UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

STATION LOCATION MAP AND AUDIO-MAGNETOTELLURIC DATA LOG FOR AN AREA BETWEEN HOOKERS HOT SPRINGS AND THE WINCHESTER MOUNTAINS, COCHISE COUNTY, ARIZONA

by

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Audio-Magnetotelluric Survey

Ten audio-magnetotelluric (AMT) soundings were made on April 11-12, 1981 in the vicinity of the Winchester Mountains, Arizona as part of the U.S. Geological Survey program to evaluate the mineral-resource potential of wilderness areas. The line of soundings extended from Hookers Hot Springs to the west face of the Winchester Mountains (Fig. 1). The soundings were made to assist in evaluating the geothermal potential of the study area.

Inductive coils were used to detect the horizontal magnetic field signals and a L-shaped array with 100 m electrode separation was used to detect the horizontal electric field. A truck mounted recording system was used at soundings 1, 2, 3, 4, and 10; a portable recording system was used for the other soundings. For a description of equipment, data acquisition, and reduction, see Hoover and others (1976, 1978).

Scalar resistivities from the data log (Table 1) indicate the possibility of a northwest-trending fault along the west face of the Winchester Mountains between soundings 7-6, 5-9, and 5-10. Low resistivities at depth at soundings five and eight and the whole low resistivity section at sounding seven suggest that thermal waters may have altered the rock.

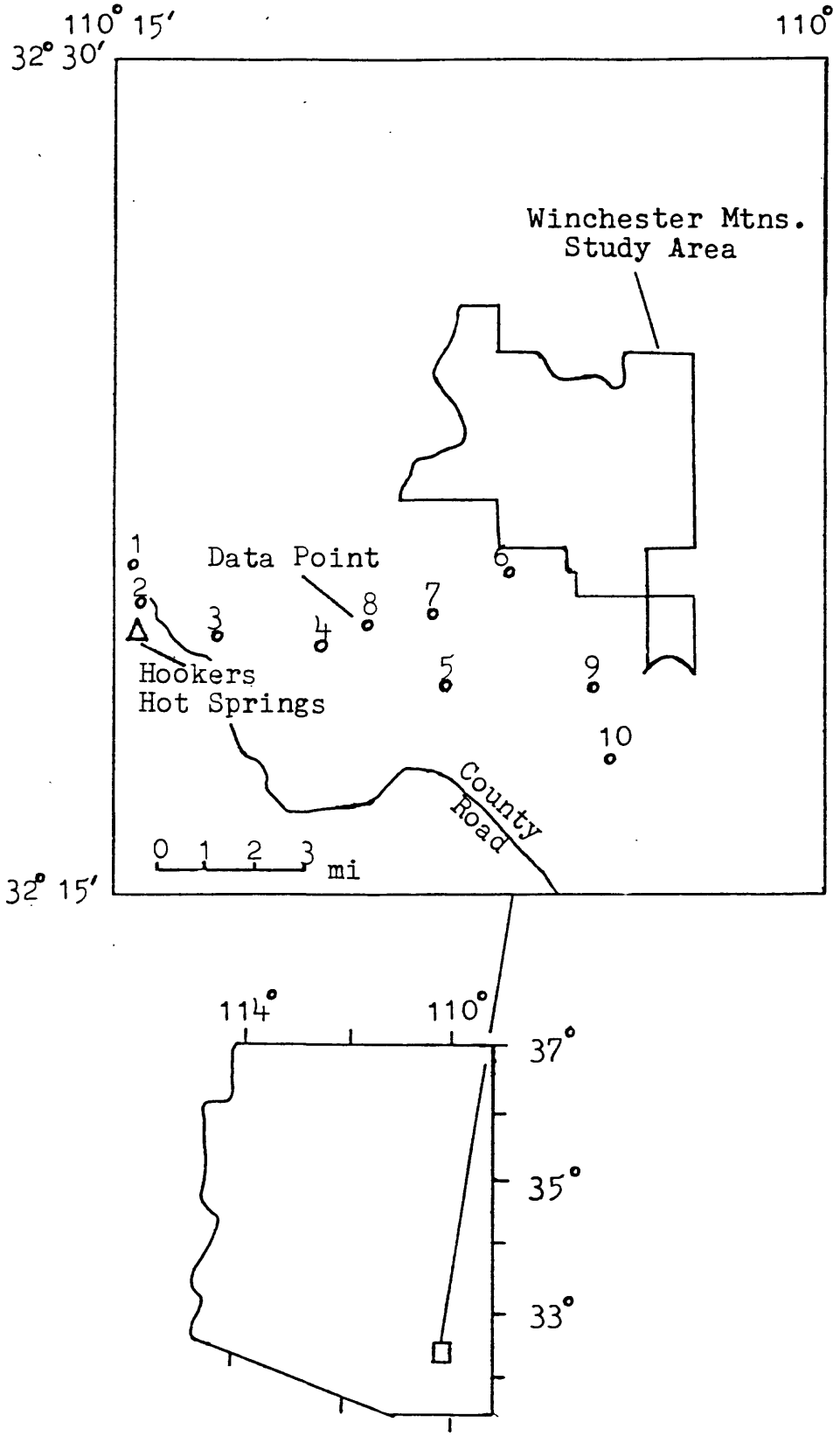

Figure 1.--Audio magnetotelluric station location map for an area between Hookers Hot Springs and the Winchester Mountains, Arizona.

References

Hoover, D. B., Frischknecht, F. C., and Tippens, C. L., 1976, Audio-magnetotelluric sounding as a reconnaissance exploration technique in Long Valley, Calif.: Journal Geophysical Research, v. 81, p. 801-809.

Hoover, D. B., Long, C. L., and Senterfit, R. M., 1978, Some results from audio-magnetotelluric investigations in geothermal areas: Geophysics, v. 43, no. 7, p. 1501-1514.

TABLE [illegible] DATA LOG, WINCHESTER MOUNTAINS

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

ρa = observed apparent resistivity in ohm-metres
N = number of observations
Er = standard error in ohm metres
– = no data

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

		FREQUENCY											
Sta. No.		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
1NS	ρa	61	47	55	49	46	27	29	10	–	10	36	–
	N	9	9	8	10	9	10	7	6	–	8	3	–
	Er	15	4	6	5	3	2	2	0	–	0	8	–
1EW	ρa	28	29	30	31	31	28	25	13	–	12	21	–
	N	10	9	9	10	9	10	9	9	–	8	3	–
	Er	2	2	2	1	1	1	3	30	–	1	6	–
2NS	ρa	41	48	45	46	54	32	43	19	–	–	–	–
	N	12	10	11	8	12	11	9	6	–	–	–	–
	Er	5	4	1	1	1	15	1	2	–	–	–	–
2EW	ρa	73	88	90	88	159	132	90	30	15	23	–	–
	N	8	10	7	10	10	10	9	8	9	8	–	–
	Er	18	15	13	13	5	7	6	2	2	1	–	–
3NS	ρa	34	51	62	52	70	31	26	31	–	–	31	–
	N	10	10	9	10	10	10	10	4	–	–	3	–
	Er	3	4	8	4	3	2	1	9	–	–	1	–
3EW	ρa	38	34	38	48	64	61	72	33	–	–	32	–
	N	8	10	8	10	10	9	9	6	–	–	10	–
	Er	5	6	3	2	3	1	6	5	–	–	2	–
4NS	ρa	58	64	95	109	114	68	44	18	14	16	59	–
	N	10	10	10	10	10	10	10	9	9	10	2	–
	Er	4	8	6	4	8	2	3	2	1	1	2	–
4EW	ρa	31	31	45	49	92	79	88	–	24	22	28	177
	N	10	5	10	10	10	10	10	–	10	10	3	3
	Er	2	3	4	3	5	3	6	–	2	1	5	8

TABLE 1--AMT DATA LOG, WINCHESTER MOUNTAINS - continued

pa = observed apparent resistivity in ohm-metres
N = number of observations
Err = standard error in ohm-metres — = no data

"NOTE" - Telluric line orientation indicated with station numbers

Sta. No.		FREQUENCY 4.5	7.5	13.6	27	45	75	136	270	450	750	1.36K	2.7K	4.5K	7.5K	10.2K	12.5K	13.6K	18.6K	23K
5 NS	pa	9	17	32	19	25	33	81	-	-	-	-	-	50	29	-	-	55	-	10
	N	4	8	8	6	11	9	7	-	-	-	-	-	4	8	-	-	10	-	9
	Err	1	1	1	1	3	3	8	-	-	-	-	-	1	1	-	-	1	-	0
5 EW	pa	21	33	36	50	66	80	135	-	-	347	-	-	100	40	-	-	44	-	15
	N	9	8	11	10	9	9	7	-	-	4	-	-	5	5	-	-	9	-	3
	Err	1	1	1	2	2	4	2	-	-	11	-	-	9	0	-	-	1	-	2
6 NS	pa	525	408	547	407	210	187	143	120	-	-	-	-	-	257	-	-	215	-	31
	N	5	8	9	7	5	10	5	4	-	-	-	-	-	9	-	-	9	-	6
	Err	179	40	22	36	15	27	39	31	-	-	-	-	-	18	-	-	6	-	2
6 EW	pa	1265	1061	769	652	633	588	586	348	164	348	-	-	326	545	-	-	350	-	-
	N	7	6	10	6	6	9	11	9	7	3	-	-	9	8	-	-	5	-	-
	Err	45	103	28	81	60	59	21	9	10	39	-	-	161	18	-	-	7	-	-
7 NS	pa	12	12	7	5	5	7	3	1	-	-	-	-	-	14	-	-	23	-	6
	N	3	10	9	7	10	10	7	5	-	-	-	-	-	8	-	-	6	-	1
	Err	2	1	1	0	0	1	1	1	-	-	-	-	-	1	-	-	1	-	0
7 EW	pa	18	22	20	18	19	20	22	21	-	-	-	-	16	41	-	-	30	-	49
	N	7	10	8	10	9	10	10	10	-	-	-	-	4	10	-	-	5	-	2
	Err	2	2	1	1	0	0	1	1	-	-	-	-	3	3	-	-	3	-	5
8 NS	pa	14	22	25	36	45	37	38	35	-	-	-	-	-	-	-	-	289	-	51
	N	3	6	7	10	10	10	8	7	-	-	-	-	-	-	-	-	7	-	5
	Err	5	1	4	4	4	2	5	3	-	-	-	-	-	-	-	-	10	-	4
8 EW	pa	34	65	66	85	131	144	34	39	30	-	50	60	267	381	-	-	236	-	77
	N	3	8	10	9	10	10	10	10	10	-	3	2	4	5	-	-	8	-	6
	Err	6	3	3	5	6	4	2	1	2	-	11	8	20	30	-	-	5	-	3

TABLE 1--AMT DATA LOG, WINCHESTER MOUNTAINS - continued

pa = observed apparent resistivity in ohm-metres
N = number of observations
Err = standard error in ohm-metres — = no data

"NOTE" - Telluric line orientation indicated with station numbers

Sta. No.		FREQUENCY																		
		4.5	7.5	13.6	27	45	75	136	270	450	750	1.36K	2.7K	4.5K	7.5K	10.2K	12.5K	13.6K	18.6K	23K
9	pa	219	182	203	81	70	54	48	27	—	—	—	—	—	86	—	—	178	—	—
	N	5	7	9	11	10	9	8	6	—	—	—	—	—	6	—	—	4	—	—
NS	Err	21	26	12	3	2	3	1	3	—	—	—	—	—	5	—	—	1	—	—
9	pa	301	199	201	156	145	143	157	111	197	197	162	—	90	132	—	—	95	—	—
	N	4	7	4	6	6	11	8	4	8	7	8	—	8	6	—	—	6	—	—
EW	Err	30	14	13	12	6	2	3	12	5	18	5	—	8	6	—	—	8	—	—
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"NOTE" - Telluric line orientation indicated with station numbers.

		FREQUENCY											
Sta. No.		7.5	10	14	27	76	285	685	1.2K	3.3K	6.7K	10.2K	18.6K
10NS	ρa	170	162	159	87	88	35	–	–	–	–	18	–
	N	9	9	12	11	11	9	–	–	–	–	5	–
	Er	8	9	5	28	183	1	–	–	–	–	0	–
10EW	ρa	133	104	117	131	112	93	–	–	–	–	22	–
	N	9	10	8	11	9	10	–	–	–	–	4	–
	Er	10	11	5	5	3	3	–	–	–	–	0	–
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