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Analytical Results for 26 Water Samples from Southern New Mexico

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INTRODUCTION

Twenty-six water samples were collected from ten springs, twelve wells, and four surface streams during April 1982 from various localities in southern New Mexico. This area was selected in order to check reported anomalous trace metals in water, particularly silver (NURE, 1981), and to continue an ongoing study of gold and silver in water in various environments.

The water samples were analyzed for calcium, magnesium, sodium, potassium, silica, alkalinity, sulfate, chloride, fluoride, nitrate, bromide, zinc, copper, molybdenum, arsenic, silver, gold, uranium, specific conductance, pH, and temperature. Temperature and pH were measured at the sample site. The remaining analyses were completed at the U.S. Geological Survey laboratory in Denver, Colo. Sample analyses and localities are presented in this report.

SAMPLE COLLECTION

Samples were collected using acid-rinsed polyethylene bottles. At each locality a 2-L and a 60-mL sample were collected, filtered through a 0.45-µm membrane filter, and acidified. Reagent-grade concentrated hydrochloric and nitric acids were used to acidify the samples. Hydrochloric acid was used to acidify the 2-L sample to 1 *N*, and nitric acid was used to acidify the 60-mL sample to pH<2. An untreated 0.5-L sample was also taken.

ANALYTICAL TECHNIQUES

Alkalinity, specific conductance, sulfate, chloride, fluoride, nitrate, bromide, and uranium were determined in the untreated samples. Calcium, magnesium, sodium, potassium, silica, zinc, copper, molybdenum, silver, and arsenic were determined in the 60-mL filtered and acidified samples. Gold was determined in the 2-L filtered and acidified samples. The analytical methods used for these determinations are shown in table 1.

RESULTS

Sample number and source are shown in table 2. Table 3 shows analytical data for each sample, as well as location by latitude and longitude. The results of the charge balance of the cations and anions for the 26 samples are shown in the last column of table 3. Ionic solutions are electrically neutral. Therefore, accuracy of analyses can be checked by comparing the sums of the charges for cations against anions. A charge balance of $\pm$ 10 percent is considered good.

No substantial amounts of silver or gold were found in these 26 water samples; further interpretation of this data is not considered at this time.

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Orion Research, Inc., 1978, Analytical methods guide, 9th ed.: Cambridge, Massachusetts, 48 p.

Perkin-Elmer Corporation, 1976, Analytical methods for atomic-absorption spectrophotometry: Norwalk, Connecticut, Perkin-Elmer Corp., 586 p.

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Scintrex Corporation, 1978, UA-3 Uranium Analyzer: Toronto, Canada, 45 p.

Table 1.--Analytical methods used for water analysis, southern New Mexico

Constituent	Method	Reference
Alkalinity	Gran's plot potentiometric titration	Orion Research, Inc. (1978).
Sulfate	Ion chromatography	Fishman and Pyen (1979).
Chloride	---do	Do.
Fluoride	---do	Do.
Nitrate	---do	Do.
Bromide	---do	Do.
Calcium	Flame atomic-absorption spectrophotometry	Perkin-Elmer Corp. (1976).
Magnesium	---do	Do.
Sodium	---do	Do.
Potassium	---do	Do.
Silica	---do	Do.
Zinc	---do	Do.
Copper	Flameless atomic-absorption spectrophotometry	Perkin-Elmer Corp. (1977).
Silver	---do	Do.
Molybdenum	---do	Do.
Arsenic	---do	Do.
Gold	---do	Do.
Uranium	Laser excited fluorescence	Scintrex Corp. (1978).
Specific conductance	Conductivity bridge	Brown, Skougstad, and Fishman (1979) p. 28-29.

Table 2.--Sample source of 26 water samples, southern New Mexico

Sample number	Source of sample
NM 1	Nogalita Spring
NM 2	Windmill
NM 3	Frank well
NM 4	Turkey Spring
NM 5	Rock Spring
NM 6	Windmill
NM 7	Geronimo Hot Springs
NM 8	Well--domestic/livestock
NM 9	Witch well--livestock
NM10	Well--artesian
NM11	Irrigation well
NM12	Well--domestic
NM13	Windmill
NM14	Robinson well
NM15	Stream--Bonner Canyon
NM16	Well
NM17	Aragon Spring
NM18	Faywood Hot Springs
NM19	Windmill
NM21	Stream
NM22	Stream
NM24	Stream in Black Canyon
NM25	Gila Hot Springs
NM26	San Francisco Hot Springs
NM27	Spring
NM28	Quarter Corner Spring

Table 3.-- ANALYSES FOR 26 WATER SAMPLES FROM SOUTHERN NEW MEXICO

[Leaders (--) indicate these samples were not determined for gold]

Sample	LATITUDE	LONGITUD	CA(mg/L)	MG(mg/L)	NA(mg/L)	K(mg/L)	SIO2(mg/	ALK(mg/L	SO4(mg/L
NM01	33 34 8	107 19 17	8.5	1.5	12.0	.6	37	39	19.0
NM02	33 33 50	107 21 7	8.5	1.0	7.0	.5	22	18	16.0
NM03	33 32 37	107 23 12	13.0	1.5	13.0	.7	46	65	5.2
NM04	33 32 49	107 25 32	7.5	1.0	3.7	.2	15	8	13.0
NM05	33 32 7	107 25 6	7.5	1.0	5.7	.2	22	21	10.0
NM06	33 26 46	107 24 37	80.0	23.0	49.0	1.1	32	362	60.0
NM07	33 8 5	107 15 0	160.0	15.0	800.0	70.0	39	180	60.0
NM08	33 18 15	106 50 21	110.0	63.0	73.0	4.0	21	370	240.0
NM09	33 21 43	107 34 54	81.0	25.0	23.0	1.0	18	200	110.0
NM10	32 51 17	107 20 19	50.0	3.0	23.0	1.9	31	170	28.0
NM11	32 48 24	107 19 58	92.0	13.0	51.0	2.2	32	250	83.0
NM12	32 25 36	106 51 11	68.0	10.0	83.0	8.5	27	210	119.0
NM13	32 20 23	108 59 58	40.0	5.0	62.0	2.8	42	230	28.0
NM14	32 15 15	108 56 51	5.0	.2	275.0	1.1	27	560	110.0
NM15	33 10 55	107 58 18	8.0	2.0	3.8	.7	22	10	24.0
NM16	33 48 21	107 24 37	6.0	1.0	6.5	.4	30	21	8.9
NM17	33 28 25	107 23 20	66.0	5.0	36.0	1.0	42	280	19.0
NM18	32 33 17	107 59 39	39.0	5.0	84.0	12.0	38	270	47.0
NM19	32 37 16	107 48 55	26.0	7.0	43.0	2.9	29	160	26.0
NM21	33 10 22	107 54 38	10.0	3.0	4.3	1.7	23	23	26.0
NM22	33 10 22	107 54 33	7.5	1.6	3.8	.8	18	6	19.0
NM24	33 10 4	107 54 50	10.0	1.5	4.0	.4	28	23	15.0
NM25	33 14 1	108 14 5	18.0	.2	150.0	5.8	70	130	75.0
NM26	33 14 42	108 52 53	47.0	5.0	300.0	33.0	77	110	30.0
NM27	33 37 42	108 53 37	50.0	5.0	26.0	1.1	36	210	4.3
NM28	33 38 8	108 54 48	57.0	7.0	16.0	.6	41	220	12.0

Table 3.--ANALYSES FOR 26 WATER SAMPLES FROM SOUTHERN NEW MEXICO

Sample	CL(mg/L)	F(mg/L)	NO3(mg/L	BR(mg/L)	ZN(ug/L)	CU(ug/L)	MO(ug/L)	AS(ug/L)
NM01	5.0	1.60	<.1	1.6	11	<1	<1	<1
NM02	2.4	.23	<.1	.2	330	8	<1	<1
NM03	11.0	2.30	<.1	.4	270	<1	<1	<1
NM04	2.4	.50	<.1	<.1	9	<1	<1	<1
NM05	1.9	.11	<.1	.2	13	<1	<1	<1
NM06	10.0	.43	<.1	.4	80	<1	9	2
NM07	1,400.0	2.50	.3	<.1	8	11	11	7
NM08	44.0	1.20	60.0	1.0	100	3	5	3
NM09	22.0	.58	16.0	.2	2,600	2	6	3
NM10	5.8	.30	<.1	<.1	13	5	1	2
NM11	22.0	.89	45.0	.3	14	<1	2	3
NM12	46.0	.54	<.1	.3	80	1	8	4
NM13	23.0	1.20	2.0	.1	190	2	6	6
NM14	19.0	11.00	<.1	2.6	70	9	4	46
NM15	1.1	.19	<.1	.4	10	<1	<1	<1
NM16	1.4	.12	<.1	<.1	40	<1	<1	<1
NM17	9.4	.72	<.1	.4	120	<1	<1	2
NM18	9.3	5.60	<.1	<.1	8	4	19	8
NM19	11.0	1.50	.5	.2	50	3	4	5
NM21	1.8	.19	1.9	<.1	7	<1	<1	<1
NM22	1.8	.27	<.1	<.1	5	<1	<1	<1
NM24	1.5	.11	<.1	<.1	6	<1	<1	<1
NM25	110.0	9.20	<.1	<.1	8	3	<1	6
NM26	470.0	1.70	<.1	3.3	5	2	5	14
NM27	3.5	.19	<.1	<.1	4	<1	2	2
NM28	3.2	.54	<.1	<.1	6	<1	<1	2

Table 3.--ANALYSES FOR 26 WATER SAMPLES FROM SOUTHERN NEW MEXICO

Sample	AG(ug/L)	AU(ug/L)	U(ug/L)	SP COND.	pH	TEMP(C)	CHAR BAL
NM01	<.02	.002	<.10	96	5.62	15.5	-7.4
NM02	<.02	<.001	<.10	83	5.60	15.5	7.6
NM03	<.02	.001	.82	136	5.94	14.5	-8.4
NM04	<.02	.003	<.10	59	5.74	9.0	11.4
NM05	<.02	.005	<.10	66	5.62	10.0	7.4
NM06	<.02	--	6.40	640	6.80	15.5	3.8
NM07	<.02	.003	1.60	4,100	7.08	40.5	2.1
NM08	.05	.004	14.00	1,120	6.80	16.5	2.5
NM09	.02	.004	3.20	660	6.90	15.5	5.0
NM10	<.02	.004	1.40	320	6.95	21.0	3.4
NM11	<.02	<.001	3.20	660	7.04	18.5	4.8
NM12	.02	.003	<.10	710	7.50	19.0	5.3
NM13	<.02	<.001	3.00	450	6.91	19.0	.8
NM14	.06	.002	25.00	1,080	8.70	19.0	-1.4
NM15	<.02	.002	<.10	73	7.36	9.0	3.0
NM16	<.02	<.001	<.10	64	7.39	15.0	8.0
NM17	<.02	.002	2.40	960	7.48	15.0	4.0
NM18	<.02	.001	<.10	530	7.82	52.0	2.9
NM19	<.02	.005	1.50	340	8.20	19.0	3.6
NM21	<.02	<.001	<.10	100	6.60	14.5	-1.5
NM22	<.02	.002	<.10	70	6.13	7.0	10.6
NM24	<.02	--	<.10	82	6.40	9.5	4.5
NM25	.04	.002	2.20	700	7.64	60.0	2.6
NM26	<.02	.001	.64	1,600	6.99	44.0	2.0
NM27	<.02	.003	2.60	340	7.12	19.5	5.6
NM28	<.02	.003	1.20	350	7.76	13.0	2.1