

6106447-6

GEOTHERMAL BRANCH

INTER-OFFICE MEMORANDUM

SUBJECT:	Hillsboro, New Mexico Geochemistry	DATE: March 11, 1982
TO:		

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H. J. 01son

cc: Charlie Miller (Tucson)

H. D. Pilkington

The 1980 AMAX geothermal reconnaissance program found anomalous hydrogeochemistry in two springs located along Warm Springs Canyon north of Hillsboro, New Mexico. The chemical analyses and calculated geothermometers of the springs, W14046 and W14104, are shown in Table I with analyses for eleven additional water samples from the area. The location of most of the samples are shown on Figure 1. Three samples, W14105-W14107, were collected in the Kingston area approximately llkm west of Hillsboro and are included to establish a regional background.

The anomalous springs have sodium-bicarbonate waters with $SO_4 > CI$. The thermal waters have a low Mg content and contain anomalous Li and F values.

Thermal waters were encountered during the drilling of thermal gradient well 1124-1 located 1500 feet north of the warm spring (W14104). The surges of water were carrying so much drill cuttings and up-hole slough that no water sample was collected.

W14043 S1T16SR7W Well	W14044 S2T16SR7W Well	W14045 S10T16SR7W We11	W14046 S4T16SR7W Spr	W14047 S29T15SR7W Well
23		22	28	20
			4	
7.9	7.4	7.6	8.0	7.7
21.0	22.0	27.0	60.0	13.0
0.9	0.8	5.4	18.0	0.3
37.0	120.0	78.0	310.0	21.0
182.0	324.0	260.0	532.0	154.0
0	0	0	0	0
40.0	33.0	55.0	100.0	34.0
27.0	63.0	84.0	400.0	30.0
1.7	1.2	6.5	16.0	1.5
49.0	93.0	54.0	8.0	42.0
12.0	16.0	8.2	1.6	5.0
< 0.1	<0.1	<0.1	0.6	<0.1
<0.2	<0.2	<0.2	<0.2	<0.2
393.	679.	642.	1463.	642.
92.	83.	106.	137.	85.
61.	52.	77.	111.	54.
13.	-50.	28.	-14.	115.
19.	8.	62.	156.	19.
	W14043 S1T16SR7W We11 23 7.9 21.0 0.9 37.0 182.0 0 40.0 27.0 1.7 49.0 12.0 <0.1 <0.2 393. 92. 61. 13. 19.	$\begin{array}{ccccccc} & \texttt{W14043} & \texttt{W14044} & \texttt{S2T16SR7W} & \texttt{S2T16SR7W} & \texttt{We11} \\ & \texttt{23} & & & & \\ & & & & & \\ & & & & & \\ & \texttt{7.9} & \texttt{7.4} & \texttt{21.0} & \texttt{22.0} & & \texttt{0.9} & \texttt{0.8} \\ & \texttt{37.0} & \texttt{120.0} & \texttt{120.0} & \texttt{182.0} & \texttt{324.0} & \texttt{0} & \texttt{0} & \texttt{0} \\ & \texttt{182.0} & \texttt{324.0} & \texttt{0} & \texttt{0} & \texttt{0} \\ & \texttt{40.0} & \texttt{33.0} & \texttt{27.0} & \texttt{63.0} & \texttt{1.7} & \texttt{1.2} & \texttt{49.0} & \texttt{93.0} \\ & \texttt{12.0} & \texttt{16.0} & \texttt{0.1} & \texttt{<0.1} & \texttt{<0.1} \\ & \texttt{<0.2} & \texttt{<0.2} & \texttt{393.} & \texttt{679.} \\ & \texttt{92.} & \texttt{83.} & \texttt{61.} & \texttt{52.} \\ & \texttt{13.} & \texttt{-50.} & \texttt{19.} & \texttt{8.} \end{array}$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$

Table I. Hydrogeochemical Analyses of Water in the Hillsboro Area, New Mexico

Table I. (Continued)

	W14048	W14103	W14104	W14105	W14106
	/ S33T15SR7W	S7T16SR7W	S5T16SR7W	S5T16SR8W	S24T16SR9W
	We11	Well	Warm Spr.	Spr	Spr
Temp ^O C	181	17.8	38	18	15
Flow (gpm)		var	9	5	2-3
pH	7.4	7.7	7.8	7.5	7.1
Cl	48.0	5.0	18.0	5.0	5.0
F	1.0	0.3	15.0	2.3	0.2
SO4	340.0	330.0	50.0	120.0	90.0
HCO3	348.0	161.0	224.0	272.0	282.0
CO3	0	0	0	0	0
SiO2	22.0	31.0	150.0	40.0	20.0
Na	120.0	10.0	160.0	22.0	11.0
K	0.6	1.2	11.0	1.2	0.6
Ca	100.0	56.0	6.0	90.0	130.0
Mg	32.0	11.0	0.4	22.6	14.0
Li	<0.1	<0.1	0.3	<0.1	<0.1
B	<0.2	<0.2	<0.2	<0.2	<0.2
TDS	1018.	983.	641.	541.	558.
T _q SiO ₂ TcSiO ₂ TNa-K TNa-K-Ca	67. 35. -94. -2.	81. 50. 65. 2.7	161. 137. 19. 170.	92. 61. 4. 1.6	63. 31. 4.

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Table I. (Continued)

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	W14107	W142O2	W14701
	S18T16SR8W	S9T16SR7W	S4T16SR7W
	Kingston Spr	Spr	1124-4
Temp ^O C	20	18	
Flow (gpm)	1	0.5	15-20
pH C1 F SO4 HCO3 CO3 SiO2 Na K Ca Mg Li B Mo TDS	7.5 6.0 2.8 130.0 192.0 0 46.0 32.0 1.2 64.0 15.0 <0.1 <0.2 494.	7.6 19.0 6.6 96.0 264.0 0 76.0 110.0 4.2 40.0 6.2 0.2 <0.2 <0.2	8.0 20.0 4.4 100.0 245.0 0 60.0 83.0 3.3 37.0 9.0 0.1 <0.2 6.0ppb 562.
T _g SiO ₂	98.	122.	111.
TCSiO ₂	68.	94.	81.
TNa-K	-18.	-17.	
TNa-K-Ca	9.	57.	50.





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In drill hole 1124-4 located 4,000 feet SSE of the warm spring waters were encountered at the alluvial bedrock surfaces and in the upper weathered portion of the bedrock to a depth of 30 meters. Three minor aquifers at 50-54 meters, 60-64 meters and 74-80 meters. A composite water sample was collected at TD (W14701) whose chemistry suggests the water is dominantly meteoric with some mixing of thermal waters. The thermal waters are probably outflow from the warm springs up the canyon.

Rock geochemistry was done in drill cuttings from the two thermal gradient wells drilled in December 1981 and January 1982. The results are shown in Table II.

Table II. Geochemical Analysis of Drill Cuttings Hillsboro area, New Mexico.

ppm
0.0
B.0
9.0

The anomalous geochemical values for Hg, As and Sb in the altered and bleached fanglomerates of the Santa Fe Formation in well 1124-1 from 20-80 feet are indicative of a geothermal system. The high Mo values may be related to the present geothermal system; however, the Mo values may well be associated with the mineralization at the Copper Flat prospect approximately 5km to the northeast.

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