

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Lassen Known Geothermal Resource Area, California: Audio-magnetotelluric
Telluric Profiling, and Self-Potential Studies

by

K. R. Christopherson, D. B. Hoover, V. Lewis,
B. Radtke, and R. M. Senterfit

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This report is preliminary and has not been edited
or reviewed for conformity with U.S. Geological
standards and nomenclature.

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During the summer of 1979, geophysical work was done in the Lassen KGRA in northeastern California to assess the geothermal potential of the area. As part of the study, 68 audio-magnetotelluric (AMT) soundings were made and 2 telluric and self-potential (SP) profiles were done. For descriptions of these techniques and the equipment used see Hoover et al (1978), Corwin and Hoover (1979), and Beyer (1977).

The AMT station locations are shown in figure 1. The scalar resistivities (table 1) were contoured for 7.5 and 27 hertz data at north-south and east-west E-line orientations (figures 2 through 5). The contour maps are complex, reflecting both lateral changes in geology and geothermal activity.

The locations of the telluric and self-potential traverses are given in figure 6. The profiles for traverse 1 (figure 7) show varied SP and telluric responses. The variations are probably geologically related with the drop in SP voltage and telluric resistivity on the east end of the traverse caused by a lateral lithology change.

The profiles for traverse 2 (figure 8) show a sharp drop in SP voltage combined with a sharp increase in telluric resistivity near station 6. This could be associated with large-scale intrusive features (a ring dike?) which trend to the northwest.

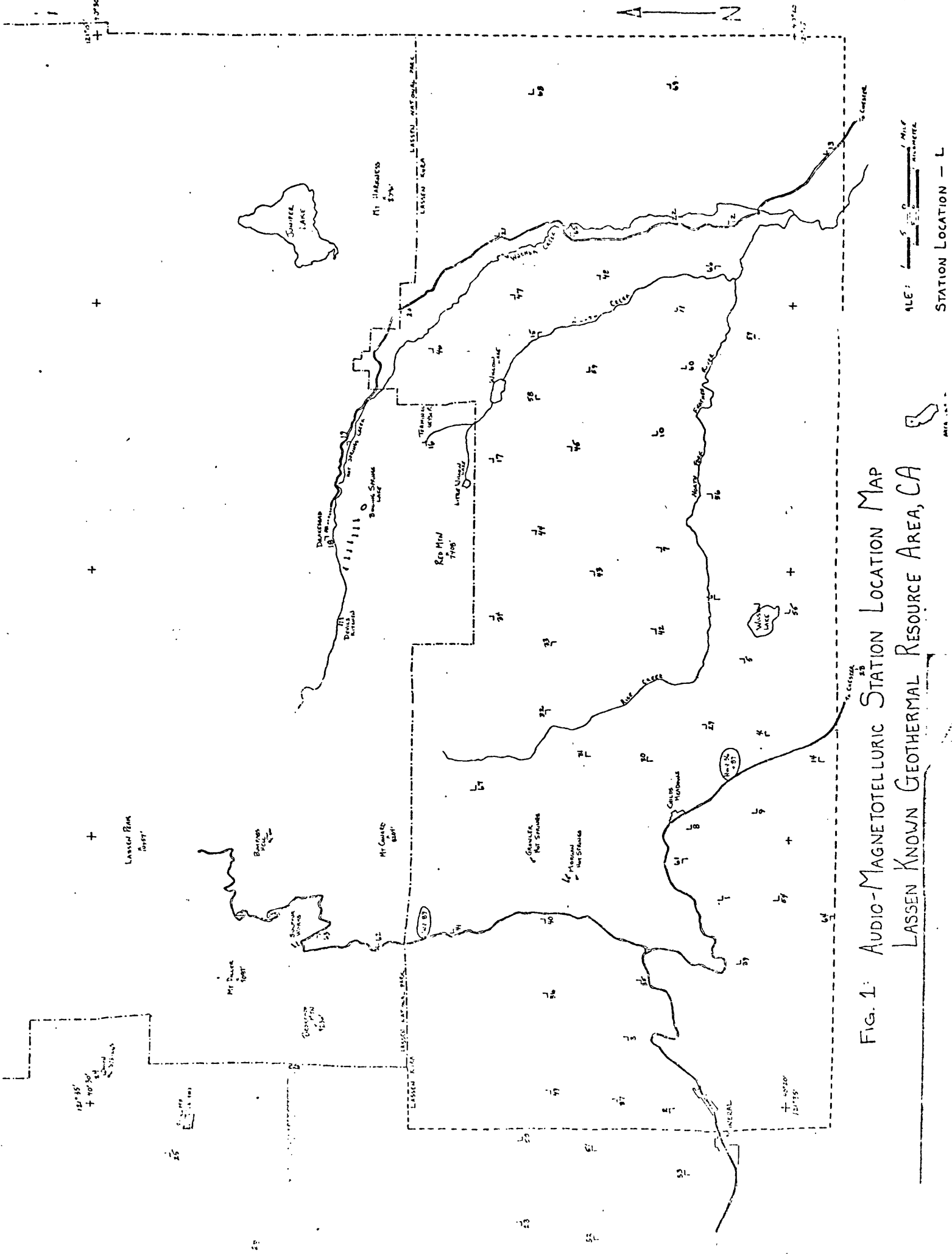


FIG. 1: AUDIO-MAGNETOTELLURIC STATION LOCATION MAP
 LASSEN KNOWN GEOTHERMAL RESOURCE AREA, CA

1:100000
 1 MILE
 1 KILOMETER
 STATION LOCATION - L

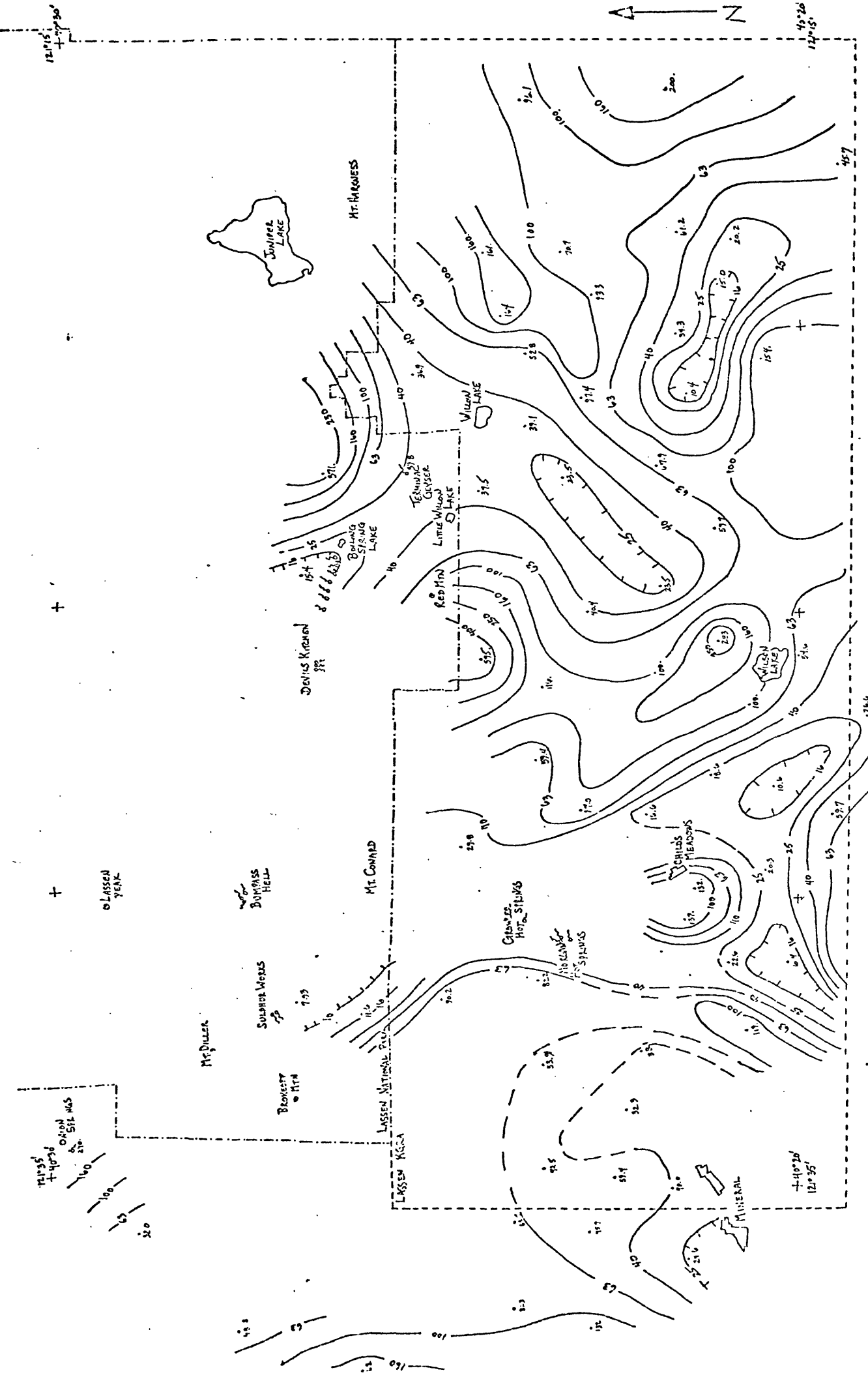


FIG. 2: AUDIO-MAGNETOTELLURIC APPARENT RESISTIVITY MAP

7.5 HERTZ · ELINE N-S

LASSEN KNOWN GEOTHERMAL RESOURCE AREA, CA.

LOGARITHMIC CONTOURS IN OHM-METERS
SCALE: 1" = 1 MILE

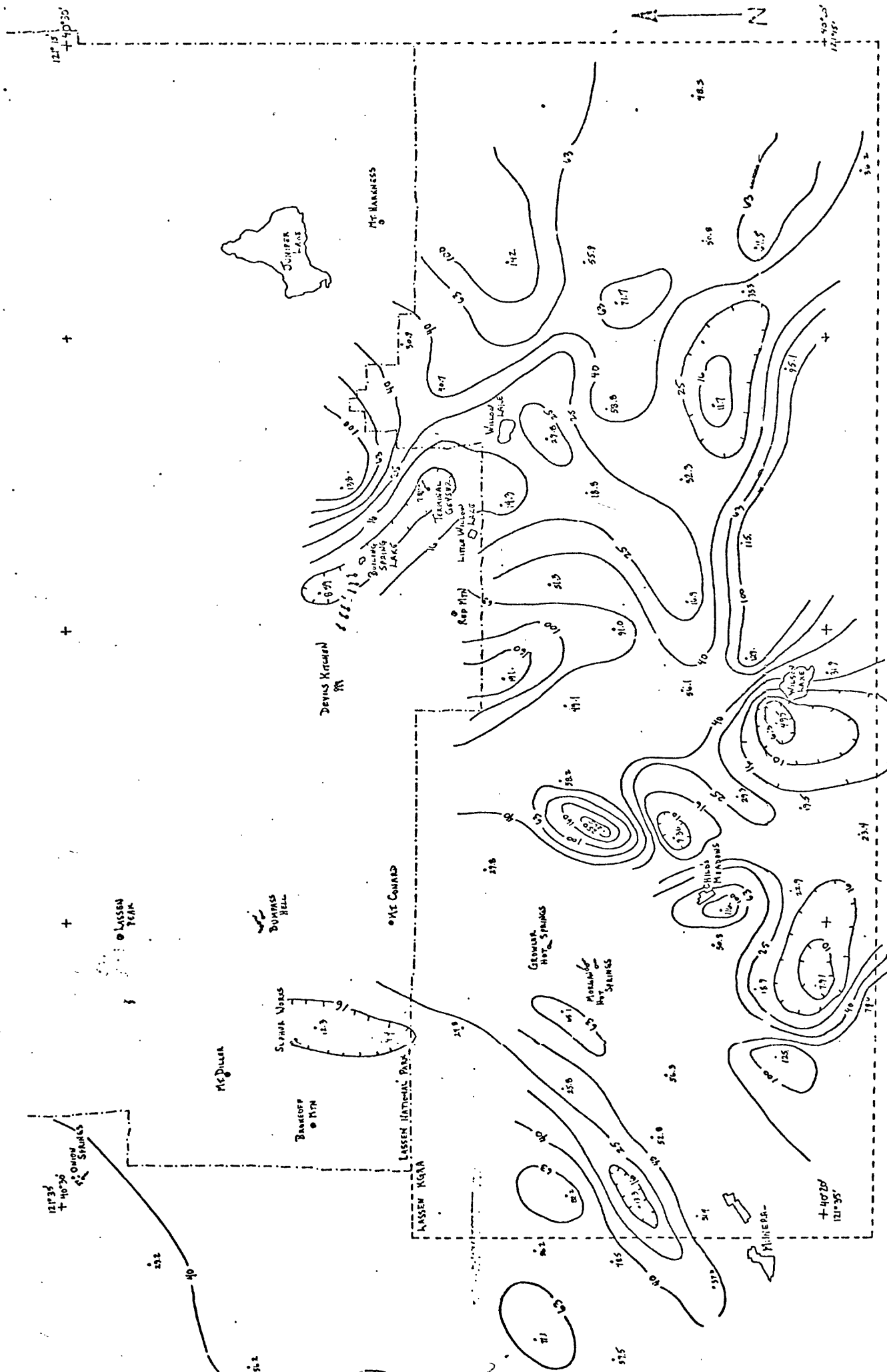


FIG. 3: AUDIO-MAGNETOTELLURIC APPARENT RESISTIVITY MAP
 75 HERTZ : E-LINE E-W
 LASSEN KNOWN GEOTHERMAL RESOURCE AREA, CA

LOGARITHMIC CONTOURS IN OHM-METERS
 SCALE: 1 MILE 1 KILOMETER

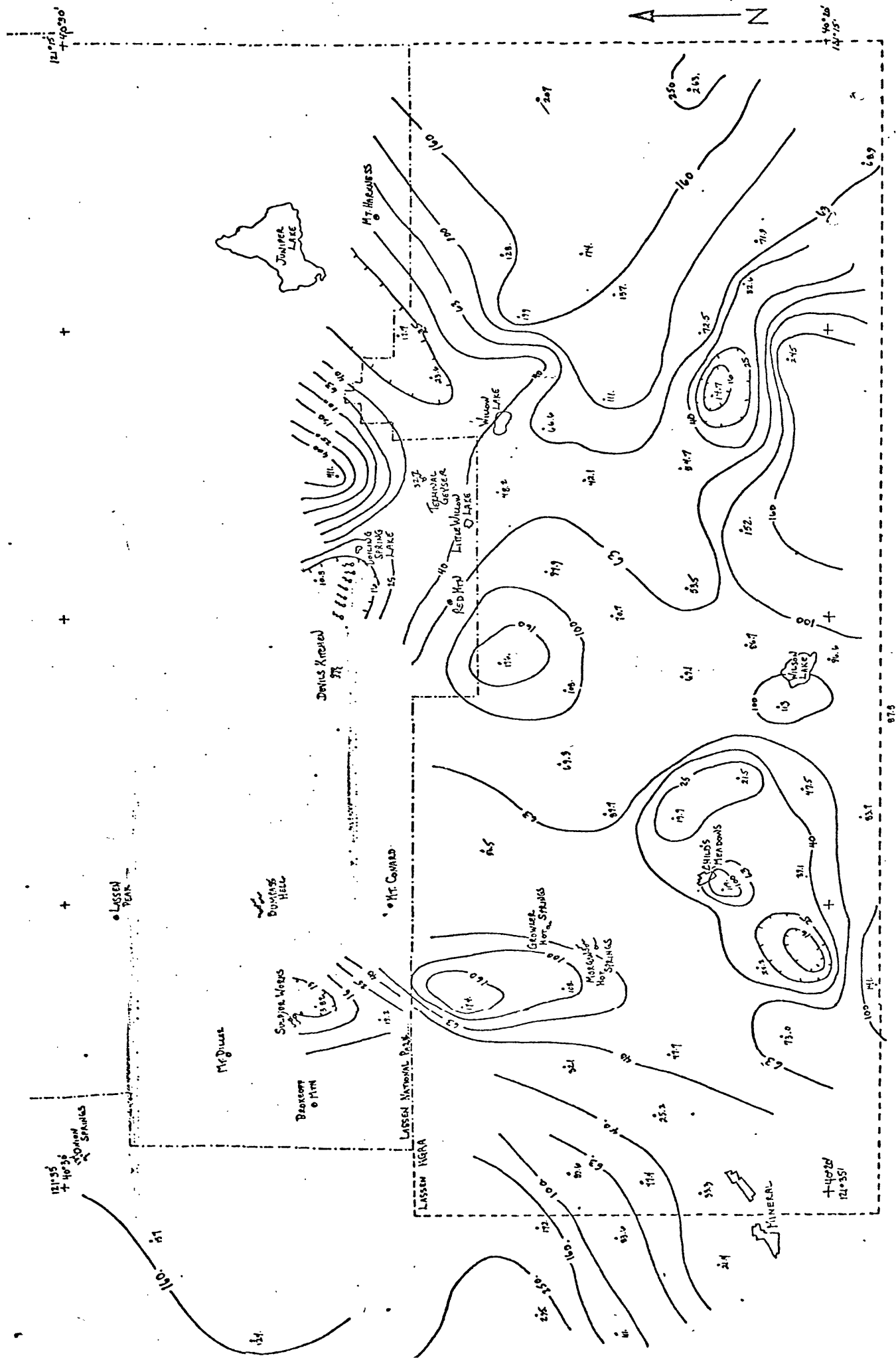


FIG. 4: AUDIO-MAGNETOTELLURIC APPARENT RESISTIVITY MAP
 27 HERTZ: E-LINE N-S
 LASSEN KNOWN GEOTHERMAL RESOURCE AREA, CA

LOGARITHMIC CONTOURS IN OHM-METERS
 SCALE: 1 MILE
 1600 METERS

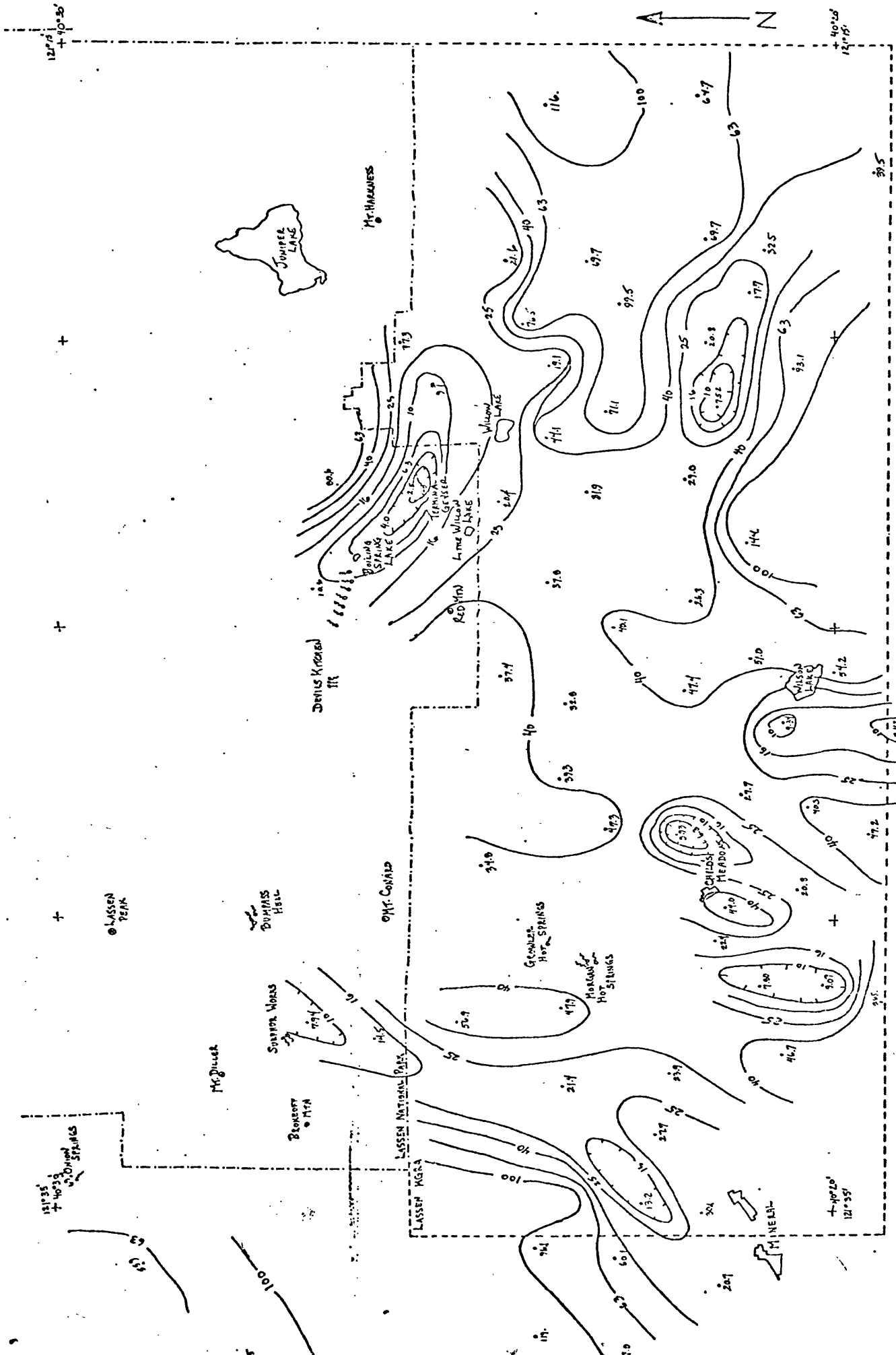


FIG. 5: AUDIO-MAGNETOTELLURIC APPARENT RESISTIVITY MAP
 27 HERTZ : ELINE E-W
 LASSEN KNOWN GEOTHERMAL RESOURCE AREA, CA

LOGARITHMIC CONTOURS IN OHM-METERS
 SCALE: 1 MILE
 0 1 KILOMETER

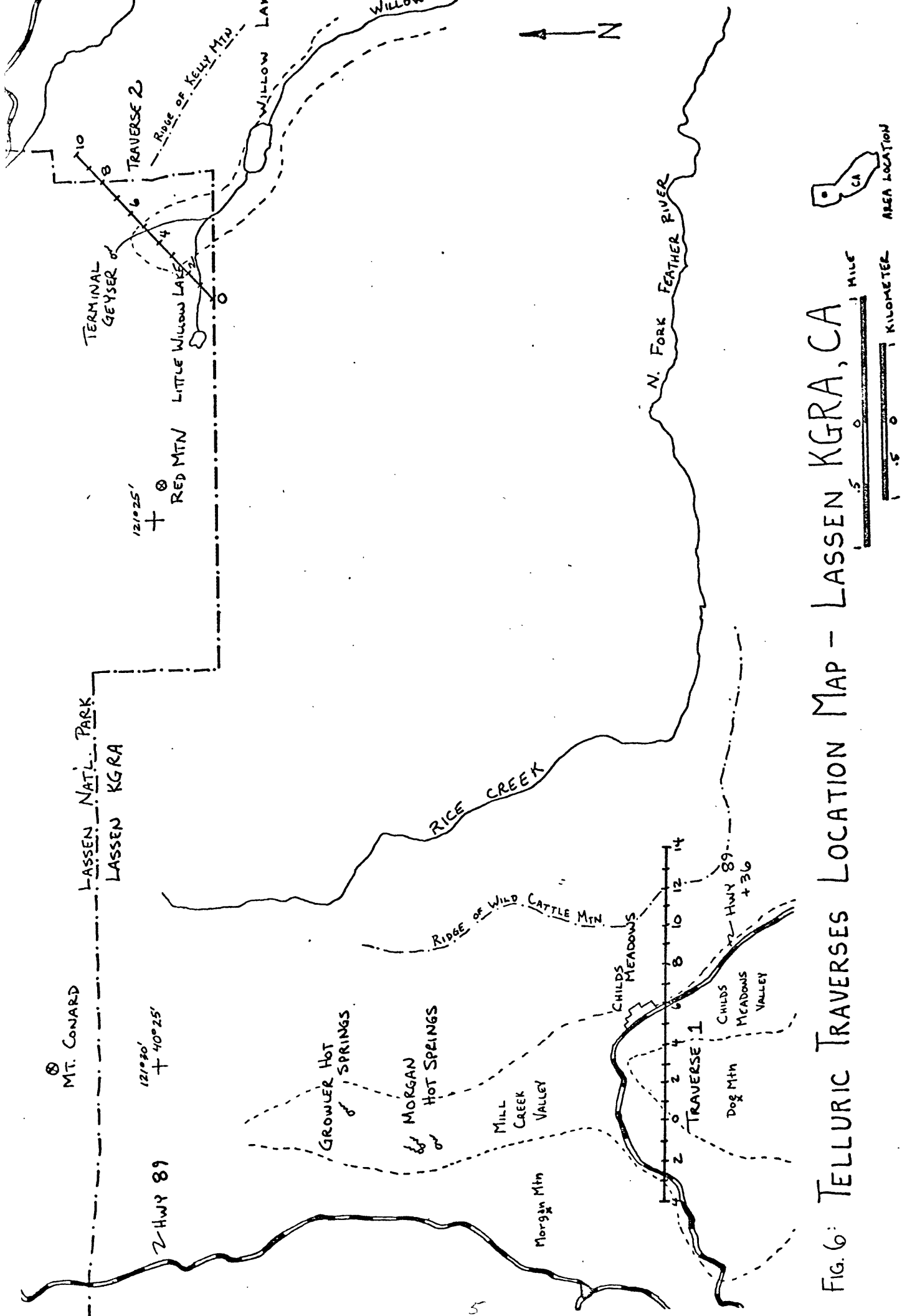


FIG. 6: TELLURIC TRAVERSES LOCATION MAP - LASSEN KGRA, CA

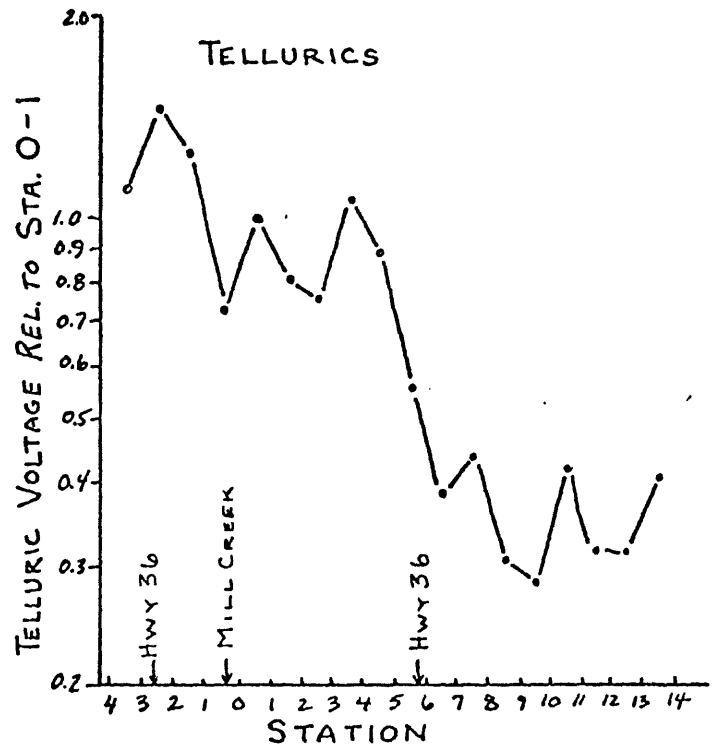
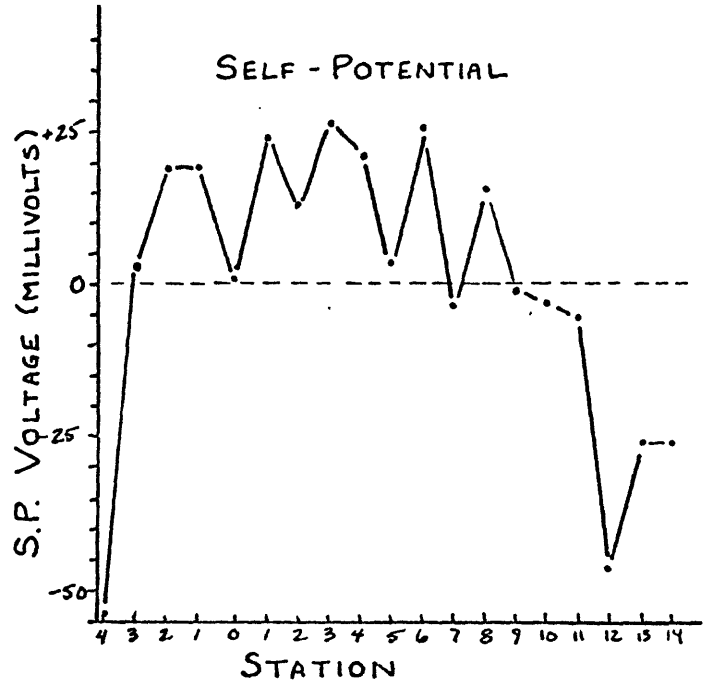


FIG. 7: PROFILES - TRAVERSE 1
LASSEN KGRA, CA

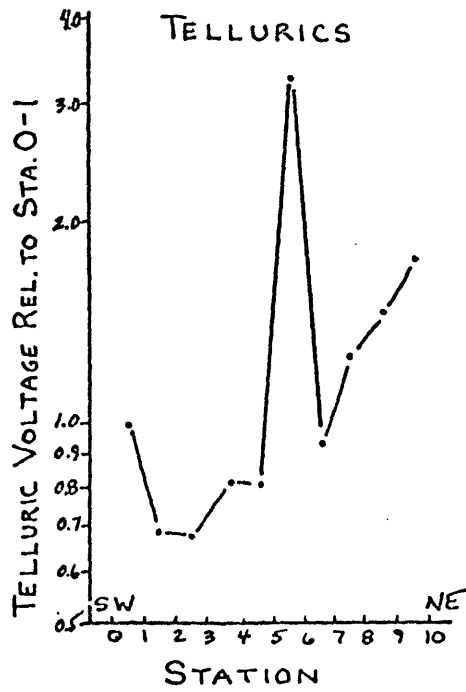
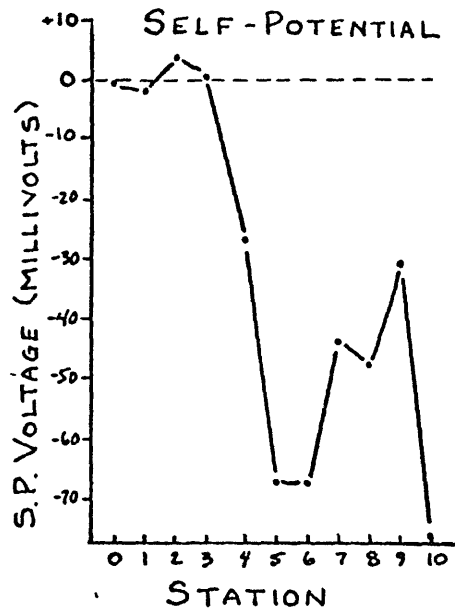


FIG. 8: PROFILES - TRAVERSE 2
LASSEN KGRA, CA

TABLE 1: U.S. GEOLOGICAL SURVEY A.M.T. DATA LOG

LASSEN KGRA, CA
JUNE 1979

pa = observed apparent resistivity in ohm-meters
 N = number of observations
 Er = standard error in ohm meters ? = no data

"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	13.6K
1NS	pa	22.6	30.4	15.0	25.2	33.6	52.5	—	—	—	43.0	39.9	103.
	N	4	7	9	8	6	7				5	5	1
	Er	1.23	2.46	2.40	1.26	1.95	5.51				5.13	1.05	—
1EW	pa	18.9	11.9	12.6	7.80	15.2	19.9	—	—	—	17.9	76.0	636.
	N	10	7	11	6	9	7				7	1	1
	Er	0.70	2.04	0.51	0.66	0.81	2.42				2.02	—	—
2NS	pa	40.0	45.8	43.7	33.3	50.9	70.6	—	—	—	71.1	48.1	181.
	N	8	8	8	8	7	9				7	5	1
	Er	3.38	4.51	3.45	4.71	4.85	6.43				5.31	2.04	—
2EW	pa	51.4	76.2	45.1	30.1	33.4	51.6	—	—	—	47.2	52.3	745
	N	8	6	10	10	10	9				8	1	1
	Er	6.79	12.8	2.72	1.07	0.81	6.63				0.68	—	—
3NS	pa	32.3	32.2	21.8	25.2	28.3	38.4	—	—	—	34.0	29.6	51.3
	N	9	9	9	7	7	8				8	4	1
	Er	3.57	4.25	1.09	1.72	1.30	2.02				2.09	3.31	—
3EW	pa	52.8	38.0	40.9	27.7	37.5	30.9	—	—	—	45.3	39.3	189.
	N	9	9	9	10	7	5				6	1	1
	Er	3.80	3.48	2.41	1.79	1.80	4.02				1.13	—	—
4NS	pa	10.6	14.0	22.7	47.5	101.	46.2	—	—	—	? 6.84	21.0	84.6
	N	11	7	11	7	8	4				8	1	1
	Er	1.23	3.31	2.79	6.83	21.6	14.3				0.42	—	—
4EW	pa	19.5	21.3	30.7	40.3	106.	86.7	—	—	—	? 7.70	73.9	185.
	N	11	8	8	7	8	8				7	1	1
	Er	1.35	1.72	2.70	3.12	7.48	9.19				0.99	—	—

ρ_a = observed apparent resistivity in ohm-meters

N = number of observations

Er = standard error in ohm meters

- = no data

"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
5NS	ρ _a	100.	66.6	77.9	113.	161.	435.	—	—	—	111.	87.1	327
	N	8	9	8	10	8	8				7	1	1
	Er	13.1	5.82	4.02	10.6	27.2	106				8.35	—	—
5EW	ρ _a	4.95	5.14	7.42	9.34	25.1	49.0	—	—	—	62.1	147.	107.
	N	12	9	10	10	10	7				7	1	1
	Er	0.28	0.49	0.26	0.72	1.35	4.64				6.44	—	—
6NS	ρ _a	283.	119.	63.2	86.7	133.	206.	—	—	—	79.4	92.3	154.
	N	8	6	11	9	9	8				8	7	1
	Er	24.4	20.0	4.78	10.5	7.38	12.0				4.52	5.78	—
6EW	ρ _a	129.	80.2	48.7	51.0	118.	168.	—	—	—	27.1	125.	261.
	N	7	6	9	10	9	8				7	1	1
	Er	24.8	22.7	3.96	4.79	9.48	19.8				2.34	—	—
7NS	ρ _a	23.5	30.7	27.5	53.5	121.	159.	—	—	—	90.9	189.	486.
	N	10	7	8	8	10	7				9	1	1
	Er	1.87	3.12	2.93	6.51	12.4	9.94				4.23	—	—
7EW	ρ _a	16.9	19.1	21.7	26.3	63.1	97.1	—	—	—	25.3	560.	343
	N	8	10	9	9	7	6				9	1	1
	Er	1.42	1.72	1.26	1.62	3.15	13.2				1.51	—	—
8NS	ρ _a	132.	87.4	113.	119.	103.	27.6	—	—	—	0.55	10.2	10.6
	N	10	7	8	10	11	7				8	1	1
	Er	8.23	11.2	13.1	6.79	4.52	5.22				0.04	—	—
8EW	ρ _a	116.	76.5	82.2	44.0	39.8	14.2	—	—	—	7.13	59.5	32.3
	N	14	12	12	11	13	11				6	1	6
	Er	2.94	3.59	4.00	1.74	2.95	0.82				0.75	—	0.69

JUNE 1979

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-- = no data

"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
9NS	pa	20.3	32.1	81.9 [?]	39.1	59.5	87.7	---	---	---	85.2	111.	200.
	N	5	5	4	6	8	5				6	1	1
	Er	1.94	6.50	19.8	8.12	2.36	4.69				6.60	---	---
9EW	pa	22.9	20.3	44.2 [?]	20.8	60.0	213.?	---	---	---	227.	274.	502.
	N	6	8	6	6	8	4				7.	1	1
	Er	1.80	3.01	2.07	2.73	4.30	17.6				7.87	---	---
10NS	pa	67.9	39.8	45.1	54.7	32.4	20.7	---	---	---	52.3	279.	369.
	N	6	5	6	9	7	7				5	1	1
	Er	10.6	9.83	3.25	5.53	1.80	3.70				1.41	---	---
10EW	pa	32.3	19.5	28.8	29.0	44.8	27.9	---	---	---	59.3	342.	1061.
	N	9	11	9	12	10	6				4	1	1
	Er	2.38	1.60	2.52	2.57	2.75	3.10				9.61	---	---
11NS	pa	34.3	54.4	49.4	72.5	67.9	44.8	---	---	---	30.3	40.4	141.
	N	9	7	8	8	8	7				10	1	1
	Er	4.35	8.02	12.9	5.04	4.33	3.42				0.96	---	---
11EW	pa	24.3	20.0	33.0	20.8	7.62 [?]	17.8	---	---	---	13.0	137.	1.00 [?]
	N	12	7	8	10	12	6				6	1	1
	Er	1.18	1.99	2.50	1.25	0.49	2.36				0.51	---	---
12NS	pa	20.2	25.5	31.4	71.9	53.3	178	---	---	---	150.	591.	480.
	N	5	7	7	8	8	5				7	1	1
	Er	2.73	1.55	2.25	13.4	4.82	37.2				5.10	---	---
12EW	pa	64.5	46.5	48.5	32.5	37.8	56.6	---	---	---	187.	474.	956.
	N	9	10	11	12	9	6				9	1	1
	Er	5.36	3.75	2.30	1.43	1.39	3.14				147	---	---

JUNE 1979

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"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
13NS	pa	45.7	70.5	56.8	68.9	45.6	115.	—	—	—	192.	764.	1297.
	N	10	8	9	10	8	8				7	1	1
	Er	5.98	6.72	4.22	4.92	2.68	40.7				5.59	—	—
13EW	pa	36.2	35.8	47.4	39.5	58.2	74.2	—	—	—	344.	696.	1038.
	N	8	7	8	8	12	10				8	1	1
	Er	2.13	2.55	1.45	6.13	2.59	2.60				18.4	—	—
14NS	pa	59.7	54.4	49.8	83.7	188.	192.	—	—	—	36.9	154.	198.
	N	10	9	9	10	8	9				7	1	1
	Er	4.75	6.08	3.74	8.51	7.32	8.40				1.17	—	—
14EW	pa	23.4	33.3	45.2	47.2	125.	146.	—	—	—	85.2	136.	345.
	N	9	11	10	7	10	7				9	1	1
	Er	1.94	1.72	2.45	3.48	4.52	6.91				2.94	—	—
15NS	pa	52.8	36.8	38.6	30.4	39.5	36.3	—	—	—	9.35	104.	35.5
	N	10	9	9	10	10	10				9	1	8
	Er	3.34	4.30	2.67	3.45	3.27	1.69				0.62	—	0.89
15EW	pa	16.3	23.1	23.8	19.1	24.6	30.8	—	—	—	23.5	149.	65.0
	N	10	10	11	10	13	10				8	1	10
	Er	1.05	2.14	1.69	1.23	1.12	1.58				1.61	—	1.14
16NS	pa	39.8	26.4	41.6	32.7	14.4	4.07	—	—	—	5.86	20.6	32.1
	N	9	9	12	9	10	8				12	1	1
	Er	4.54	2.65	3.10	3.02	0.80	0.14				0.34	—	—
16EW	pa	7.86	4.94	1.40	2.13	3.33	3.69	—	—	—	3.58	8.18	28.2
	N	5	5	7	11	12	10				9	1	1
	Er	1.47	0.64	0.24	0.15	0.19	0.10				0.17	—	—

U.S. GEOLOGICAL SURVEY A.M.T. DATA LOG

LASSEN KGRA, CA

JUNE 1979

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- = no data

"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
17ns	pa	37.5	42.2	32.9	48.2	88.0	79.9	—	—	—	124.	388.	258.
	N	12	8	11	11	10	8	—	—	—	8	1	1
	Er	4.92	3.85	2.05	2.67	4.70	1.19	—	—	—	13.5	—	—
17ew	pa	14.3	13.9	16.8	20.4	53.1	97.7	—	—	—	140.	306.	139.
	N	10	7	9	11	10	12	—	—	—	9	1	1
	Er	0.88	1.45	0.97	1.61	2.24	8.48	—	—	—	9.33	—	—
18ns	pa	15.4	15.5	8.98	10.8	14.9	13.9	—	—	—	16.9	53.2	107
	N	7	8	10	10	11	11	—	—	—	8	1	1
	Er	2.10	2.69	0.85	0.78	0.82	1.25	—	—	—	1.62	—	—
18ew	pa	8.59	9.31	10.2	10.6	16.6	15.8	—	—	—	16.5	59.5	37.3
	N	7	7	9	9	12	9	—	—	—	9	1	1
	Er	0.72	1.75	0.89	1.13	0.95	1.61	—	—	—	1.10	—	—
19ns	pa	371.	472.	569.	411.	373.	246.	—	—	—	53.8	57.6	247.
	N	9	9	9	10	8	7	—	—	—	10	1	1
	Er	27.6	50.1	143.	29.3	31.9	27.1	—	—	—	3.97	—	—
19ew	pa	138.	118.	138.	80.6	88.9	13.4	—	—	—	27.6	81.7	152
	N	10	11	8	11	10	6	—	—	—	7	1	1
	Er	12.2	10.9	16.8	3.08	2.52	1.07	—	—	—	1.65	—	—
20ns	pa	33.1	39.8	22.0	17.7	9.15	11.5	—	—	—	34.1	179.	312.
	N	7	8	10	10	6	9	—	—	—	8	1	1
	Er	3.95	4.72	2.54	1.68	1.80	1.52	—	—	—	1.80	—	—
20ew	pa	30.9	24.0	25.2	17.3	23.3	38.4	—	—	—	99.2	169.	156.
	N	10	11	12	11	13	11	—	—	—	9	1	1
	Er	1.92	1.81	1.92	0.58	0.65	1.22	—	—	—	2.97	—	—

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Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
21NS	pa	161.	168.	115.	128.	123.	96.7	—	—	—	28.7	134.	170.
	N	8	5	13	10	9	8				9	1	1
	Er	21.7	16.4	9.61	8.53	5.70	10.1				1.54	—	—
21EW	pa	142.	8.18?	5.10	21.6	17.1	64.1	—	—	—	84.7	156.	96.9
	N	5	7	4	6	5	8				7	1	4
	Er	18.0	0.85	1.11	4.49	2.97	15.0				5.50	—	4.89
22NS	pa	61.2	107.	70.2	105.	65.3	37.8	—	—	—	56.0	275.	383.
	N	8	8	12	8	6	10				9	1	1
	Er	5.27	18.5	6.14	8.98	3.79	1.14				2.55	—	—
22EW	pa	50.8	49.8	61.0	69.7	96.8	99.5	—	—	—	256.	237.	28.7
	N	10	12	11	10	12	12				9	1	1
	Er	4.58	3.44	2.21	8.75	7.06	5.37				14.4	—	—
23NS	pa	26.6	39.6	47.8	87.8	111.	184.	—	—	—	52.5	103.	? 1.19
	N	9	7	10	11	11	11				7	1	1
	Er	2.96	6.59	2.91	7.77	11.1	14.8				3.97	—	—
23EW	pa	15.0	7.49	9.54	7.42	17.2	30.6	—	—	—	24.4	111.	
	N	6	6	7	8	11	9				6	1	
	Er	2.54	0.35	1.11	0.87	1.70	4.03				1.98	—	—
24NS	pa	240.	129.	91.4	134.	203.	155.	—	—	—	135.	788.	395.
	N	5	9	7	9	7	7				6	1	1
	Er	17.7	24.2	22.1	12.3	8.85	20.7				8.33	—	—
24EW	pa	37.0	35.9	53.7	69.4	208.	269.	—	—	—	87.9	1008.	1643.
	N	12	9	13	12	11	9				1	1	1
	Er	2.22	3.63	2.67	3.51	7.21	16.4				1.08	—	—

JUNE 1979

pa = observed apparent resistivity in ohm-meters

N = number of observations

Er = standard error in ohm meters

— = no data

"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
25NS	pa	52.0	57.9	105.	157.	341.	277.	—	—	—	11.3	36.9	46.5
	N	8	7	7	5	11	10				9	1	1
	Er	7.95	6.02	11.3	12.0	27.1	17.9				0.42	—	—
25EW	pa	29.2	30.3	41.2	55.9	131.	123.	—	—	—	12.2	52.9	51.4
	N	18	13	13	11	13	12				8	1	6
	Er	2.04	2.07	2.65	2.84	7.81	4.50				1.34	—	3.84
26NS	pa	48.8	76.5	74.1	124.	260.	242.	—	—	—	104.	229.	446.
	N	9	10	12	11	9	10				6	1	1
	Er	5.09	10.9	4.46	5.42	19.2	23.5				13.8	—	—
26EW	pa	56.2	43.5	65.1	77.5	164.	252.	—	—	—	74.6	279.	154.
	N	9	12	12	13	13	8				7	1	3
	Er	6.34	3.85	4.11	3.96	5.04	22.5				6.05	—	2.33
27NS	pa	168.	245.	283.	238.	1176. [?]	684.	—	—	—	202.	737.	804.
	N	8	11	12	6	6	7				7	1	1
	Er	20.3	28.9	19.1	27.3	78.8	95.9				5.09	—	—
27EW	pa	33.8	59.6	95.1	102.	368.	587.	—	—	—	167.	575.	185.
	N	7	12	11	12	13	10				10	1	1
	Er	5.11	4.81	5.37	5.07	16.5	42.0				11.3	—	—
28NS	pa	81.3	136.	98.7	295.	303.	230.	—	—	—	169.	809.	852.
	N	10	6	8	12	6	12				8	1	1
	Er	7.02	4.78	6.70	19.8	29.3	17.2				9.54	—	—
28EW	pa	71.1	74.5	91.9	119.	281.	262.	—	—	—	169.	355.	213.
	N	13	9	11	12	9	10				8	1	1
	Er	6.82	7.54	3.72	3.95	6.02	11.6				9.35	—	—

JUNE 1979

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— = no data

"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
29ns	pa	18.6	25.6	20.3	21.5	21.7	3.74	—	—	—	14.4	123.	147.
	N	14	12	11	9	8	7	—	—	—	8	(	1
	Er	1.13	1.71	2.20	1.93	1.09	0.80	—	—	—	0.77	—	—
29ew	pa	29.3	27.9	26.9	27.7	44.9	8.77	—	—	—	11.3	237.	43.0
	N	12	10	12	12	12	7	—	—	—	6	1	1
	Er	1.63	1.64	1.51	1.00	2.61	0.86	—	—	—	1.23	—	—
30ns	pa	16.6	15.8	10.2	19.9	23.2	24.9	—	—	—	21.7	57.6	148.
	N	9	9	8	11	13	6	—	—	—	10	1	1
	Er	1.10	1.73	0.44	2.07	0.64	4.22	—	—	—	1.33	—	—
30ew	pa	9.36	12.8	8.28	5.93	—	7.16	—	—	—	2.82	51.3	149.
	N	8	8	11	13	—	5	—	—	—	8	1	1
	Er	0.92	1.99	0.52	0.57	—	1.00	—	—	—	0.35	—	—
31ns	pa	97.0	73.0	70.8	89.7	148.	352.	—	—	—	13.8	892.	17.2
	N	10	8	8	10	9	6	—	—	—	7	(	1
	Er	5.16	9.20	3.60	8.94	10.9	139.	—	—	—	1.7	—	—
31ew	pa	265.	254.	115.	47.3	50.3	30.8	—	—	—	716.	254.	—
	N	2	6	7	11	9	7	—	—	—	6	(—
	Er	26.5	53.3	16.5	3.71	2.79	2.10	—	—	—	49.1	1	—
32ns	pa	59.4	49.8	51.9	69.3	88.8	135.	—	—	—	400.	827.	1850.
	N	14	13	11	10	15	7	—	—	—	7.	(	1
	Er	6.67	5.23	2.69	5.09	10.1	21.3	—	—	—	19.0	—	—
32ew	pa	58.2	38.9	43.3	39.3	100.	196.	—	—	—	108.	1193.	716.
	N	13	9	9	11	15	8	—	—	—	9	1	1
	Er	4.60	5.49	2.85	2.32	3.30	26.3	—	—	—	5.87	—	—

U.S. GEOLOGICAL SURVEY A.M.T. DATA LOG

WASSEN KGRA, CA

JUNE 1979

pa = observed apparent resistivity in ohm-meter s

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— = no data

"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
33ns	pa	116.	54.9	70.6	108.	69.6	31.3	—	—	—	344.	793.	4040.
	N	5	7	5	11	6	8				13	(	1
	Er	25.8	6.27	12.6	6.20	4.74	4.35				9.71	—	—
33ew	pa	49.1	51.4	38.7	32.8	45.9	79.9	—	—	—	183.	3180.	660.
	N	14	15	14	8	15	11				8	(	1
	Er	5.01	6.08	1.84	2.63	2.87	6.67				13.7	—	—
34ns	pa	595.?	512.?	162.	196.	131.	348.	—	—	—	627.	2240.	2115.
	N	3	5	5	8	7	11				9	(	1
	Er	131.	47.6	24.3	20.7	27.5	48.8				32.1	—	—
34ew	pa	191.	72.9	70.0	57.4	118.	76.1	—	—	—	270.	1011.	8195.
	N	8	12	14	12	10	6				9	(	1
	Er	23.6	7.25	5.83	5.54	16.0	14.4				15.1	—	—
35ns	pa	38.1	50.0	30.7	47.7	52.0	67.8	—	—	—	89.9	1074.	378.
	N	8	9	7	11	9	9				8	(	1
	Er	4.52	4.90	4.16	3.64	2.52	8.31				4.80	—	—
35ew	pa	56.3	36.5	29.8	23.9	27.7	52.9	—	—	—	86.7		
	N	12	9	11	10	9	9				8		
	Er	2.88	3.54	2.34	1.51	1.68	5.92				8.91		
36ns	pa	53.9	79.8	21.6	32.1	109.?	248.?	—	—	—	39.9	36.6	288.
	N	12	2	12	10	5	5				7	(	1
	Er	5.40	5.84	1.71	3.93	8.73	25.4				1.40	—	—
36ew	pa	25.8	55.5	26.7	21.4	95.7	65.6	—	—	—	34.8	162.	4730.
	N	11	6	8	6	8	5				7	(1
	Er	3.64	7.26	2.25	2.46	16.1	6.36				4.21	—	—

JUNE 1979

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"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
37ws	pa	59.4	27.0	27.9	47.4	23.0	14.4	—	—	—	152.	452.	645.
	N	7	6	6	9	5	7				10	1	1
	Er	6.67	4.33	3.47	6.75	1.90	2.65				4.07	—	—
37ew	pa	13.3	6.79	14.1	13.2	18.5	16.5	—	—	—	50.0	810.	1195.
	N	11	9	11	12	10	6				8	1	1
	Er	1.17	0.48	0.73	0.96	1.22	1.92				3.63	—	—
39ws	pa	119.	129.	73.9	73.0	97.6	107.	—	—	—	32.1	122.	116.
	N	8	5	11	10	9	8				10	1	1
	Er	6.73	11.9	6.08	14.6	6.86	14.7				1.60	—	—
39ew	pa	125.	126.	64.6	46.7	53.8	58.5	—	—	—	41.2	130.	335.
	N	7	9	7	13	15	11				10	1	1
	Er	10.2	12.3	4.23	4.31	3.80	3.60				2.90	—	—
40ws	pa	82.2	80.6	74.9	108.	193.	109.	—	—	—	71.3	108.	313.
	N	10	8	10	11	12	9				8	1	1
	Er	7.71	6.23	2.36	5.24	10.7	13.9				5.27	—	—
40ew	pa	65.1	37.7	55.3	49.9	139.	183.	—	—	—	149.	237.	419.
	N	6	7	11	14	12	12				7	1	1
	Er	13.2	2.67	5.83	3.06	4.30	13.4				13.5	—	—
41ws	pa	90.2	103.	88.7	174.	434.	657.	—	—	—	50.6	161.	171.
	N	5	6	9	8	8	8				8	1	1
	Er	19.0	8.68	3.93	12.1	18.5	57.8				1.28	—	—
41ew	pa	24.8	27.3	56.1	56.9	149.	177.	—	—	—	71.9	313.	167.
	N	6	8	11	9	11	7				8	1	1
	Er	3.07	4.38	5.09	3.71	8.90	17.0				8.24	—	—

JUNE 1979

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— = no data

"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
42 _{us}	pa	100.	79.2	50.0	69.1	97.4	27.5	—	—	—	37.0	40.8	206.
	N	8	7	11	12	11	7				6	1	1
	Er	12.8	6.07	3.78	4.88	6.54	4.78				3.60	—	—
42 _{ev}	pa	56.1	50.0	57.4	47.4	70.4	46.1	—	—	—	22.2	255.	431.
	N	10	8	13	10	10	6				7	1	1
	Er	3.01	3.59	3.33	3.79	4.63	5.97				2.98	—	—
43 _{us}	pa	40.4	92.6	34.8	70.7	112.	151.	—	—	—	178.	520.	1195.
	N	8	10	11	11	9	5				8	1	1
	Er	3.88	16.7	1.32	5.62	10.2	44.6				9.70	—	—
43 _{ev}	pa	91.0	104.	51.1	40.1	98.9	205.	—	—	—	108.	1780.	2410.
	N	7	7	11	11	9	9				9	1	1
	Er	8.00	10.6	4.39	2.45	3.75	18.0				19.8	—	—
44 _{us}	pa	66.7	102.	78.0	97.9	91.9	160.	—	—	—	286.	865.	1330.
	N	8	6	7	10	12	4				10	1	1
	Er	7.17	10.2	5.61	4.81	6.20	29.4				13.9	—	—
44 _{ev}	pa	51.3	35.6	43.6	37.8	65.9	23.2	—	—	—	111.	2680.	549.
	N	10	5	8	13	10	9				8	1	1
	Er	1.91	12.3	3.00	2.89	8.14	3.27				7.18	—	—
45 _{us}	pa	23.5	45.3	27.3	42.1	62.5	58.7	—	—	—	62.4	70.7	366.
	N	7	8	9	10	11	10				7	1	1
	Er	2.46	3.61	2.13	3.53	3.48	7.18				3.10	—	—
45 _{ev}	pa	18.8	18.2	31.0	31.9	67.3	218.	—	—	—	96.5	488.	252.
	N	12	12	11	8	12	8				4	1	1
	Er	1.60	1.91	2.64	5.12	2.04	16.0				5.58	—	—

JUNE 1979

ρ_a = observed apparent resistivity in ohm-meters

N = number of observations

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— = no data

"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
46ws	ρ_a	36.9	29.2	23.7	23.6	9.23	11.9	—	—	—	39.2	115.	239.
	N	7	8	10	11	9	9				8	(	1
	Er	3.49	3.46	1.66	1.58	1.24	1.37				1.18	—	—
46ew	ρ_a	40.7	30.1	17.2	9.61	22.0	21.5	—	—	—	33.8	54.5	3720.
	N	9	7	7	12	10	12				9	1	1
	Er	4.51	2.23	0.99	0.55	3.09	1.01				1.49	—	—
47ws	ρ_a	164.	178.	208.	199.	149.	107.	—	—	—	61.4	87.1	198.
	N	7	4	11	5	12	12				10	(	1
	Er	20.7	43.4	21.0	26.6	10.9	10.3				2.16	—	—
47ew	ρ_a	81.8	207.?	74.3	76.5	57.4	78.4	—	—	—	55.8	82.3	182.
	N	4	6	10	13	14	15				11	1	5
	Er	14.8	28.3	6.39	4.47	2.03	4.72				1.54	—	3.43
48ws	ρ_a	93.3	91.3	114.	157.	231.	121.	—	—	—	152.	588.	719.
	N	11	11	11	11	11	10				7	(	1
	Er	6.45	12.1	6.24	13.7	18.8	10.3				12.3	—	—
48ew	ρ_a	71.7	80.2	93.2	99.5	197.	166.	—	—	—	195.	303.	1820.
	N	9	7	9	12	12	9				9	(	1
	Er	8.62	5.66	8.75	7.23	7.34	14.28				12.4	—	—
49ws	ρ_a	42.5	45.9	34.1	89.6	148.	54.6	—	—	—	72.9	45.3	408.
	N	9	11	10	11	9	9				10	(	1
	Er	4.87	5.21	2.27	8.22	16.9	4.62				6.33	—	—
49ew	ρ_a	82.2	58.3	80.8	112.	300.	248.	—	—	—	233.	848.	1020.
	N	8	11	9	10	12	10				9	(	1
	Er	10.1	6.90	7.40	7.12	14.4	20.5				12.9	—	—

ρ_a = observed apparent resistivity in ohm-meters

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"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
50ns	ρ_a	63.7	80.4	97.1	172.	284.	112.	—	—	—	95.2	313.	176.
	N	11	9	11	10	9	10				8	1	1
	Er	2.95	10.0	4.50	12.9	33.8	10.8				8.76	—	—
50ew	ρ_a	56.2	65.7	82.1	96.1	235.	406.	—	—	—	190.	618.	470.
	N	9	8	11	12	11	10				8	1	1
	Er	5.51	8.45	4.21	4.70	5.71	23.4				16.9	—	—
51ps	ρ_a	45.7	75.1	59.6	83.6	116.	64.7	—	—	—	56.1	87.1	96.1
	N	9	10	12	12	12	9				10	1	1
	Er	4.23	5.39	4.63	4.23	5.12	8.94				1.50	—	—
51ew	ρ_a	48.5	52.8	52.5	60.1	146.	117.	—	—	—	79.0	253.	215.
	N	6	10	11	11	11	8				10	1	1
	Er	7.03	2.76	3.55	2.06	8.94	15.5				6.63	—	—
52ns	ρ_a	132.	163.	131.	111.	143.	116.	—	—	—	55.1	134.	94.5
	N	3	4	6	9	12	7				10	1	1
	Er	37.8	38.0	13.7	7.99	6.71	19.2				2.68	—	—
52ew	ρ_a	57.5	49.2	78.	97.0	212.	132.	—	—	—	27.9	59.5	59.5
	N	12	10	7	8	10	10				9	1	1
	Er	5.68	3.26	16.8	7.79	17.2	14.0				2.76	—	—
53ns	ρ_a	24.6	24.7	22.1	21.4	17.8	12.4	—	—	—	22.0	32.3	44.2
	N	12	14	15	10	13	9				10	1	1
	Er	2.25	1.62	1.10	1.06	0.96	1.00				1.53	—	—
53ew	ρ_a	37.6	31.4	33.8	20.7	19.5	14.0	—	—	—	18.0	42.6	253
	N	11	11	10	13	11	11				10	1	1
	Er	3.65	1.55	2.37	0.73	0.74	1.11				1.22	—	—

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"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
54NS	pa	10.4	8.98	11.9	14.8	21.1	16.5	---	---	---	21.2	15.1	196.
	N	11	9	13	13	13	8				10	1	1
	Er	0.61	0.48	0.63	1.15	1.23	0.96				0.88	-	-
54EW	pa	7.91	5.46	7.63	9.07	16.6	16.2	---	---	---	26.9	34.1	38.4
	N	10	8	10	11	10	10				9	1	1
	Er	1.00	0.22	0.36	0.37	1.03	1.29				1.07	-	-
55NS	pa	54.6	89.8	61.1	96.6	215.	266.	---	---	---	279.	348.	552.
	N	9	8	10	10	9	7				8	1	1
	Er	6.88	8.05	3.35	5.73	11.9	26.3				23.6	-	-
55EW	pa	31.9	22.0	41.5	54.2	129.	229.	---	---	---	180.	367	87.5
	N	6	7	9	11	11	10				8	1	1
	Er	6.78	1.33	2.01	2.65	5.78	9.35				5.31	-	-
56NS	pa	59.7	79.4	95.4	152.	216.	199.	---	---	---	125.	130.	711.
	N	13	10	8	13	9	9				7	6	1
	Er	3.98	4.60	1.98	72.3	8.68	30.4				5.96	5.98	-
56EW	pa	115.	118.	132.	144.	298.	313.	---	---	---	370.	786.	871.
	N	5	8	12	9	11	10				8	1	1
	Er	13.1	10.9	6.93	6.07	12.8	23.9				29.5	-	-
57NS	pa	154.	194.	143.	245.	270.	166.	---	---	---	320.	1364.	968.
	N	10	9	13	12	10	8				10	1	1
	Er	14.7	13.1	4.77	14.4	20.3	16.2				14.7	-	-
57EW	pa	95.1	75.3	92.8	93.1	223.	352.	---	---	---	289.	643.	836.
	N	5	8	10	11	12	10				9	1	1
	Er	9.37	8.93	7.80	3.48	12.4	21.6				19.8	-	-

JUNE 1979

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"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
58ns	pa	39.1	34.0	33.1	66.6	124.	435.	--	--	--	173.	191.	382.
	N	6	7	6	9	9	9				8	1	1
	Er	4.83	2.94	4.37	6.87	10.6	34.7				8.32	--	--
58ew	pa	29.8	64.7	45.7	44.1	139.	298.	--	--	--	414.	582.	310.
	N	6	8	11	7	11	11				7	1	4
	Er	3.71	11.3	3.69	3.58	6.97	13.9				17.3	--	16.8
59ns	pa	97.4	141.	75.3	111.	205.	377.	--	--	--	123.	64.2	162.
	N	7	6	9	11	9	10				11	9	1
	Er	12.8	14.6	4.66	4.50	17.5	19.6				4.97	1.76	--
59ew	pa	58.8	75.1	50.1	71.1	175.	326.	--	--	--	350.	243.	387.
	N	10	11	11	7	11	9				11	11	1
	Er	6.15	14.0	3.20	6.40	10.6	9.82				15.0	11.2	--
60ns	pa	10.4	11.8	9.03	14.7	23.4	49.6	--	--	--	132.	146.	126.
	N	6	7	11	9	8	7				8	6	1
	Er	1.86	0.72	1.71	1.07	1.79	5.53				6.98	5.16	--
60ew	pa	11.7	7.39	8.62	7.52	13.4	24.1	--	--	--	163.	136.	137.
	N	11	9	10	10	11	8				8	6	5
	Er	1.08	0.44	0.55	0.44	0.52	1.34				5.75	7.82	6.09
61ns	pa	137.	389.?	116.	40.6	47.4	30.4	--	--	--	21.1	13.7	69.9
	N	5	4	5	5	9	7				6	7	1
	Er	18.1	54.6	12.3	3.24	1.33	5.31				1.07	1.34	--
61ew	pa	50.8	40.9	39.9	22.4	34.6	36.3	--	--	--	47.8	45.0	199.
	N	9	12	8	9	11	8				7	1	1
	Er	4.60	2.37	3.05	1.04	1.67	1.57				2.63	--	--

pa = observed apparent resistivity in ohm-meters

N = number of observations

Er = standard error in ohm meters

- = no data

"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
62ws	pa	11.6	15.1	12.3	19.2	31.8	11.5	---	---	---	10.0	15.9	83.7
	N	9	9	10	11	5	8	---	---	---	6	1	1
	Er	0.95	1.01	0.46	1.09	0.84	0.78	---	---	---	0.21	---	---
62ew	pa	14.4	10.8	16.7	14.5	36.5	43.2	---	---	---	21.3	59.5	133.
	N	7	8	9	10	12	9	---	---	---	8	1	1
	Er	1.10	0.66	0.91	0.67	1.22	7.88	---	---	---	2.24	---	---
63ws	pa	7.93	8.31	7.48	8.82	11.9	5.71	---	---	---	2.78	3.70	44.2
	N	9	10	11	9	10	11	---	---	---	8	7	1
	Er	0.66	1.06	0.36	0.49	0.79	0.55	---	---	---	0.16	0.22	---
63ew	pa	12.3	9.99	11.0	7.94	11.2	7.57	---	---	---	4.71	20.2	63.9
	N	7	11	10	12	9	10	---	---	---	11	1	1
	Er	1.37	0.84	0.42	0.41	0.55	0.37	---	---	---	0.27	---	---
64ws	pa	72.1	61.9	72.7	141.	441.?	243.	---	---	---	29.6	---	---
	N	10	12	5	5	6	8	---	---	---	8	43.4	110.
	Er	3.55	5.32	9.07	16.3	25.0	20.4	---	---	---	2.44	6	1
64ew	pa	78.6	104.	102.	← power line → 265.	1144.	122.	---	---	---	27.3	5.18	---
	N	3	4	6	6	4	8	---	---	---	9	45.0	85.0
	Er	12.7	24.5	23.6	28.4	36.1	8.36	---	---	---	1.22	1	1
65ws	pa	70.7	118.	88.8	174.	172.	267.	---	---	---	53.9	---	---
	N	9	9	9	10	9	8	---	---	---	8	---	---
	Er	6.15	23.2	13.8	12.7	19.9	35.1	---	---	---	5.56	---	---
65ew	pa	55.9	49.8	77.1	69.7	133.	16.6.	---	---	---	93.0	---	---
	N	7	9	11	11	9	10	---	---	---	9	---	---
	Er	5.52	4.81	4.68	1.70	6.94	6.52	---	---	---	3.82	---	---

pa = observed apparent resistivity in ohm-meters

N = number of observations

Er = standard error in ohm meters

- = no data

"NOTE" - Telluric line orientation indicated with station numbers.

Sta. No.		FREQUENCY											
		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
66ns	pa	15.0	60.6	31.0	32.6	35.3	68.0	—	—	—	90.7	115.	2460.
	N	9	7	6	9	8	6				6	1	1
	Er	1.64	2.94	4.11	3.23	2.18	7.16				14.4	—	—
66sw	pa	35.3	55.2	26.4	17.7	30.8	55.1	—	—	—	145.	145.	859.
	N	8	10	10	10	10	10				7	1	1
	Er	3.89	6.53	1.23	0.90	1.76	2.70				5.94	—	—
67ns	pa	29.8	40.3	30.5	56.5	92.0	39.3	—	—	—	36.3	125.	59.7
	N	9	6	10	8	10	6				6	1	4
	Er	4.72	3.30	1.64	3.67	6.56	3.46				1.67	—	0.86
67sw	pa	39.8	26.9	28.8	34.8	41.2	17.8	—	—	—	31.6	169.	645
	N	8	6	10	9	8	9				8	1	5
	Er	2.23	3.99	2.38	2.58	3.81	1.17				3.30	—	1.93
68ns	pa	96.1	160.	164.	207.	393.	283.	—	—	—	67.9	189.	72.3
	N	7	7	8	12	8	8				6	1	5
	Er	5.48	16.3	8.36	16.7	20.5	16.6				6.40	—	2.93
68sw	pa	67.7	126.	87.0	116.	209.	311.	—	—	—	174.	40.6	217
	N	6	7	9	6	9	6				6	1	5
	Er	7.02	18.3	7.51	9.33	14.6	7.8				11.0	—	8.59
69ns	pa	200.	355.	195.	263.	302.	201.	—	—	—	84.2	72.2	39.8
	N	7	11	10	11	12	12				9	1	6
	Er	16.9	30.0	11.6	23.3	31.8	11.3				4.26	—	1.68
69sw	pa	48.3	69.5	61.5	64.7	117.	158.	—	—	—	200.	291.	219.
	N	12	6	12	10	10	10				9	1	6
	Er	3.15	8.80	2.25	3.57	3.75	6.38				15.0	—	0.94

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