100. (n=6), <10. (n=37) µg/l	77.
Hg	<20. (n=11), <2. (n=42) µg/l	95.
Zr	<200. (n=14), <20. (n=42) µg/l	100.
Be	<20. (n=14), <2. (n=42) µg/l	100.
Ti	<100. (n=14), <10. (n=42) µg/l	100.
Al	<100. (n=13), <10. (n=32) µg/l	80.

Table 3. Mean, standard deviation, minimum, maximum, and count (number of results higher than the detection limit) for each element (concentrations reported to three significant figures). Most elements have distributions not significantly different from normal (at the 1 percent level) using the skewness and kurtosis goodness-of-fit tests (Rock, 1988). Unflagged elements have this distribution. Elements flagged with "*" have distributions not significantly different from the lognormal using the same tests. In these cases, the mean is the geometric mean and the standard deviation is the geometric standard deviation. Other types of transforms were not attempted. Rb is flagged with "**" and has a distribution significantly different from normal and lognormal. See Table 2 for detection limits.

Element	Mean	Std. deviation	Minimum	Maximum	Count
Na (mg/l)	6480.	1030.	4050.	8550.	56
K* (mg/l)	1360.	1.26	733.	2500.	56
Ca (mg/l)	398.	80.7	201.	577.	56
Mg * (mg/l)	0.50	1.71	0.21	1.55	36
Si* (mg/l)	826.	1.17	579.	1230.	56
Li (mg/l)	18.4	3.94	11.1	30.7	56
B * (mg/l)	13.5	1.22	8.13	17.6	56
Sr (mg/l)	6.74	4.00	0.37	14.2	56
Ba * (mg/l)	0.65	1.53	0.22	2.2	56
Rb ** (mg/l)	11.2	4.97	4.27	21.3	56
Fe(A) * (µg/l)	389.	2.56	70.2	6940.	43
Fe(B) * (µg/l)	397.	2.47	91.5	7030.	42
Mn * (µg/l)					
(condensed)	553.	2.36	142.	4250.	50
(flashed)	0.70	2.56	0.32	3.0	6
Zn(A) * (µg/l)	75.0	2.06	21.1	450.	30
Zn(B) * (µg/l)	35.8	2.69	8.47	306.	21
Mo (µg/l)	117.	38.7	30.1	168.	50
Co (µg/l)	51.0	21.3	11.3	103.	37
Cr (µg/l)	42.6	22.6	2.56	116.	41
Pb (µg/l)	602.	193.	233.	966.	47
Ni (µg/l)	33.2	13.7	5.88	61.3	36
V (µg/l)	81.1	34.1	5.17	147.	41
Cd * (µg/l)	14.4	3.11	2.18	128	31
Cu(A) (µg/l)	---	---	---	---	---
Cu(B) (µg/l)	3.99	.969	3.11	5.03	3
Tl (µg/l)	120.	54.6	26.5	283.	45
As * (µg/l)	964.	2.04	201.	3430.	39
Se * (µg/l)	294.	2.14	61.2	1220.	41
Sb (µg/l)	552.	197.	201.	931.	24
Bi (µg/l)	272.	247.	12.5	833.	13
Hg (µg/l)	65.2	26.8	45.	95.6	3
Zr (µg/l)	---	---	---	---	---
Be (µg/l)	---	---	---	---	---
Ti (µg/l)	---	---	---	---	---
Al (µg/l)	105.	58.6	39.6	208	11

Table 4. Well No. M-5 (see fig. 1 for location). Elements in 4 observations (records 5-63, 38, and 51-52; Table 1); one each in 1977 and 1978 and three in 1979. All samples were condensed; one collected in 1977 as well as two of the three collected in 1979 was also diluted in the field. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B). Regression analysis suggest some elements exhibit significant trends with time and are noted when at the 1-percent level of significance. Annual change in concentration (i.e., the slope of the regression equation) is reported as a change in concentration and relative to the mean. Care should be taken in interpreting the statistics on account of the small number of samples and different sample preparations involved.
[Standard deviation, Std; number of observations, N; maximum concentration, Max.; minimum concentration, Min.; annual change in concentration, ±Delta; and in terms of percent , ±Delta %; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N	Delta	Delta %
Na (mg/L)	6910.	266.	6550.	7280.	5	--	--
K (mg/L)	1500.	141.	1290.	1620.	5	--	--
Ca mg/L)	385.	21.5	355.	412.	5	--	--
Mg (mg/L)	0.504	0.041	0.46	0.54	3	--	--
Si (mg/L)	891.	151.	723.	1070.	5	--	--
Li (mg/L)	18.4	1.79	15.7	20.7	5	--	--
B (mg/L)	15.4	0.935	13.9	16.2	5	--	--
Sr (mg/L)	5.15	3.97	0.8	8.32	5	+4.66	+91
Ba (mg/L)	0.523	0.055	0.43	0.559	5	--	--
Rb (mg/L)	10.7	4.46	7.12	15.6	5	-5.26	-49
Fe(A) (µg/L)	638.	786.	159.	1980.	5	-930	-150
Fe(B) (µg/L)	1130.	1200.	292.	2500.	3	--	--
Mn (µg/L)	820.	30.9	780.	860.	5	--	--
Zn(A) (µg/L)	110.	--	--	126.	2	--	--
Zn(B) (µg/L)	54.5	--	10.8	98.2	2	--	--
Mo (µg/L)	119.	24.1	89.4	149.	5	--	--
Co (µg/L)	45.9	40.	12.3	103.	4	--	--
Cr (µg/L)	49.1	41.8	11.9	116.	5	--	--
Pb (µg/L)	674.	75.7	591.	739.	3	--	--
Ni (µg/L)	30.2	18.2	10.3	54.1	4	--	--
V (µg/L)	79.4	25.6	41.7	110.	5	--	--
Cd (µg/L)	2.18	--	2.18	2.18	1	--	--
Cu(A) (µg/L)	--	--	--	--	--	--	--
Cu(B) (µg/L)	--	--	--	--	--	--	--
Tl (µg/L)	153.	84.6	83.2	283.	5	--	--
As (µg/L)	1170.	644.	587.	2090.	4	--	--
Se (µg/L)	394.	302.	7105	847.	5	--	--
Sb (µg/L)	444.	--	439.	449.	2	--	--
Bi (µg/L)	669.	--	505.	833.	2	--	--
Hg (µg/L)	55.1	--	55.1	55.1	1	--	--
Al (µg/L)	168.	--	168.	168.	1	--	--
Na/K Rato	4.67	0.562	4.33	5.64	5	--	--

Table 5. Well No. M-8 (see fig. 1 for location). Elements in 4 observations (records 7-8, 35, and 49; Table 1); one each in 1977 and 1978, and two in 1979 which slightly biases these summary statistics. All samples were condensed; one of two samples (record no. 49) in 1979 was also diluted in the field. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B). Regression analysis suggest that none of the elements exhibit significant trends with time at the 1-percent level of significance.

[Standard deviation, Std; minimum concentration, Min.; maximum concentration, Max.; number of observations, N; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N
Na (mg/L)	5750.	525.	5350.	6520.	4
K (mg/L)	1210.	82.9	1120.	1290.	4
Ca mg/L)	298.	13.4	285.	317.	4
Mg (mg/L)	0.361	--	0.31	0.412	2
Si (mg/L)	805.	147.	689.	1020.	4
Li (mg/L)	16.	1.46	14.	17.5	4
B (mg/L)	11.1	1.21	9.37	12.2	4
Sr (mg/L)	3.19	2.98	0.58	5.9	4
Ba (mg/L)	0.788	0.108	0.698	0.944	4
Rb (mg/L)	8.64	3.69	5.12	12.4	4
Fe(A) (µg/L)	614.	495.	1110.	1100.	3
Fe(B) (µg/L)	630.	479.	143	1100	3
Mn (µg/L)	343.	67.8	277.	435.	4
Zn(A) (µg/L)	57.8	--	50.4	65.2	2
Zn(B) (µg/L)	--	--	--	--	--
Mo (µg/L)	98.0	39.2	58.6	144.	4
Co (µg/L)	39.7	17.5	21.6	56.5	3
Cr (µg/L)	26.0	17.5	7.56	46.5	4
Pb (µg/L)	446.	173.	235.	618.	4
Ni (µg/L)	24.6	--	19.7	29.6	2
V (µg/L)	56.8	24.4	29.2	75.4	3
Cd (µg/L)	7.86	--	6.21	9.5	2
Cu(A) (µg/L)	--	--	--	--	--
Cu(B) (µg/L)	--	--	--	--	--
Tl (µg/L)	75.0	20.0	60.2	102.	4
As (µg/L)	305.	--	290.	320.	2
Se (µg/L)	256.	--	80.9	439	2
Sb (µg/L)	445.	--	316.	574.	2
Bi (µg/L)	355.	--	355.	355.	1
Hg (µg/L)	95.6	--	95.6	95.6	1
Al (µg/L)	55.7	--	55.7	55.7	1
Na/K Rato	4.76	0.402	4.26	5.13	4

Table 6. Well No. M-11. Elements in six samples; one each in 1977 and 1978 and four in 1979 which biases these summary statistics. All samples were condensed; two of the four in 1979 were also diluted in the field. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B). Regression analysis suggest some elements exhibit significant trends with time and are noted when at the 1-percent level of significance. Annual change in concentration (i.e., the slope of the regression equation) is reported both absolutely and relatively. Care should be taken in interpreting the data on account of the small number of samples and different sample preparations involved.

[Standard deviation, Std; minimum concentration, Min.; maximum concentration, Max.; number of observations, N; annual change in concentration, ±Delta; and in terms of percent, ±Delta %; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N	Delta	Delta %
Na (mg/L)	7280.	455.	6860.	8090.	6	-560.	-7.
K (mg/L)	1700.	14.7	1680.	1720.	6	+340.	+20.
Ca mg/L)	428.	25.2	404.	465.	6	-30.	-7.
Mg (mg/L)	0.373	0.165	0.229	0.54	4	-0.185	-50.
Si (mg/L)	900.	151.	768.	1120.	6	--	--
Li (mg/L)	23.4	1.97	22.2	27.3	6	--	--
B (mg/L)	16.7	0.605	16.	17.6	6	--	--
Sr (mg/L)	7.91	0.549	7.39	8.82	6	--	--
Ba (mg/L)	0.664	0.164	0.522	0.939	6	-0.210	-32.
Rb (mg/L)	11.2	4.69	7.67	18	6	-6.0	-54.
Fe(A) (µg/L)	210.	152.	79.4	390.	4	-170.	-80.
Fe(B) (µg/L)	224	147.	97.6	376.	4	--	--
Mn (µg/L)	1170.	291.	659.	1450	6	+280.	+24.
Zn(A) (µg/L)	96.4	65.5	21.1	140	3	--	--
Zn(B) (µg/L)	46.4	14.5	30.9	65.7	4	--	--
Mo (µg/L)	97.8	37.6	41.	127.	6	--	--
Co (µg/L)	43.0	--	39.	47.1	2	--	--
Cr (µg/L)	39.6	--	36.3	42.8	2	--	--
Pb (µg/L)	518.	153.	273.	679.	5	--	--
Ni (µg/L)	34.0	--	32.5	35.4	2	--	--
V (µg/L)	63.1	50.2	5.17	93.3	3	--	--
Cd (µg/L)	30.7	32.1	3.18	68	4	--	--
Cu(A) (µg/L)	--	--	--	--	--	--	--
Cu(B) (µg/L)	3.11	--	3.11	3.11	1	--	--
Tl (µg/L)	71.5	48.8	26.5	138	5	-58.	-82
As (µg/L)	1260	--	1220	1300.	2	--	--
Se (µg/L)	671.	320.	392.	1020.	3	--	--
Sb (µg/L)	489.	--	249.	730.	2	--	--
Bi (g/L)	388.	--	345.	431	2	--	--
Hg (g/L)	--	--	--	--	--	--	--
Al (g/L)	--	--	--	--	--	--	--
Na/K Rato	4.28	0.293	4.04	4.82	6	-0.373	-9.

Table 7. Well No. M-14. Elements in two samples; all collected in 1979. All samples were condensed; one was also diluted in the field. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B). Care should be taken in interpreting the statistics on account of the small number of samples and the two sample preparations involved.

[Standard deviation, Std; minimum concentration, Min.; maximum concentration, Max.; number of observations, N; value(s) missing or below detection limit , "--"]

Element	Mean	Std	Min.	Max.	N
Na (mg/L)	5540.	--	5500.	5590.	2
K (mg/L)	1050.	--	1020.	1080.	2
Ca mg/L)	343.	--	342.	344.	2
Mg (mg/L)	1.55	--	1.55	1.55	1
Si (mg/L)	760.	--	670.	849.	2
Li (mg/L)	15.	--	14.7	15.2	2
B (mg/L)	11.8	--	11.2	12.5	2
Sr (mg/L)	9.4	--	9.03	9.78	2
Ba (mg/L)	1.68	--	1.64	1.72	2
Rb (mg/L)	5.55	--	5.52	5.58	2
Fe(A) (g/L)	280.	--	278.	282.	2
Fe(B) (g/L)	552.	--	552.	552.	1
Mn (g/L)	330.	--	313.	346.	2
Zn(A) (g/L)	--	--	--	--	--
Zn(B) (g/L)	--	--	--	--	--
Mo (g/L)	85.8	--	85.8	85.8	1
Co (g/L)	--	--	--	--	--
Cr (g/L)	6.1	--	6.1	6.1	1
Pb (g/L)	530.	--	530.	530.	1
Ni (g/L)	15.	--	15.	15.	1
V (g/L)	27.	--	27.	27.	1
Cd (g/L)	--	--	--	--	--
Cu(A) (g/L)	--	--	--	--	--
Cu(B) (g/L)	--	--	--	--	--
Tl (g/L)	47.8	--	47.8	47.8	1
As (g/L)	308.	--	308.	308.	1
Se (g/L)	66.8	--	66.8	66.8	1
Sb (g/L)	--	--	--	--	--
Bi (g/L)	--	--	--	--	--
Hg (g/L)	--	--	--	--	--
Al (g/L)	79.7	--	79.7	79.7	1
Na/K Rato	5.29	--	5.09	5.48	2

Table 8. Well No. M-19A. Elements in 3 observations; one in 1977 and two in 1978. The sample collected in 1977 was condensed as well as one of the samples in 1978; the other one colleced in 1978 was flashed. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B).

[Standard deviation, Std; minimum concentration, Min.; maximum concentration, Max.; number of observations, N; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N
Na (mg/L)	7810.	450.	7550.	8330.	3
K (mg/L)	1740.	116.	1660.	1870.	3
Ca mg/L)	460.	32.7	439.	498.	3
Mg (mg/L)	0.479	0.036	0.44	0.51	3
Si (mg/L)	842.	48.0	804.	896.	3
Li (mg/L)	20.3	3.76	16.1	23.3	3
B (mg/L)	15.6	1.05	14.5	16.6	3
Sr (mg/L)	9.14	0.832	8.59	10.1	3
Ba (mg/L)	0.649	0.051	0.604	0.704	3
Rb (mg/L)	18.3	1.50	17.3	20.	3
Fe(A) (g/L)	478.	38.8	437.	514.	3
Fe(B) (g/L)	391.	65.5	333.	462.	3
Mn (g/L)	1090.	955.	1.83*	1770	3
Zn(A) (g/L)	121.	73.2	59.7	202.	3
Zn(B) (g/L)	70.6	--	18.3	123.	2
Mo (g/L)	156.	13.0	141.	166.	3
Co (g/L)	60.8	12.9	47.2	72.8	3
Cr (g/L)	53.3	13.4	38.2	63.9	3
Pb (g/L)	830.	100.	741.	939	3
Ni (g/L)	42.4	6.77	34.7	47.7	3
V (g/L)	112.	11.8	105.	126.	3
Cd (g/L)	17.0	7.23	12.3	25.3	3
Cu(A) (g/L)	--	--	--	--	--
Cu(B) (g/L)	--	--	--	--	--
Tl (g/L)	153.	41.9	117.	199.	3
As (g/L)	1240.	185.	1020.	1380.	3
Se (g/L)	432.	97.0	321.	502.	3
Sb (g/L)	473.	287.	237.	793.	3
Bi (g/L)	--	--	--	--	--
Hg (g/L)	--	--	--	--	--
Al (g/L)	--	--	--	--	--
Na/K Rato	4.50	0.047	4.46	4.55	3

***sample flashed.**

Table 9. Well No. M-21A. Elements in two samples; one each in 1977 and 1978. Both samples were condensed. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B).

[Standard deviation, Std; minimum concentration, Min.; maximum concentration, Max.; number of observations, N; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N
Na (mg/L)	7480.	--	7450.	7500.	2
K (mg/L)	1520.	--	1450.	1590.	2
Ca mg/L)	467.	--	445.	490.	2
Mg (mg/L)	0.546	--	0.5	0.592	2
Si (mg/L)	750.	--	719.	781.	2
Li (mg/L)	19.2	--	17.7	20.6	2
B (mg/L)	15.4	--	14.4	16.5	2
Sr (mg/L)	7.49	--	7.33	7.65	2
Ba (mg/L)	0.644	--	0.584	0.704	2
Rb (mg/L)	17.2	--	17.2	17.2	2
Fe(A) (g/L)	554.	--	502.	607.	2
Fe(B) (g/L)	526.	--	346.	707.	2
Mn (g/L)	223.	--	0.45*	445.	2
Zn(A) (g/L)	63.4	--	57.4	69.5	2
Zn(B) (g/L)	--	--	--	--	--
Mo (g/L)	155.	--	150.	160.	2
Co (g/L)	65.	--	58.3	71.7	2
Cr (g/L)	59.0	--	56.3	61.8	2
Pb (g/L)	734.	--	684.	784.	2
Ni (g/L)	41.7	--	40.2	43.2	2
V (g/L)	102.	--	99.8	104.	2
Cd (g/L)	21.1	--	18.	24.3	2
Cu(A) (g/L)	--	--	--	--	--
Cu(B) (g/L)	--	--	--	--	--
Tl (g/L)	138.	--	130.	145.	2
As (g/L)	2840.	--	2290.	3400.	2
Se (g/L)	453.	--	418.	488.	2
Sb (g/L)	--	--	--	--	--
Bi (g/L)	27.	--	27.	27.	1
Hg (g/L)	--	--	--	--	--
Al (g/L)	--	--	--	--	--
Na/K Rato	4.93	--	4.69	5.17	2

***suspect value--too low, record 30.**

Table 10. Well No. M-26. Elements in 5 observations; one in 1977 and two each in 1978 and 1979. All samples were condensed except for one of the two in 1978 which was flashed. One sample in 1979 were also diluted in the field. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B). Regression analysis suggest some elements exhibit significant trends with time when the flashed sample was excluded and are noted when at the 1-percent level of significance. Annual change in concentration (i.e., the slope of the regression equation) is reported both absolutely and relatively. Care should be taken in interpreting the statistics on account of the small number of samples and different sample preparations involved.

[Standard deviation, Std; number of observations, N; maximum concentration, Max.; minimum concentration, Min.; annual change in concentration, ±Delta; and in terms of percent , ±Delta %; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N	Delta	Delta %
Na (mg/L)	5690.	1230.	4400.	7300.	5	--	--
K (mg/L)	1030.	132.	904.	1250.	5	--	--
Ca mg/L)	409.	49.0	364.	488.	5	-27.	-7
Mg (mg/L)	0.731	0.139	0.62	0.927	4	--	--
Si (mg/L)	779.	81.4	708.	883.	5	--	--
Li (mg/L)	14.3	1.68	12.1	16.8	5	--	--
B (mg/L)	10.2	0.996	9.29	11.9	5	--	--
Sr (mg/L)	4.59	2.34	0.61	9.75	5	--	--
Ba (mg/L)	0.952	0.076	0.876	1.06	5	--	--
Rb (mg/L)	11.9	5.65	5.69	17.6	5	-6	-49
Fe(A) (g/L)	606.	129.	411.	767.	5	--	--
Fe(B) (g/L)	564.	212.	211.	718.	5	--	--
Mn (g/L)	218.	132.	0.37	326.	5	-64	-29
Zn(A) (g/L)	88.6	47.6	35.7	128.	3	--	--
Zn(B) (g/L)	25.0	--	15.9	34.2	2	--	--
Mo (g/L)	120.	26.8	81.1	139	4	--	--
Co (g/L)	44.8	26.3	11.3	69.5	4	--	--
Cr (g/L)	39.5	21.8	11.4	58.5	4	--	--
Pb (g/L)	596.	141.	404.	728.	4	--	--
Ni (g/L)	27.8	16.2	6.28	43.2	4	--	--
V (g/L)	71.0	29.6	27.1	92.	4	--	--
Cd (g/L)	31.4	--	30.4	32.4	2	--	--
Cu(A) (g/L)	--	--	--	--	--	--	--
Cu(B) (g/L)	--	--	--	--	--	--	--
Tl (g/L)	110.	36.5	65.	153.	4	-30	-27
As (g/L)	2730.	892.	1430.	3430.	4	--	--
Se (g/L)	230.	198.	61.2	485.	4	--	--
Sb (g/L)	362.	--	201.	522.	2	--	--
Bi (g/L)	--	--	--	--	--	--	--
Hg (g/L)	--	--	--	--	--	--	--
Al (g/L)	189.	--	170.	208.	2	--	--
Na/K Rato	5.46	0.62	4.70	5.67	5	-0.76	-14

Table 11. Well No. M-27. Elements in 6 observations; condensed sample in 1977, one condensed and one flashed in 1978, and three condensed samples in1979 one which was also diluted in the field. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B). Regression analysis suggest some elements exhibit significant trends with time and are noted when at the 1-percent level of significance. Annual change in concentration (i.e., the slope of the regression equation) is reported both absolutely and relatively. Care should be taken in interpreting the statistics on account of the small number of samples and different sample preparations involved.

[Standard deviation, Std; number of observations, N; maximum concentration, Max.; minimum concentration, Min.; annual change in concentration, ±Delta; and in terms of percent , ±Delta %; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N	Delta	Delta %
Na (mg/L)	4930.	518.	4050.	5340.	5	--	--
K (mg/L)	1020.	146.	773.	1130.	5	--	--
Ca mg/L)	261.	33.7	201.	281.	5	--	--
Mg (mg/L)	0.3	--	0.295	0.304	2	--	--
Si (mg/L)	810.	149.	603.	1020.	5	--	--
Li (mg/L)	13.2	1.21	11.1	14.2	5	--	--
B (mg/L)	9.96	1.17	8.13	11.	5	--	--
Sr (mg/L)	3.31	2.64	0.37	5.44	5	--	--
Ba (mg/L)	0.393	0.132	0.22	0.507	5	--	--
Rb (mg/L)	6.60	2.75	4.27	10.5	5	-3.3	-50
Fe(A) (g/L)	260.	204.	92.2	525.	4	--	--
Fe(B) (g/L)	292.	170.	139.	524.	4	--	--
Mn (g/L)	287.	47.9	227.	334.	5	--	--
Zn(A) (g/L)	48.4	9.37	38.2	56.6	3	--	--
Zn(B) (g/L)	13.1	--	13.1	13.1	1	--	--
Mo (g/L)	82.8	35.4	30.1	122.	5	--	--
Co (g/L)	40.9	11.6	32.9	54.2	3	--	--
Cr (g/L)	27.7	17.4	7.01	49.5	4	--	--
Pb (g/L)	440.	74.3	350.	532.	4	--	--
Ni (g/L)	25.7	6.06	20.8	32.5	3	--	--
V (g/L)	55.3	22.6	28.4	83.3	4	--	--
Cd (g/L)	13.0	9.25	4.94	25.1	4	--	--
Cu(A) (g/L)	--	--	--	--	--	--	--
Cu(B) (g/L)	--	--	--	--	--	--	--
Tl (g/L)	92.2	30.1	60.4	123.	4	--	--
As (g/L)	900.	198.	760.	1040.	2	--	--
Se (g/L)	336.	221.	102.	540.	3	-250	-86
Sb (g/L)	529.	--	484.	574.	2	--	--
Bi (g/L)	139.	202.	12.5	373	3	--	--
Hg (g/L)	45.	--	45.	45.	1	--	--
Al (g/L)	80.0	17.6	63.	98.2	3	--	--
Na/K Rato	4.86	0.23	4.63	5.24	5	--	--

Table 12. Well No. M-29. Elements in two samples; one collected in 1977 and one in 1978. All samples were condensed. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B).

[Standard deviation, Std; minimum concentration, Min.; maximum concentration, Max.; number of observations, N; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N
Na (mg/L)	5980.	--	5740.	6210.	2
K (mg/L)	1060.	--	1050.	1060.	2
Ca mg/L)	464.	--	455.	473.	2
Mg (mg/L)	1.37	--	1.29	1.45	2
Si (mg/L)	600.	--	580.	620.	2
Li (mg/L)	19.2	--	18.6	19.7	2
B (mg/L)	13.5	--	13.1	13.9	2
Sr (mg/L)	13.9	--	13.6	14.2	2
Ba (mg/L)	0.926	--	.9	.952	2
Rb (mg/L)	15.4	--	14.6	16.1	2
Fe(A) (g/L)	558.	--	467.	649.	2
Fe(B) (g/L)	496.	--	278.	714.	2
Mn (g/L)	496.	--	471.	520.	2
Zn(A) (g/L)	79.6	--	48.2	111.	2
Zn(B) (g/L)	33.4	--	8.47	58.4	2
Mo (g/L)	134.	--	120.	147.	2
Co (g/L)	59.8	--	40.	79.5	2
Cr (g/L)	55.3	--	43.5	67.1	2
Pb (g/L)	819.	--	711.	927.	2
Ni (g/L)	40.1	--	30.6	49.6	2
V (g/L)	111.	--	98.9	123.	2
Cd (g/L)	20.3	--	20.3	20.3	1
Cu(A) (g/L)	--	--	--	--	--
Cu(B) (g/L)	--	--	--	--	--
Tl (g/L)	148.	--	132.	165.	2
As (g/L)	710.	--	530.	890.	2
Se (g/L)	286.	--	279.	294.	2
Sb (g/L)	595.	--	595.	595.	1
Bi (g/L)	19.3	--	19.3	19.3	1
Hg (g/L)	--	--	--	--	--
Al (g/L)	--	--	--	--	--
Na/K Rato	5.66	--	5.42	5.91	2

Table 13. Well No. M-30. Elements in three samples; one in 1977 and two in 1979. Samples were condensed except for one in 1979. Mn includes condensed samples only. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B).
[Standard deviation, Std; minimum concentration, Min.; maximum concentration, Max.; number of observations, N; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N
Na (mg/L)	7690.	388.	7440.	8140.	3
K (mg/L)	1660.	108.	1570.	1780.	3
Ca mg/L)	534	37.6	506.	577.	3
Mg (mg/L)	1.05	0.06	0.99	1.11	3
Si (mg/L)	813.	63.4	759.	883.	3
Li (mg/L)	21.	1.02	20.	22.	3
B (mg/L)	14.9	0.971	14.1	16.	3
Sr (mg/L)	10.4	0.993	9.55	11.5	3
Ba (mg/L)	0.494	0.051	0.445	0.547	3
Rb (mg/L)	19.2	1.82	17.9	21.3	3
Fe(A) (g/L)	1030.	363.	700.	1420.	3
Fe(B) (g/L)	1090.	547.	617.	1690.	3
Mn (g/L)	2280.	--	2120.	2430	2
Zn(A) (g/L)	232.	188.	110.	448.	3
Zn(B) (g/L)	161.	206.	16.	306.	2
Mo (g/L)	152.	16.2	135.	167.	3
Co (g/L)	77.8	17.0	62.4	96.1	3
Cr (g/L)	65.6	8.17	60.6	75.	3
Pb (g/L)	842.	125.	716.	966.	3
Ni (g/L)	51.1	10.6	40.2	61.3	3
V (g/L)	128.	17.5	113.	147.	3
Cd (g/L)	12.4	4.42	7.6	16.3	3
Cu(A) (g/L)	--	--	--	--	--
Cu(B) (g/L)	--	--	--	--	--
Tl (g/L)	189.	48.7	157.	245.	3
As (g/L)	1020.	80.2	940.	1100	3
Se (g/L)	315.	149.	174.	469.	3
Sb (g/L)	615.	174	445.	793.	3
Bi (g/L)	--	--	--	--	--
Hg (g/L)	--	--	--	--	--
Al (g/L)	--	--	--	--	--
Na/K Rato	4.64	0.12	4.56	4.78	3

Table 14. Well No. M-31. Elements in 4 observations; one each in 1977 and 1978 and two in 1979. All samples were condensed; one of the two collected in 1979 was also diluted in the field. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B). Regression analysis suggest some elements exhibit significant trends with time and are noted when at the 1-percent level of significance. The change in concentration is reported absolutely (i.e., the slope of the regression equation) and relative to the mean. Care should be taken in interpreting the statistics on account of the small number of samples and different sample preparations involved.

[Standard deviation, Std; number of observations, N; maximum concentration, Max.; minimum concentration, Min.; annual change in concentration, ±Delta; and in terms of percent , ±Delta %; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N	Delta	Delta %
Na (mg/L)	5840.	614.	5280.	6680	4	--	--
K (mg/L)	1180.	37.0	1150.	1230.	4	-42.	-4
Ca mg/L)	344.	18.4	328.	366.	4	-21.	-6
Mg (mg/L)	0.382	--	0.314	0.45	2	--	--
Si (mg/L)	763.	85.9	702.	890.	4	--	--
Li (mg/L)	15.8	1.68	13.7	17.8	4	--	--
B (mg/L)	11.4	0.645	10.6	12.	4	--	--
Sr (mg/L)	5.46	3.20	0.73	7.56	4	--	--
Ba (mg/L)	0.565	0.058	0.513	0.637	4	--	--
Rb (mg/L)	9.71	4.90	4.99	14.7	4	--	--
Fe(A) (g/L)	386.	90.5	322.	450.	2	--	--
Fe(B) (g/L)	260.	23.3	243.	276.	2	--	--
Mn (g/L)	187.	31.8	142.	215.	4	--	--
Zn(A) (g/L)	188.	--	41.6	335.	2	--	--
Zn(B) (g/L)	146.	--	22.	270.	2	--	--
Mo (g/L)	97.6	47.7	37.2	146.	4	--	--
Co (g/L)	55.4	--	51.2	59.5	2	--	--
Cr (g/L)	45.2	--	43.7	46.6	2	--	--
Pb (g/L)	474.	221.	233.	706.	4	--	--
Ni (g/L)	36.2	--	33.5	38.9	2	--	--
V (g/L)	94.5	--	87.	102	2	--	--
Cd (g/L)	53.3	64.9	10.2	128	3	--	--
Cu(A) (g/L)	--	--	--	--	--	--	--
Cu(B) (g/L)	3.84	--	3.84	3.84	1	--	--
Tl (g/L)	118.	--	118.	118.	2	--	--
As (g/L)	770.	497.	201.	1120.	3	--	--
Se (g/L)	597.	215.	215.	1110.	3	--	--
Sb (g/L)	664.	--	649.	678.	2	--	--
Bi (g/L)	162.	--	19.6	304.	2	--	--
Hg (g/L)	--	--	--	--	--	--	--
Al (g/L)	--	--	--	--	--	--	--
Na/K Rato	4.93	0.436	4.59	5.567	4	--	--

Table 15. Well No. M-35. Elements in 4 observations (records 24-25, 45, and 59; Table 1); one each in 1977 and 1978 and two in 1979 which slightly biases these summary statistics. All samples were condensed; one collected in 1979 was also diluted in the field. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B). Regression analysis suggest some elements exhibit significant trends with time and are noted when at the 1-percent level of significance. Annual change in concentration (i.e., the slope of the regression equation) is reported both as a change in concentration and relative to the mean. Care should be taken in interpreting the statistics on account of the small number of samples and different sample preparations involved.
[Standard deviation, Std; number of observations, N; maximum concentration, Max.; minimum concentration, Min.; annual change in concentration, ±Delta; and in terms of percent , ±Delta %; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N	Delta	Delta %
Na (mg/L)	6720.	723.	5990.	7700.	4	--	--
K (mg/L)	1600.	77.9	1500.	1690.	4	--	--
Ca mg/L)	361.	21.2	339.	387.	4	-24.1	-7
Mg (mg/L)	0.28	--	0.21	0.35	2	--	--
Si (mg/L)	918.	103.	845.	1070.	4	--	--
Li (mg/L)	19.1	2.02	16.9	21.8	4	--	--
B (mg/L)	13.9	0.702	13.2	14.6	4	-0.787	-6
Sr (mg/L)	3.68	3.44	0.72	7.21	4	--	--
Ba (mg/L)	0.566	0.5	0.503	0.624	4	--	--
Rb (mg/L)	11.5	5.03	6.44	16.6	4	--	--
Fe(A) (g/L)	2660.	3730.	70.2	6940.	3	--	--
Fe(B) (g/L)	2760.	3740.	97.	7030.	3	--	--
Mn (g/L)	630.	176.	517.	892.	4	--	--
Zn(A) (g/L)	44.4	--	22.5	66.2	2	--	--
Zn(B) (g/L)	17.3	--	16	18.6	2	--	--
Mo (g/L)	106.	56.7	33.6	163.	4	--	--
Co (g/L)	63.7	--	62.4	65.	2	--	--
Cr (g/L)	50.	--	45.3	54.7	2	--	--
Pb (g/L)	597.	200.	370.	748.	3	--	--
Ni (g/L)	44.3	--	42.2	46.4	2	--	--
V (g/L)	110.	--	100.	120.	2	--	--
Cd (g/L)	33.7	43.7	2.18	83.6	3	--	--
Cu(A) (g/L)	--	--	--	--	--	--	--
Cu(B) (g/L)	--	--	--	--	--	--	--
Tl (g/L)	103.	64.2	28.9	143.	3	--	--
As (g/L)	814.	261.	513.	970.	3	--	--
Se (g/L)	623.	541.	167.	1220.	3	--	--
Sb (g/L)	774.	--	723.	824.	2	--	--
Bi (g/L)	275.	--	275.	275.	1	--	--
Hg (g/L)	--	--	--	--	--	--	--
Al (g/L)	--	--	--	--	--	--	--
Na/K Rato	4.20	0.39	4.00	4.78	--	--	--

Table 16. Well No. M-42 (see fig. 1 for location). Elements in 2 observations (records 26 and 34; Table 1); one each in 1977 and 1978. The 1977 sample was condensed; the 1978 was flashed. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B).

[Standard deviation, Std; minimum concentration, Min.; maximum concentration, Max.; number of observations, N; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N
Na (mg/L)	6400.	--	6160.	6630.	2
K (mg/L)	1380.	--	1340.	1410.	2
Ca mg/L)	388.	--	388	388	2
Mg (mg/L)	0.438	--	0.43	0.447	2
Si (mg/L)	834.	--	809.	860.	2
Li (mg/L)	17.6	--	16.9	18.4	2
B (mg/L)	15.8	--	15.3	16.2	2
Sr (mg/L)	5.34	--	0.82	9.85	2
Ba (mg/L)	0.681	--	0.572	0.79	2
Rb (mg/L)	14.4	--	12.8	16.1	2
Fe(A) (g/L)	360.	--	249.	470.	2
Fe(B) (g/L)	321.	--	283.	359.	2
Mn (g/L)	216.	--	0.34*	432.	2
Zn(A) (g/L)	45.4	--	31.5	59.4	2
Zn(B) (g/L)	41.1	--	41.1	41.1	1
Mo (g/L)	136.	--	104.	168.	2
Co (g/L)	54.8	--	39.	70.6	2
Cr (g/L)	42.0	--	33.6	50.5	2
Pb (g/L)	700.	--	560.	840.	2
Ni (g/L)	47.4	--	47.4	47.4	1
V (g/L)	107.	--	81.6	132.	2
Cd (g/L)	3.0	--	2.18	3.81	2
Cu(A) (g/L)	--	--	--	--	--
Cu(B) (g/L)	--	--	--	--	--
Tl (g/L)	152.	--	99.1	205.	2
As (g/L)	915.	--	840.	990.	2
Se (g/L)	233.	--	191.	275.	2
Sb (g/L)	666.	--	400.	931.	2
Bi (g/L)	--	--	--	--	--
Hg (g/L)	--	--	--	--	--
Al (g/L)	--	--	--	--	--
Na/K Rato	4.65	0.074	4.60	4.70	2

***flashed sample (see text).**

Table 17. Well No. M-45 (see fig. 1 for location). Elements in 2 observations (records 26 and 34; Table 1) in 1979; both samples were condensed one of which was also diluted in the field. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B).
[Standard deviation, Std; minimum concentration, Min.; maximum concentration, Max.; number of observations, N; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N
Na (mg/L)	7980.	--	7410.	8550.	2
K (mg/L)	2480.	--	2450.	2500.	2
Ca mg/L)	429.	--	422.	436.	2
Mg (mg/L)	0.33	--	0.33	0.33	1
Si (mg/L)	1070.	--	911.	1230.	2
Li (mg/L)	27.1	--	23.5	30.7	2
B (mg/L)	17.2	--	17.1	17.2	2
Sr (mg/L)	5.44	--	4.94	5.95	2
Ba (mg/L)	2.04	--	1.87	2.2	2
Rb (mg/L)	10.9	--	9.88	11.9	2
Fe(A) (g/L)	254.	--	254.	254.	1
Fe(B) (g/L)	405.	--	405.	405.	1
Mn (g/L)	4000.	--	3740.	4250.	2
Zn(A) (g/L)	--	--	--	--	--
Zn(B) (g/L)	36.3	--	36.3	36.3	1
Mo (g/L)	166.	--	166.	166.	1
Co (g/L)	50.3	--	50.3	50.3	1
Cr (g/L)	2.6	--	2.6	2.6	1
Pb (g/L)	629.	--	629.	629.	1
Ni (g/L)	5.88	--	5.88	5.88	1
V (g/L)	29.3	--	29.3	29.3	1
Cd (g/L)	--	--	--	--	--
Cu(A) (g/L)	--	--	--	--	--
Cu(B) (g/L)	5.03	--	5.03	5.03	1
Tl (g/L)	94.1	--	94.1	94.12	1
As (g/L)	240.	--	240.	240.	1
Se (g/L)	--	--	--	--	--
Sb (g/L)	--	--	--	--	--
Bi (g/L)	--	--	--	--	--
Hg (g/L)	--	--	--	--	--
Al (g/L)	45.5	--	45.5	45.5	1
Na/K Rato	3.22	0.28	3.02	3.42	2

Table 18. Well No. M-114. Elements in four samples; all in 1979. All samples were condensed; two of the four were also diluted in the field. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B).

[Standard deviation, Std; minimum concentration, Min.; maximum concentration, Max.; number of observations, N; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N
Na (mg/L)	6010.	166.	5770.	6120.	4
K (mg/L)	1070.	38.6	1030.	1110.	4
Ca mg/L)	522.	3.30	520	527	4
Mg (mg/L)	0.245	--	0.239	0.251	2
Si (mg/L)	786.	103.	693.	890.	4
Li (mg/L)	18.5	1.87	16.5	20.4	4
B (mg/L)	12.2	0.129	12.1	12.4	4
Sr (mg/L)	13.8	0.208	13.6	14.1	4
Ba (mg/L)	0.414	0.05	0.369	0.458	4
Rb (mg/L)	5.95	0.673	5.34	6.64	4
Fe(A) (g/L)	--	--	--	--	--
Fe(B) (g/L)	106.	--	91.5	121	2
Mn (g/L)	224.	2.38	222.	227.	4
Zn(A) (g/L)	--	--	--	--	--
Zn(B) (g/L)	--	--	--	--	--
Mo (g/L)	164.	--	161.	167.	2
Co (g/L)	37.6	--	24.4	50.9	2
Cr (g/L)	51.6	--	38.7	64.6	2
Pb (g/L)	540.	299.	259.	812.	4
Ni (g/L)	24.4	--	19.3	29.4	2
V (g/L)	52.	--	42.5	61.5	2
Cd (g/L)	--	--	--	--	--
Cu(A) (g/L)	--	--	--	--	--
Cu(B) (g/L)	--	--	--	--	--
Tl (g/L)	160.	--	139.	181	2
As (g/L)	1620.	1090.	836.	2870.	3
Se (g/L)	168.	--	152.	184.	2
Sb (g/L)	--	--	--	--	--
Bi (g/L)	--	--	--	--	--
Hg (g/L)	--	--	--	--	--
Al (g/L)	--	--	--	--	--
Na/K Rato	5.608	0.103	5.51	5.75	4

Table 19. Well No. M-130. Elements in two samples; all in 1979. All samples were condensed; one of two was also diluted in the field. Fe, Zn, and Cu analyzed using two cassettes designated as (A) and (B).

[Standard deviation, Std; minimum concentration, Min.; maximum concentration, Max.; number of observations, N; value(s) below detection limit or not statistically significant, "--"]

Element	Mean	Std	Min.	Max.	N
Na (mg/L)	7340.	--	7110.	7570.	2
K (mg/L)	1860.	--	1800.	1920.	2
Ca mg/L)	441.	--	432.	450.	2
Mg (mg/L)	432.	---	432.	432.	1
Si (mg/L)	1050.	--	952.	1140.	2
Li (mg/L)	23.8	--	22.7	24.9	2
B (mg/L)	16.2	--	15.7	16.6	2
Sr (mg/L)	8.73	--	8.32	9.14	2
Ba (mg/L)	0.88	--	.819	.941	2
Rb (mg/L)	8.91	--	8.77	9.05	2
Fe(A) (g/L)	7.60	--	7.60	7.60	1
Fe(B) (g/L)	--	--	--	--	--
Mn (g/L)	1740.	--	1740.	1740.	--
Zn(A) (g/L)	--	--	--	--	--
Zn(B) (g/L)	--	--	--	--	--
Mo (g/L)	95.3	--	95.3	95.3	1
Co (g/L)	24.2	--	24.2	24.2	1
Cr (g/L)	20.1	--	20.1	20.1	1
Pb (g/L)	547.	--	547.	547.	1
Ni (g/L)	14.2	--	14.2	14.2	1
V (g/L)	39.6	--	39.6	39.6	1
Cd (g/L)	--	--	--	--	--
Cu(A) (g/L)	--	--	--	--	--
Cu(B) (g/L)	--	--	--	--	--
Tl (g/L)	116.	--	116.	116.	1
As (g/L)	522.	--	522.	522.	1
Se (g/L)	--	--	--	--	--
Sb (g/L)	--	--	--	--	--
Bi (g/L)	--	--	--	--	--
Hg (g/L)	--	--	--	--	--
Al (g/L)	151.	--	151.	151.	1
Na/K Rato	3.94	--	3.94	3.95	2