New Mexico Bureau of Mines and Mineral Resources

Open-file Report 131

WATER-QUALITY DATA COMPILED FOR HYDROGEOLOGIC STUDY OF ANIMAS VALLEY, HIDALGO COUNTY, NEW MEXICO

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INTRODUCTION

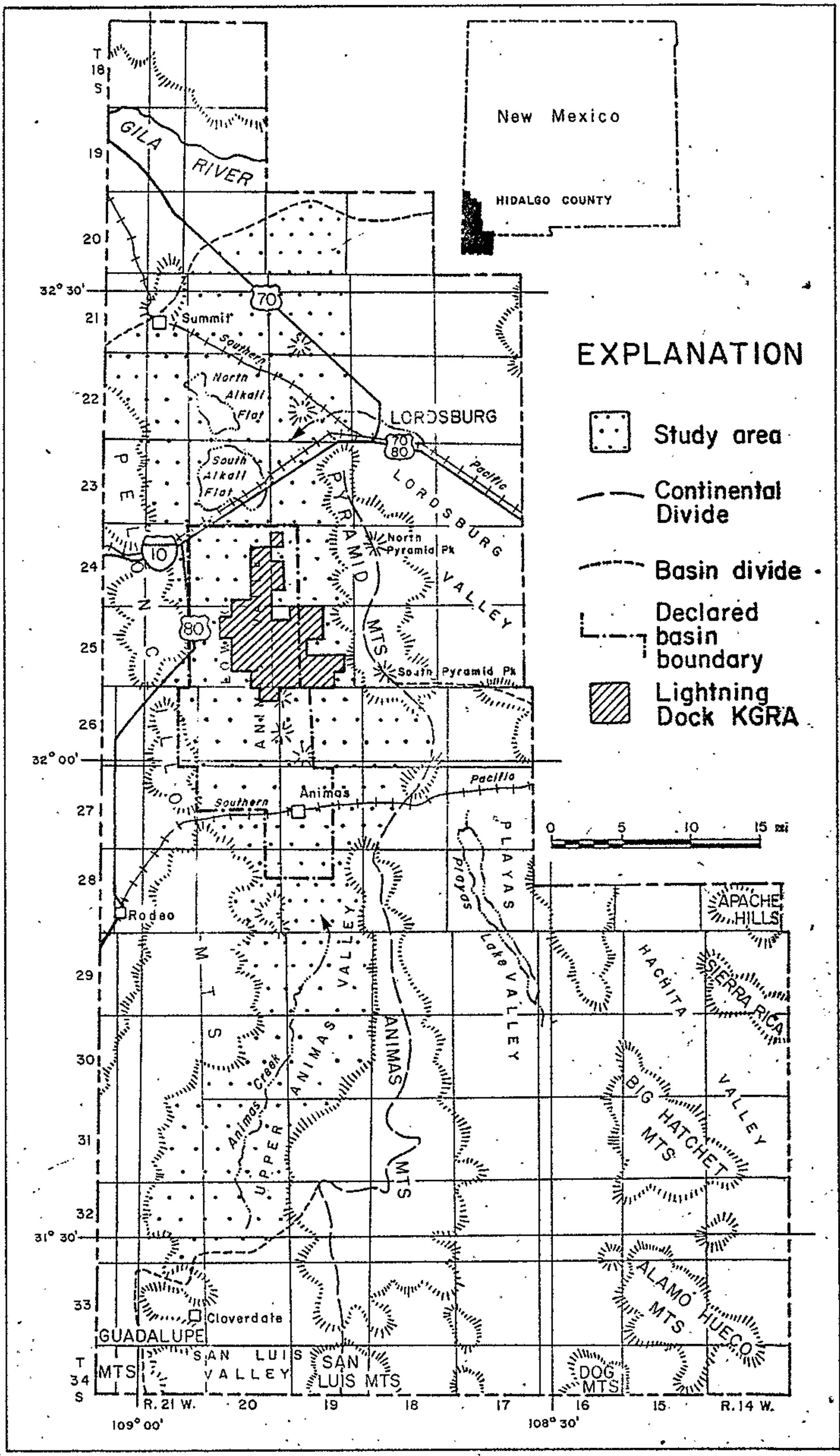
The Animas Valley is a closed basin located in western Hidalgo County, southwest New Mexico (fig. 1). The valley is approximately 80 mi long, lying between the Mexican border and US highway 70. The width of the valley varies from 6 to 12 mi along its length.

Problem and purpose of study

The central part of the valley is an important area for irrigated agriculture (Lansford and others, 1980) and is the site of the Lightning Dock Known Geothermal Resource Area (fig. 1). Although an understanding of the hydrogeology of the valley is important to both the agricultural economy and the development of the area's geothermal resources, the water resources of the entire area have not been studied in detail since 1957 (Reeder, 1957). The Animas Valley is also an excellent example of a closed alluvial basin. For these reasons the present study was initiated as part of the U.S. Geological Survey Water-Resource Division's Southwest Alluvial Basin Regional Aquifer System Analysis. The work is being funded under contract with the U.S. Geological Survey (WRD), Albuquerque.

Purpose of this report

Basic data compiled for the Animas Valley study are being released in a series of Bureau Open-file reports so that the information compiled may be available for use prior to the completion of the final project report. This report (OF-131) gives the basic water-quality data. Bureau OF-130 gives the basic


New Mexico
HIDALGO COUNTY
EXPLANATION
Study area
Continental Divide
Basin divide
Declared basin boundary
Lightning Dock KGRA
GILA RIVER
LORDSBURG
Summit
North Alkali Flat
South Alkali Flat
Southern Pacific
LORDSBURG VALLEY
PYRAMID MTS
North Pyramid Pk
South Pyramid Pk
PELONCILLO MTS
ANIMAS VALLEY
Animas
PLAYAS VALLEY
Playas Lake
Rodeo
APACHE HILLS
HACHITA VALLEY
SIERRA RICA
BIG HATCHET MTS
UPPER ANIMAS VALLEY
Animas Creek
ANIMAS MTS
ALAMO HUECO MTS
Cloverdale
GUADALUPE MTS
SAN LUIS VALLEY
SAN LUIS MTS
DOG MTS
0 5 10 15 mi
32° 30'
32° 00'
31° 30'
109° 00'
108° 30'
T 18 S
T 34 S
R. 21 W.
R. 14 W.

water-level data, OF-132 will give the basic data obtained from the drilling and testing program, OF-133 will give the hydrologic model, and OF-134 will be the final report on the project.

The Animas Valley

The Animas Valley lies in the Mexican Highlands section of the Basin and Range physiographic province. It is bounded on the west by the Peloncillo Mountains and on the east by the Animas Mountains and the Pyramid Mountains (fig. 1). The northern boundary is marked by an extensive eolian dune field just south of US 70. The southern boundary lies across the international boundary in Mexico.

The climate of the Animas Valley is arid to semiarid (Cox, 1973). Precipitation generally averages 10 inches in the valley and 22 inches in the higher mountains. Based on 30 years of data (1931-1960), precipitation at Lordsburg falls below 5.71 inches and exceeds 13.84 inches one year in ten. Rainfall is greatest in late summer and early fall; half of the average annual precipitation occurs in July through September. Animas Creek, which rises in the southern Peloncillo Mountains and flows northerly to a point just south of the town of Animas, is the only perennial stream in the study area. Alluvial fans along the west and east valley margins are sources of ephemeral flow.

The Peloncillo Mountains consist of various sedimentary and volcanic rocks. Approximately 5,000 ft of Paleozoic strata, approximately 2,500 ft of Cretaceous strata, and an undetermined thickness of Cretaceous and Tertiary volcanic rocks occur in the area north of the ghost town of Steins and south of Cowboy Pass

(Gillerman, 1958).

The Animas Mountains consist mainly of sedimentary rocks. These include approximately 3,500 ft of Paleozoic limestone, dolostone, sandstone, and shale and 10,000-15,000 ft of Cretaceous sandstone and shale (Soule, 1972).

The Pyramid Mountains consist of a variety of volcanic and plutonic igneous rocks (Flege, 1959). The northern part consists of basalt intruded by granodiorite. The central part is characterized by pyroclastic volcanics and lesser amounts of rhyolite, rhyolitic welded tuff, and basalt. The southern part is dominated by andesite with lesser amounts of rhyolite and basalt.

The valley was the site of two Quaternary lakes: Lake Cloverdale in the south (Schwennesen, 1918) and Lake Animas in the north (Fleischhauer and Stone, 1981). The valley is filled with bolson and lacustrine deposits of undetermined thickness.

Geologic maps and geophysical surveys confirm the basin-and-range structure of the area. The valley is a graben and the bounding ranges are horsts. Complex folding and faulting is apparent within the mountain blocks and presumably occurs in the intervening basin as well.

Sources of data

Water quality data used in this report were compiled from unpublished Master's theses, published sources, the U.S. Geological Survey's WATSTORE, and data collected for the project. Unpublished Master's theses include Logsdon (1981) and Hawkins (1981). Published sources are Schwennesen (1918), Reeder (1957) and Doty (1960).

MAJOR DISSOLVED CONSTITUENTS

Water quality data were divided into four groups based on area. The four areal divisions are upper Animas Valley (latitudes between 31°55' and 31°20'), middle Animas Valley without Known Geothermal Resource Area (KGRA) (latitudes between 32°17'30" and 31°55'), the KGRA (see fig. 1), and lower Animas Valley (latitudes between 32°35' and 32°17'30"). The accuracy of the water quality analyses was checked by comparing in milliequivalents per liter the total major catons (ca, Mg, Na+K) with the total major anions (HCO_3, Cl, SO_4). The percent difference between the cation and anion totals was calculated by dividing the difference of the cation and anion totals by the average of the totals and multiplying by 100. Analyses with a percent difference greater than 10 percent were not used in the piper diagram plots. There are 232 water quality analyses from the Animas Valley of which 148 meet the percent difference criterion (table 1). All of the water-quality data are plotted on the areal distribution maps (plates 1-4). Contour lines drawn on the maps do not exactly follow the plotted data values because some data values are incorrect and some reflect anthropogenic contamination.

Specific Conductance

In the upper part of the basin, specific conductance increases from a low of 204 micromhos/cm in the southern portion of the upper valley to a high of 469 micromhos/cm in the northern portion of upper Animas Valley (plate 1). Specific conductance ranges from 300 to 1110 micromhos/cm in middle Animas Valley (plate 1). The

KGRA possesses the highest specific conductance values which range from 442 to 7672 micromhos/cm (plate 1). Lower Animas Valley has relatively low values on the perimeter of the basin ranging from 350 to 500 micromhos/cm, whereas in the center of the basin values between 1800 to 3000 micromhos/cm are common (plate 1).

A mathematical expression relating specific conductance to total dissolved solids for the entire basin was determined. Data used to define the relationship consisted of 107 values. The majority of the data were located in the middle Animas Valley. The general expression for the specific conductance (micromhos/cm)/ total dissolved solids (mg/ℓ) relationship is:

$$TDS = .717(SC) - 14.2$$

where SC = specific conductance and TDS = total dissolved solids.

Specific conductance values give an indication of the concentrations of ionic species in solution. Ionic species in solution can create a salinity hazard to plants. Specific conductance values in excess of 750 micromhos/cm possess a high salinity hazard.

Cations

Major cations in the upper Animas Valley as shown on the piper diagram in figure 2 are calcium, calcium-sodium, and sodium. Middle Animas Valley without the KGRA values has sodium and sodium-calcium as the predominant cations (fig. 3). Sodium is the principal cation in the KGRA (fig. 4). The major cation in lower Animas Valley is sodium (fig. 5). The evolution of calcium as the major cation in the upper Animas Valley to sodium as the major cation in the

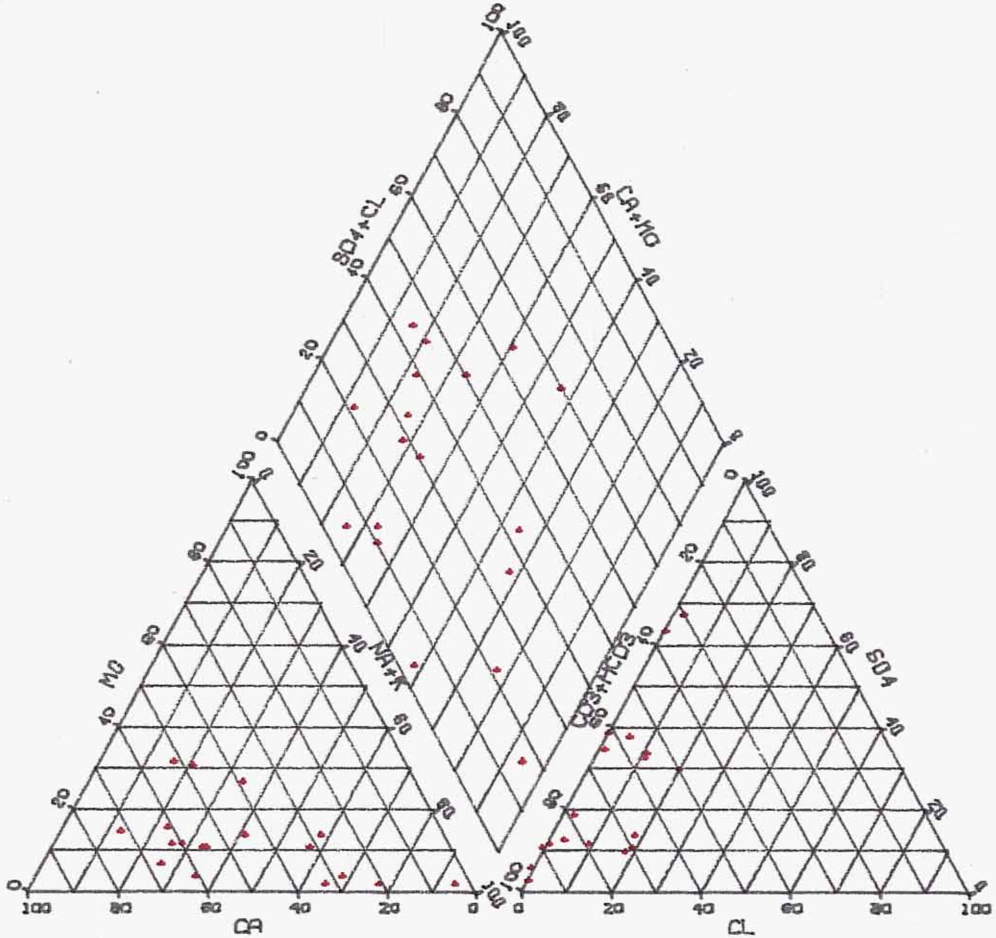


Figure 2 PIPER DIAGRAM UPPER ANIMAS VALLEY

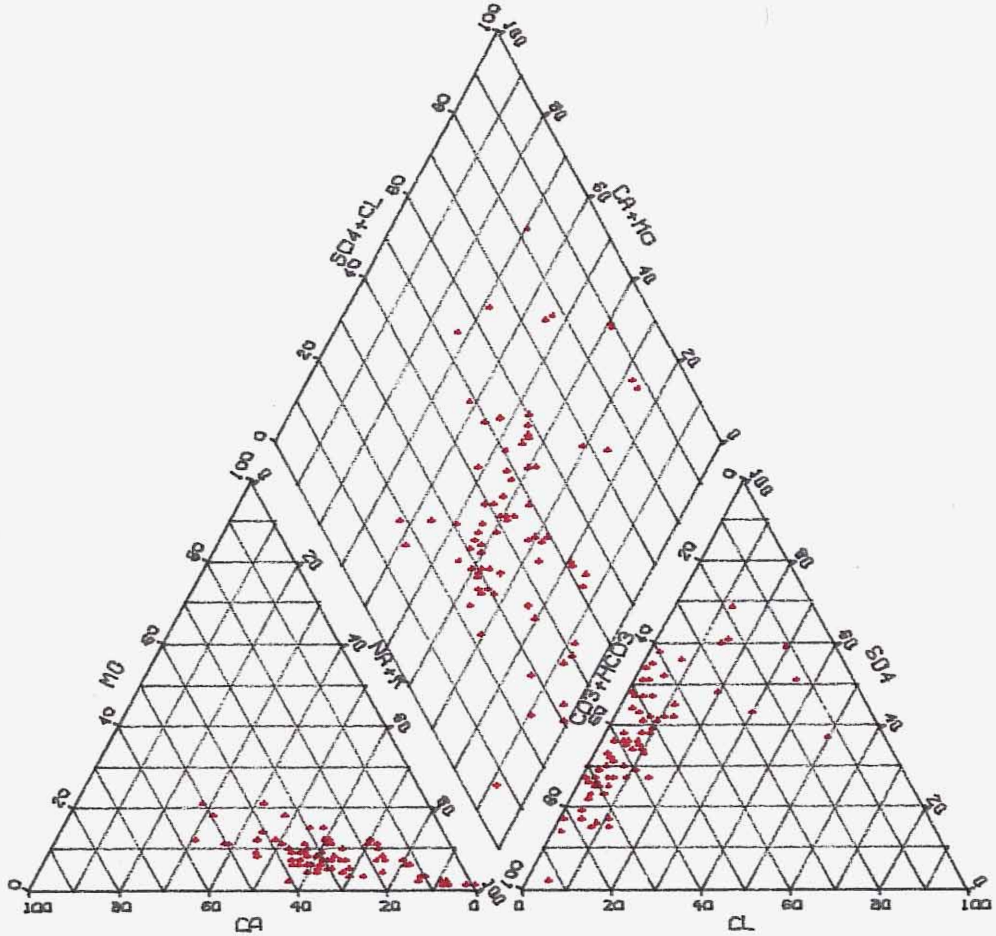


Figure 3 PIPER DIAGRAM MIDDLE ANIMAS VALLEY WITHOUT KGRA VALUES

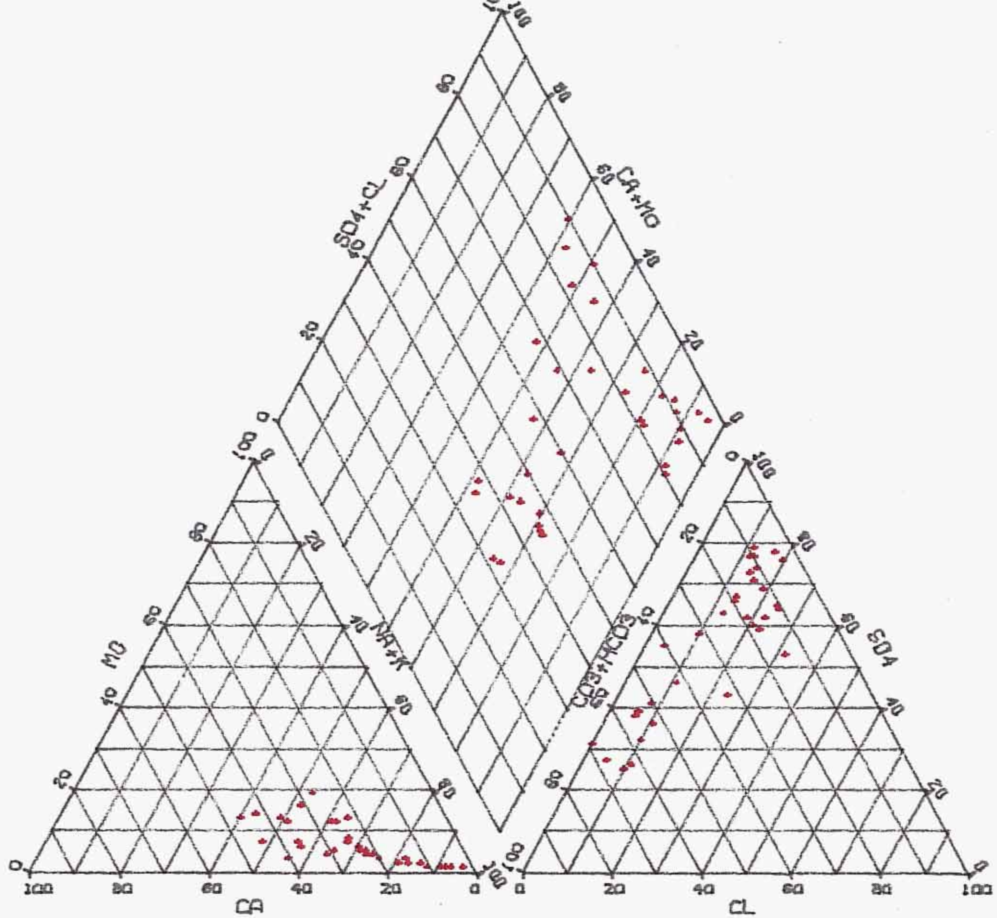


Figure 4 PIPER DIAGRAM KNOWN GEOTHERMAL RESOURCE AREA

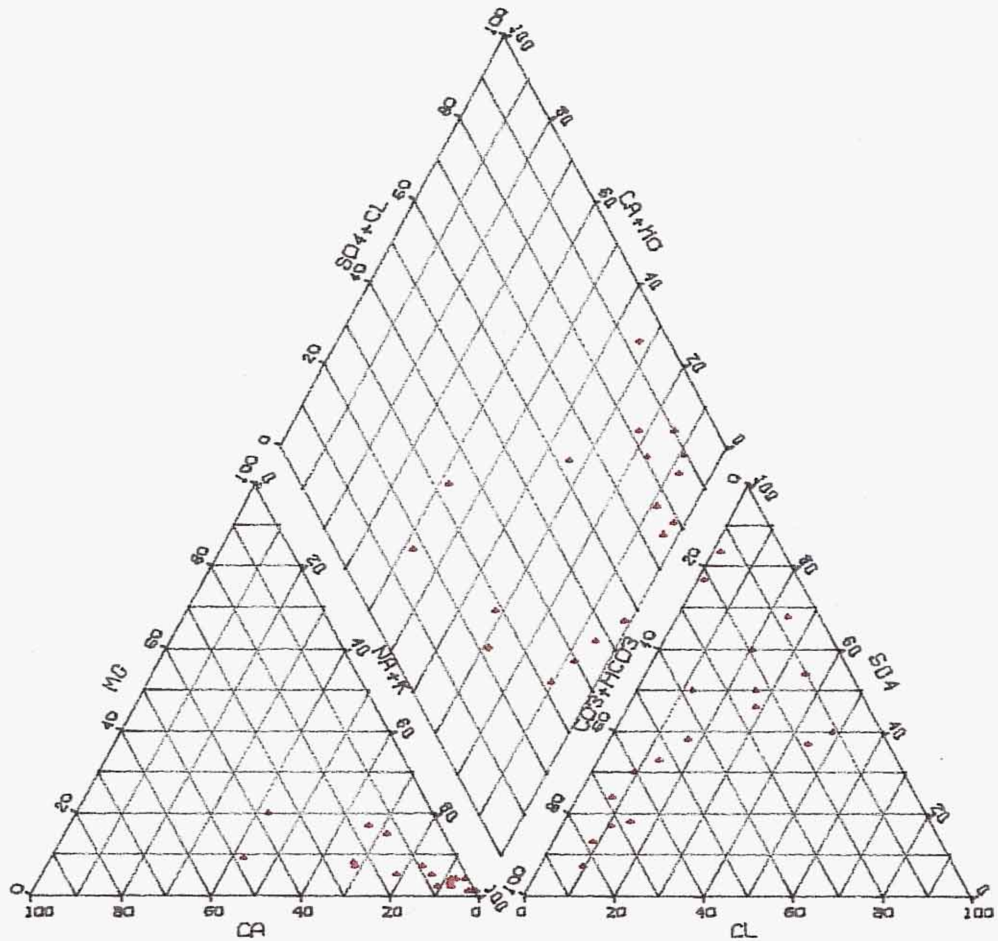


Figure 5 PIPER DIAGRAM LOWER ANIMAS VALLEY

lower Animas Valley reflects the strength of ion-exchange processes occurring in the valley.

The upper part of the basin is narrow and possesses notable relief. Colloidal-sized particles are usually carried away from the valley center by surface runoff in Animas Creek. Removal of colloidal-sized particles reduces ion-exchange sites where calcium ions can be exchanged with sodium ions. The result of the lack of colloidal-sized particles is the presence of calcium as the major cation.

The middle and lower parts of the basin are characterized by low relief and absence of a through-flowing surface water drainage system. Large thicknesses of colloidal-sized particles are deposited in the basin. Ion-exchange sites abound resulting in groundwater with sodium as the major cation.

Anions

The major anion in the upper Animas Valley is bicarbonate (fig. 2). Middle Animas Valley has bicarbonate and sulfate as the major anions (fig. 3). The KGRA has sulfate and sulfate-bicarbonate as the major anions (fig. 4). The major anions in lower Animas Valley are bicarbonate, bicarbonate-sulfate, and sulfate-chloride (fig. 5).

Bicarbonate ions are derived from carbon dioxide in the atmosphere, soil, and from solution of carbonate rocks. Weathering of sulfides followed by oxidation yield sulphate ions. Chloride ions are contributed to groundwater systems through solution of evaporite deposits, concentration by evaporation of chloride ions in rain, and solution of dry fallout from the atmosphere.

Ground Water Classification

The upper Animas Valley is characterized by groundwater with calcium, calcium-sodium, and sodium as the principal cations and bicarbonate as the principal anion (fig. 2). Sodium and sodium-calcium are the principal cations, and bicarbonate and bicarbonate-sulfate are the major anions in middle Animas Valley neglecting the KGRA values (fig. 3). In the KGRA, sodium is the principal cation and sulfate and sulfate-bicarbonate are the major anions (fig. 4). The lower Animas Valley has sodium as the major cation and bicarbonate, bicarbonate-sulfate, and sulfate-chloride as the major anions (fig. 5).

SODIUM ADSORPTION RATIO

The sodium adsorption ratio predicts the degree to which water tends to enter into cation-exchange reactions in soil clays and colloids. Cation-exchange reactions involving the replacement of adsorbed magnesium and calcium by sodium ions cause a reduction of soil permeability and a general hardening of the soil. The sodium adsorption ratio (SAR) is defined as:

$$SAR = \frac{(Na^{+})}{\sqrt{\frac{(Ca^{+2})+(Mg^{+2})}{2}}}$$

where ion concentrations are expressed in milliequivalents per liter.

A sodium adsorption ratio greater than 18 indicates a sodium hazard.

Ground water in the Animas Valley generally has SAR values below 10. SAR values increase from low values in the upper Animas Valley to higher values in the lower Animas Valley (fig. 6). There are only a few SAR values in both the middle and lower Animas Valley that exceed 18.

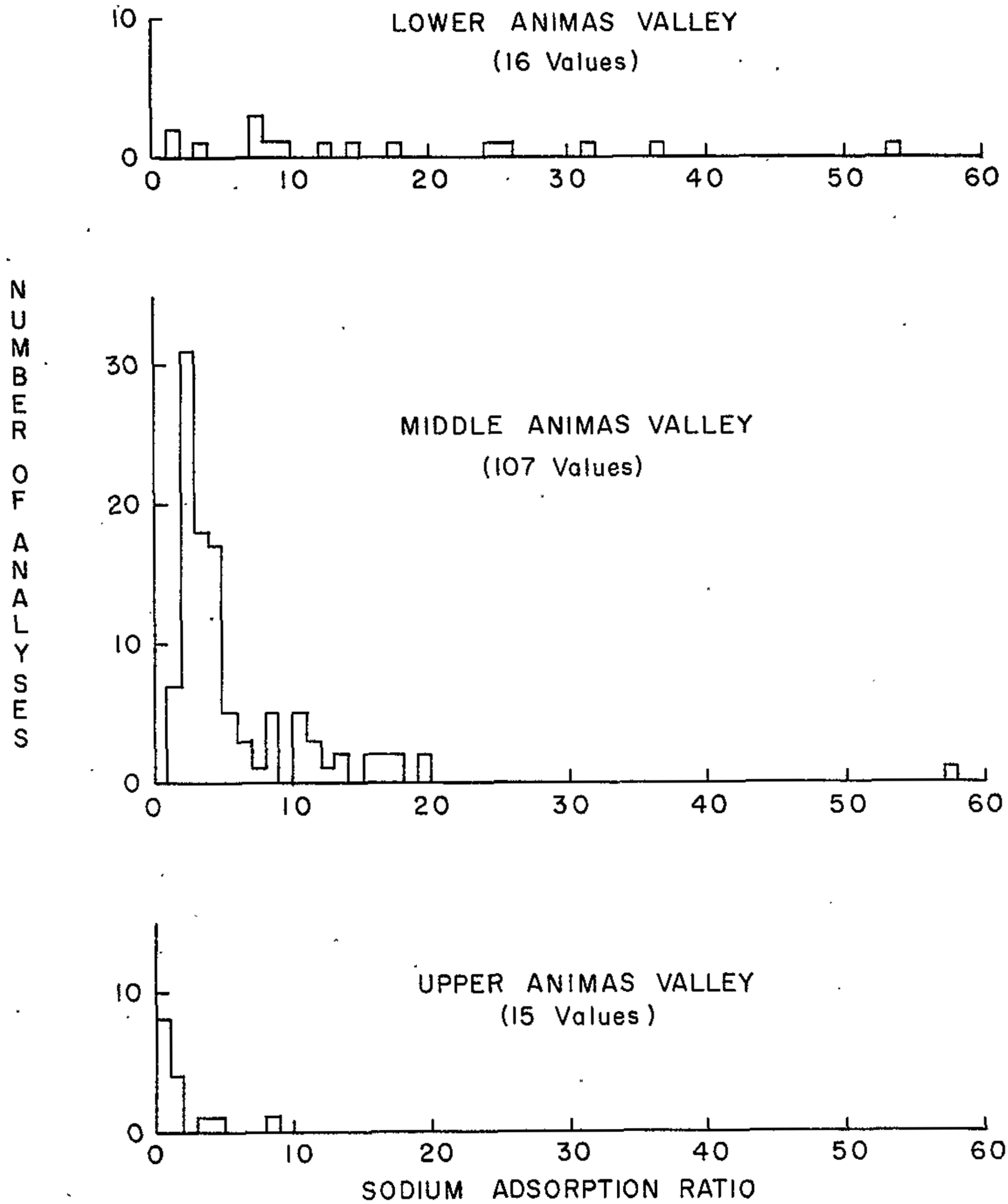


Figure 6 SODIUM ADSORPTION RATIO MAGNITUDE AND DISTRIBUTION

AREAL DISTRIBUTION OF CONSTITUENTS

Correlation coefficients indicating the degree to which variation in one variable is related to variation in another variable were determined for specific conductance versus silica, calcium, magnesium, sodium, potassium, bicarbonate, chloride, sulfate, fluoride, and boron. The strength of the association between specific conductance and the above-listed variables provides insight into which constituents should be investigated. Correlation coefficients near 1.0 indicate a strong association whereas correlation coefficients near 0.0 indicate a weak association.

Using the entire data base for Animas Valley, the correlation coefficient for specific conductance and silica was calculated to be 0.4750. This value indicates a small association between the variables. The areal distribution of silica values should show a different spatial variation than specific conductance. Plate 2 illustrates this variation and identifies the input of silica by the KGRA into the groundwater system.

The areal distribution of boron and chloride shown on plates 3 and 4 illustrate the same spatial variation as specific conductance. The correlation coefficients for boron and chloride with specific conductance are 0.5629 and 0.9365, respectively. The distribution of these constituents throughout the basin demonstrates the input of high concentrations of these species at the KGRA and the dilution of constituent concentrations along local and regional groundwater flow paths.

WATEQF

WATEQF, a FORTRAN IV computer program that calculates the inorganic chemical equilibrium of natural waters, was used to study the physicochemical properties of the groundwater. Inspection of the log IAP/KT values; where IAP = ion activity product, K = thermodynamic equilibrium constant, and T = temperature, for 104 water-quality analyses provided information about which minerals were supersaturated or saturated in the groundwater. Calcite, chalcedony, dolomite and gypsum saturation indices were studied and figure 7 shows the frequency of saturation or supersaturation of these minerals in the groundwater quality analyses. Saturation indices were defined by log IAP/KT values. Minerals were at saturation when the log IAP/KT values were between -0.25 and 0.25. Supersaturation was defined as log IAP/KT values greater than 0.25.

Upper Animas Valley has groundwater saturated or supersaturated in silica. The common cement in this part of the basin should be silica. Middle and lower Animas Valley possess groundwater saturated or supersaturated in silica and calcite and these two minerals should be the primary cement-forming minerals.

The presence of other cement-forming minerals were not detected because of the absence of iron and aluminum values in the ground water analyses. Zeolites, iron oxides and iron hydroxides may be other minerals forming cement in the Animas Valley.

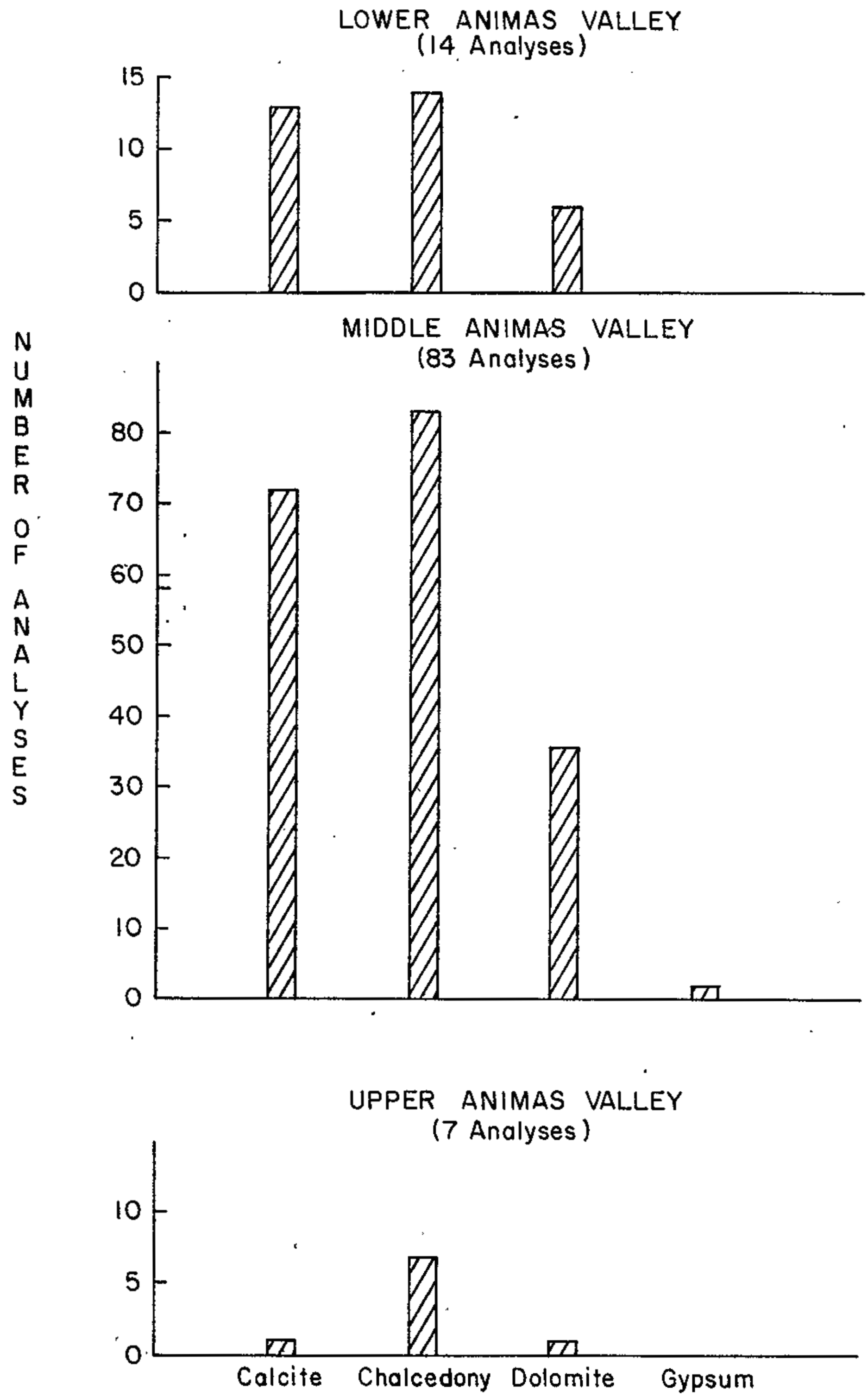


Figure 7 RESULTS OF WATEQF SHOWING LOCATION AND NUMBER OF WATER-QUALITY ANALYSES SATURATED OR SUPER-SATURATED WITH RESPECT TO CALCITE, CHALCEDONY, DOLOMITE AND GYPSUM

TABLE 1. Water-quality analyses presented by Logsdon (1981). Station number = latitude-longitude, SiO_2 = silica, Ca = calcium, Mg = magnesium, Na = sodium, K = potassium, HCO_3 = bicarbonate, Cl = chloride, SO_4 = sulfate, F = fluoride, SC = specific conductance, TDS = total dissolved solids, Temp = temperature ^{0}C, B = boron. Dissolved species concentrations given in mg/ℓ.

LOGSDON GROUNDWATER QUALITY DATA FROM THESIS (1981)

STATION NUMBER	SIO2	Ca	Mg	Na	K	HCO3	Cl	SO4	F	SC	TDS	pH	Na+K	Temp	B
320842-1084736	31.	28.	7.3	68.7	1.9	183.	20.5	79.3	.4	-9.9	484.	8.2	-9.9	23.	.35
320842-1084954	148.	22.	.5	334.	24.	107.	88.3	497.	12.6	-9.9	1116.	7.71	-9.9	25.	.48
320852-1084954	143.	23.2	.8	319.	21.1	104.	67.6	480.	12.	-9.9	1024.	8.16	-9.9	41.	.5
320842-1085024	116.	67.3	5.3	498.	27.8	119.	111.	893.	7.3	-9.9	1608.	7.84	-9.9	71.	.42
320806-1085054	42.	159.	35.	232.	9.0	209.	192.	956.	3.6	-9.9	1660.	8.08	-9.9	22.	.25
321336-1094942	61.	68.	17.1	366.	6.3	255.	134.	939.	7.25	-9.9	1708.	8.18	-9.9	23.	.51
321342-1085224	74.	38.	2.7	106.	3.4	238.	16.9	299.	3.9	-9.9	756.	7.9	-9.9	19.	.1
321006-1085248	48.	47.9	4.4	71.	2.7	209.	43.	290.	.9	-9.9	668	8.0	-9.9	20.	.06
320606-1085042	34.	79.	12.6	152.	5.9	201.	60.5	484.	2.4	-9.9	868.	8.07	-9.9	24.	.18
320448-1085400	50.	43.2	4.1	97.	2.3	192.	41.3	305.	2.5	-9.9	632.	8.02	-9.9	42.	.1
320406-1085254	43.3	49.3	4.4	111.3	2.7	192.2	38.6	311.7	1.2	-9.9	600.	7.9	-9.9	22.	.06
321212-1084848	29.3	18.6	2.4	120.4	1.6	250.2	49.1	308.3	1.15	-9.9	640.	8.08	-9.9	24.	.12
321054-1085042	149.7	38.5	1.8	321.4	18.	275.8	79.1	768.5	9.35	-9.9	1348.	7.92	-9.9	-9.9	.5
320906-1085248	34.3	38.1	5.7	78.8	3.5	183.1	8.9	285.8	3.55	-9.9	604.	8.35	-9.9	43.	.12
321854-1083848	33.5	7.6	1.4	143.2	5.9	234.3	27.6	93.7	3.7	-9.9	564.	8.09	-9.9	45.3	.46
321342-1083042	39.6	28.	2.7	216.	11.7	314.8	47.5	223.8	6.9	-9.9	816.	7.86	-9.9	33.	.46
321036-1083136	43.4	117.4	18.7	98.7	10.2	218.4	116.6	181.5	.44	-9.9	740.	7.48	-9.9	-9.9	.32
320354-1083430	32.3	10.2	1.8	159.3	1.5	301.4	33.	104.2	2.7	-9.9	592	7.94	-9.9	-9.9	.5
315548-1083654	47.2	15.6	1.3	234.5	5.5	400.3	50.7	154.6	7.1	-9.9	796.	7.82	-9.9	-9.9	.64
315700-1084830	38.1	22.	7.3	27.6	2.	147.3	3.5	19.2	.3	-9.9	208.	7.92	-9.9	-9.9	.12
314836-1084630	47.6	40.3	4.9	15.2	2.	156.2	2.5	4.3	.16	-9.9	208.	7.82	-9.9	24.4	.12
315000-1085230	45.2	26.	2.2	21.1	1.2	109.8	2.8	4.3	1.34	-9.9	184.	7.57	-9.9	41.2	.06
314012-1084954	47.6	21.	3.2	6.2	4.5	65.9	.7	33.6	.12	-9.9	176.	7.39	-9.9	18.7	.04
313548-1085212	39.3	17.8	3.3	6.9	6.2	57.3	1.4	40.3	.11	-9.9	156.	7.31	-9.9	-9.9	.04
312412-1085148	52.4	16.5	4.8	35.8	5.1	173.3	1.4	3.8	1.12	-9.9	200.	7.74	-9.9	18.3	.12
312312-1085454	35.7	15.8	2.9	13.8	3.5	37.8	.7	52.8	.18	-9.9	136.	6.88	-9.9	18.	.06
312024-1084754	39.3	8.2	1.7	15.2	2.7	22.	1.4	40.3	.14	-9.9	132.	7.0	-9.9	17.	.06
312800-1085024	14.2	2.4	.5	54.7	.4	137.9	4.2	16.3	.31	-9.9	160.	8.8	-9.9	-9.9	.1
313412-1085224	47.6	27.6	3.2	16.3	3.1	124.4	1.	13.4	.42	-9.9	212.	8.11	-9.9	-9.9	.08
313718-1085418	41.7	29.4	1.7	11.5	2.3	117.1	.1	5.7	.22	-9.9	164.	7.94	-9.9	-9.9	.08
314448-1084836	44.	21.2	.7	12.9	1.5	98.8	.1	9.1	.16	-9.9	168.	8.06	-9.9	-9.9	.08
315254-1084800	42.9	16.4	.6	65.3	1.2	173.3	4.2	32.7	2.26	-9.9	320.	8.15	-9.9	-9.9	.12
321142-1085212	58.3	26.2	2.2	54.	2.	151.3	7.1	42.7	1.6	-9.9	300.	7.88	-9.9	23.	.14
321212-1084848	15.5	13.	1.6	115.4	2.	241.	23.7	44.	.95	-9.9	360.	8.0	-9.9	18.	.17
321006-1085248	68.5	39.7	3.8	66.9	2.7	207.4	15.6	64.8	.66	-9.9	380.	8.29	-9.9	16.	.02
320942-1085042	97.5	79.9	8.3	353.3	14.1	228.8	122.7	492.8	2.85	-9.9	1372.	7.59	-9.9	24.	.59
320806-1085054	50.5	122.	25.3	178.6	8.2	172.1	144.3	351.9	3.48	-9.9	1184.	7.82	-9.9	19.	.18
320718-1085112	30.	125.2	14.6	161.4	6.6	83.6	117.	369.	1.98	-9.9	1020	8.0	-9.9	19.	.78
320618-1085048	29.5	60.5	9.7	134.3	4.3	195.2	68.1	167.	2.28	-9.9	624.	7.52	-9.9	20.	.17
320742-1085312	33.5	28.8	2.7	55.6	2.3	170.8	3.3	51.6	1.14	-9.9	272.	7.82	-9.9	-9.9	.05
320448-1085248	.95	19.8	4.7	98.2	3.1	81.1	39.2	107.3	.84	-9.9	384.	7.85	-9.9	18.	.01
320330-1085330	37.5	29.8	8.5	112.2	3.5	156.8	32.9	111.7	.63	-9.9	524.	7.92	-9.9	18.	.02
320306-1085436	44.5	81.8	9.1	110.6	4.3	202.	38.3	198.6	2.85	-9.9	688.	7.68	-9.9	19.	.19
320442-1085400	45.	34.5	3.	77.9	2.7	185.5	8.5	74.8	2.28	-9.9	384.	7.73	-9.9	21.	-9.9
320306-1085242	32.	25.	1.8	103.4	3.9	167.8	27.3	44.1	3.03	-9.9	420	8.26	-9.9	26.	.12
320242-1085500	44.	26.	1.8	70.3	2.3	176.3	1.8	58.8	3.45	-9.9	340.	7.75	-9.9	40.	.04
320418-1085112	30.	18.2	2.5	49.6	2.	139.8	6.5	38.4	.63	-9.9	240.	7.93	-9.9	44.	-9.9
320336-1085318	37.	30.7	3.	89.9	2.7	178.8	19.8	86.9	1.32	-9.9	384.	8.39	-9.9	40.	-9.9
320448-1085242	30.	30.7	5.7	129.2	7.	237.4	49.4	113.3	4.02	-9.9	524.	8.17	-9.9	22.	.13
320536-1085212	37.5	31.3	3.2	67.8	2.7	157.4	47.3	58.8	1.71	-9.9	352.	8.43	-9.9	21.	.18
320906-1084624	40.	81.	3.5	74.5	2.7	181.8	42.5	197.	-9.9	-9.9	675.	8.33	-9.9	-9.9	.04
320512-1085336	49.5	76.1	7.2	91.7	3.5	187.9	64.2	124.9	.69	-9.9	628.	7.41	-9.9	20.	.05
320712-1085518	37.5	39.9	6.3	74.5	3.5	186.7	9.6	88.5	3.8	-9.9	404.	8.27	-9.9	19.	.04
320618-1085142	32.5	25.4	2.5	93.8	2.3	172.1	40.9	76.4	2.16	-9.9	396.	8.41	-9.9	19.	.05
320906-1085242	37.	22.	2.1	53.4	2.	148.	2.1	51.6	.93	-9.9	384.	8.44	-9.9	18.	-9.9

TABLE 1 (cont.) - Water-quality analyses presented by Hawkins (1981).

HAWKINS GROUNDWATER QUALITY DATA (collected 8/80 thru 3/81)

STATION NUMBER	SiO2	Ca	Mg	Na	K	HCO3	Cl	SO4	F	SC	TDS	pH	Na+K	Temp	B
321516-1085043	55.	75.	24.5	350.	14.8	152.5	386.	376.	-9.9	2010.	1304.	8.1	-9.9	-9.9	-9.9
321206-1084848	38.	20.1	2.8	110.	2.2	214.	24.6	55.	-9.9	680.	366.	8.2	-9.9	24.	-9.9
321443-1085042	72.	64.	17.	295.	12.6	137.2	244.	451.	-9.9	1650.	1152.	7.9	-9.9	-9.9	-9.9
321408-1085044	72.	12.	1.96	114.	3.	167.8	12.	129.	-9.9	489.	357.	8.3	-9.9	19.	-9.9
321201-1085246	84.	35.	3.	59.	7.	137.	10.	80.	-9.9	390.	348.	6.9	-9.9	-9.9	-9.9
321122-1085122	99.	122.	8.3	250.	40.	276.	99.	583.	-9.9	1875.	1345.	7.8	-9.9	20.	-9.9
321107-1085041	103.	75.	3.6	368.	32.8	237.	160.	656.	-9.9	2000.	1526.	7.7	-9.9	21.5	-9.9
321107-1085041a	128.	125.	7.3	495.	25.	198.	206.	957.	-9.9	2650.	2046.	6.8	-9.9	20.	-9.9
321141-1085200	64.	30.1	3.	56.	2.8	181.	12.	56.	-9.9	435.	316.	8.2	-9.9	22.	-9.9
321002-1085245	56.	39.2	.62	60.	2.9	220.	15.	55.	-9.9	450.	345.	7.9	-9.9	19.6	-9.9
321002-1085245a	63.	39.	4.	64.	2.1	122.	14.	122.	-9.9	424.	307.	8.1	-9.9	17.	-9.9
321002-1085245b	78.	40.	3.7	65.	2.6	153.	16.	98.	-9.9	430.	381.	6.95	-9.9	18.	-9.9
321047-1085158	68.	30.	1.9	54.	2.1	137.	10.	64.	-9.9	311.	299.	6.9	-9.9	20.	-9.9
321050-1085156	46.	21.	2.	48.	2.7	158.	7.	40.	-9.9	325.	200.	7.9	-9.9	20.	-9.9
320858-1085005	150.	16.1	-9.9	305.	30.	68.	89.	508.	-9.9	3930.	982.	8.5	-9.9	18.9	-9.9
320843-1084957	163.	23.	.33	300.	31.	107.	62.	513.	-9.9	1500.	1167.	7.3	-9.9	44.	-9.9
320843-1084957a	140.	25.	.06	307.5	30.	91.5	68.	536.	-9.9	1510.	1034.	8.0	-9.9	-9.9	-9.9
320843-1084957b	216.	146.	-9.9	4200.	1340.	68.	1581.	8730.	-9.9	18800	16281	10.9	-9.9	89.4	-9.9
320843-1084957c	190.	160.	.34	4428.	1129.	355.	1690.	7973.	-9.9	20100.	15604.	8.1	-9.9	94.	-9.9
320843-1084957d	194.	62.3	-9.9	460.	40.	96.	123.	881.	-9.9	2100.	1628.	8.7	-9.9	71.	-9.9
320843-1084957e	230.	52.	.125	420.	42.	122.	106.	768.	-9.9	2020.	1452.	8.5	-9.9	65.	-9.9
320832-1084942	17.	31.2	5.	90.	3.6	254.	15.	80.	-9.9	600.	352.	7.3	-9.9	24.5	-9.9
320832-1084942a	26.	34.	6.05	100.	3.6	167.8	12.	178.	-9.9	499.	418.	7.6	-9.9	24.	-9.9
320905-1084624	43.	110.	23.	81.	2.7	229.	36.	283.	-9.9	1000.	703.	6.75	-9.9	21.	-9.9
320727-1084513	43.	99.	24.	59.	2.6	259.	16.	230.	-9.9	800.	561.	6.6	-9.9	18.	-9.9
320943-1085041	100.	96.5	9.8	342.	28.5	237.	121.	692.	-9.9	1600.	1514.	8.0	-9.9	24.1	-9.9
320906-1085544	43.	42.	8.0	77.	3.4	152.5	6.	159.	-9.9	600.	375.	7.9	-9.9	21.5	-9.9
320857-1085126	45.	62.3	5.8	105.	4.	214.	37.	185.	-9.9	680.	507.	7.8	-9.9	21.4	-9.9
320857-1085126a	62.	61.	6.8	100.	3.8	153.	32.	225.	-9.9	760.	570.	6.9	-9.9	18.	-9.9
320805-1085059	43.	116.	4.6	174.	9.0	120.	125.	415.	-9.9	1380.	910.	7.1	-9.9	20.3	-9.9
320805-1085059a	34.	314.	49.	292.	17.5	214.	332.	1063.	-9.9	2850.	2213.	7.4	-9.9	19.	-9.9
320805-1085059b	58.	230.	43.	340.	27.	183.	266.	917.	-9.9	2600.	1984.	6.75	-9.9	20.	-9.9
320742-1085340	55.	28.	2.6	67.	1.8	137.	4.	103.	-9.9	370.	276.	7.9	-9.9	16.	-9.9
320726-1085245	41.	31.	4.	64.	1.8	137.	6.	116.	-9.9	360.	292.	7.9	-9.9	-9.9	-9.9
320646-1085137	28.	83.4	7.8	97.	4.5	186.	64.	194.	-9.9	950.	597.	7.7	-9.9	19.6	-9.9
320448-1085341	46.	102.	9.6	120.	3.2	152.5	72.	339.	-9.9	1010.	733.	8.3	-9.9	-9.9	-9.9
315946-1084920	36.	7.	.34	103.	2.	168.	12.	81.	-9.9	415.	326.	7.5	-9.9	-9.9	-9.9
320429-1085403	55.	95.	10.6	110.	3.6	152.5	60.	292.	-9.9	1000.	656.	8.0	-9.9	-9.9	-9.9
320325-1085548	40.	50.	6.8	82.	3.3	167.8	8.	190.	-9.9	620.	424.	8.1	-9.9	18.	-9.9
320227-1085145	55.	32.	4.	69.	2.7	122.	24.	92.	-9.9	430.	345.	7.05	-9.9	-9.9	-9.9
320222-1085144	43.	28.	3.95	53.	2.1	122.	16.	71.	-9.9	330.	281.	7.0	-9.9	23.	-9.9
320153-1085058	43.	26.	3.5	59.	2.5	137.	14.	70.	-9.9	330.	289.	6.9	-9.9	20.	-9.9
320129-1085116	55.	32.	5.	51.	2.1	122.	14.	81.	-9.9	340.	305.	6.95	-9.9	-9.9	-9.9
320127-1085052	30.	24.	5.5	57.	2.3	137.	14.	63.	-9.9	380.	237.	8.3	-9.9	-9.9	-9.9
320127-1085052a	52.	24.	4.25	54.	2.4	153.	14.	57.	-9.9	340.	287.	6.95	-9.9	-9.9	-9.9
320033-1085156	43.	21.	1.18	73.	1.7	137.	6.	101.	-9.9	370.	273.	8.4	-9.9	16.	-9.9
320016-1085004	50.	16.	1.82	69.	3.	153.	8.	60.	-9.9	329.	286.	7.3	-9.9	-9.9	-9.9
320348-1085649	40.	43.	6.55	77.	3.2	152.5	6.	148.	-9.9	600.	362.	7.8	-9.9	-9.9	-9.9
320238-1085635	46.	49.	6.65	82.	3.3	152.5	6.	158.	-9.9	600.	382.	8.4	-9.9	23.	-9.9
315638-1084902	40.	36.	7.25	43.	2.3	122.	16.	74.	-9.9	365.	284.	7.0	-9.9	20.5	-9.9
315630-1084831	45.	26.	6.5	40.	2.1	107.	14.	53.	-9.9	300.	243.	6.6	-9.9	23.	-9.9
315829-1085002	43.	127.	15.	78.	4.2	107.	54.	338.	-9.9	1000.	719.	6.7	-9.9	-9.9	-9.9
315709-1085302	40.	30.	4.	72.	2.4	137.	10.	4.	-9.9	440.	391.	7.15	-9.9	-9.9	-9.9
315643-1085356	33.	38.	12.	60.	3.1	153.	14.	0.	-9.9	450.	435.	6.9	-9.9	-9.9	-9.9
315247-1084638	50.	40.	14.7	13.	2.7	122.	16.	.	-9.9	330.	260.	6.95	-9.9	-9.9	-9.9
315134-1084802	50.	28.	.93	61.	2.	137.	10.	.4	-9.9	410.	295.	6.95	-9.9	21.	-9.9

TABLE 1 (cont.) - Water-quality analyses presented by U.S. Geological Survey WATSTORE. Boron concentrations given in µg/ℓ, other dissolved species in mg/ℓ.

GEOLOGICAL SURVEY GROUNDWATER QUALITY DATA (FROM WATSTORE)

STATION NUMBER	SIO2	Ca	Mg	Na	K	HCO3	Cl	SO4	F	SC	TDS	pH	Na+K	Temp	B
322650-1085735	-9.9	7.2	7.4	-9.9	-9.9	570.	100.	280.	-9.9	1889.	1340.	-9.9	420.	-9.9	-9.9
322320-1085603	-9.9	20.	8.2	-9.9	-9.9	120.	360.	10.	-9.9	1899.	1340.	-9.9	430.	-9.9	-9.9
321617-1085629	-9.9	26.	3.	-9.9	-9.9	1120.	49.	[illegible]	-9.9	1819.	1290.	-9.9	440.	-9.9	-9.9
321447-1085042	-9.9	34.	11.	-9.9	-9.9	200.	26.	[illegible]	-9.9	622.	432.	-9.9	82.	-9.9	-9.9
321447-1085042	63.	19.	4.7	140.	-9.9	210.	28.	0.	4.7	730.	505.	8.2	-9.9	19.5	-9.9
321447-1085042	50.	120.	29.	310.	-9.9	130.	240.	10.	2.8	2150.	1450.	7.4	-9.9	19.0	-9.9
321407-1085631	-9.9	41.	14.	-9.9	-9.9	340.	35.	90.	-9.9	1056.	743.	-9.9	170.	-9.9	-9.9
321348-1085238	-9.9	64.	8.2	-9.9	-9.9	310.	5.8	50.	-9.9	633.	440.	-9.9	54.	-9.9	-9.9
321318-1085156	-9.9	70.	17.	-9.9	-9.9	21.	17.	83.	-9.9	607.	421.	-9.9	18.	-9.9	-9.9
321318-1085156	-9.9	91.	6.1	-9.9	-9.9	320.	130.	380.	-9.9	1498.	1060.	-9.-9	270.	-9.9	-9.9
321314-1085604	-9.9	-9.9	-9.9	-9.9	-9.9	360.	-9.9	240.	-9.9	-9.9	-9.9	-9.9	190.	-9.9	-9.9
321314-1085604	-9.9	40.	15.	-9.9	-9.9	362.	17.	237.	-9.9	1110.	782.	-9.9	187.	-9.9	-9.9
321106-1085156	-9.9	74.	9.1	-9.9	-9.9	230.	17.	150.	-9.9	705.	491.	-9.9	67.	-9.9	-9.9
320257-1085059	-9.9	29.	4.7	-9.9	-9.9	152.	12.	25.	-9.9	779.	544.	-9.9	34.	-9.9	-9.9
315704-1084818	-9.9	29.	4.7	-9.9	-9.9	150.	12.	25.	-9.9	413.	282.	-9.9	34.	-9.9	-9.9
315841-1085350	-9.9	36.	3.7	-9.9	-9.9	170.	12.	84.	-9.9	536.	370.	-9.9	64.	-9.9	-9.9
315227-1084632	-9.9	47.	5.6	-9.9	-9.9	160.	12.	19.	-9.9	424.	290.	-9.9	10.	-9.9	-9.9
315026-1084549	-9.9	42.	4.6	-9.9	-9.9	140.	23.	22.	-9.9	359.	243.	-9.9	20.	-9.9	-9.9
313714-1085116	-9.9	16.	2.6	-9.9	-9.9	490.	12.	16.	-9.9	209.	136.	-9.9	10.	-9.9	-9.9
313545-1085212	-9.9	12.	4.6	-9.9	-9.9	41.	5.8	20.	-9.9	212.	138.	-9.9	6.	-9.9	-9.9
312409-1085148	-9.9	12.	5.	-9.9	-9.9	47.	12.	22.	-9.9	240.	158.	-9.9	12.	-9.9	-9.9
320125-1090138	-9.9	-9.9	-9.9	-9.9	-9.9	184.	5.	-9.9	-9.9	401.	-9.9	-9.9	-9.9	20.0	-9.9
320026-1090122	-9.9	-9.9	-9.9	-9.9	-9.9	172.	10.	-9.9	6.0	389.	-9.9	-9.9	-9.9	22.7	-9.9
315659-1090020	-9.9	-9.9	-9.9	-9.9	-9.9	187.	6.	-9.9	-9.9	381.	-9.9	-9.9	-9.9	-9.9	-9.9
315533-1090028	-9.9	-9.9	-9.9	-9.9	-9.9	168.	13.	-9.9	-9.9	381.	-9.9	-9.9	-9.9	21.1	-9.9
320541-1085042	30.	33.	3.8	113.	4.9	228.	18.	127.	3.	687.	448.	7.8	-9.9	23.8	-9.9
315810-1085000	-9.9	-9.9	-9.9	-9.9	-9.9	177.	7.5	-9.9	-9.9	413.	-9.9	7.7	-9.9	20.0	-9.9
315018-1090142	68.	37.	4.3	26.	-9.9	134.	22.	15.	2.5	338.	254.	8.0	-9.9	-9.9	-9.9
322504-1085934	-9.9	-9.9	-9.9	-9.9	-9.9	430.	100.	-9.9	-9.9	1590.	-9.9	7.8	-9.9	31.0	-9.9
321807-1085058	-9.9	32.	19.	-9.9	-9.9	210.	49.	230.	1.9	945.	590.	-9.9	150.	23.5	-9.9
321442-1085042	50.	120.	29.	-9.9	-9.9	130.	240.	610.	2.8	2150.	1450.	7.4	310.	19.0	-9.9
321423-1085043	-9.9	16.	4.4	-9.9	-9.9	230.	14.	86.	-9.9	580.	350.	-9.9	110.	-9.9	-9.9
321423-1085043	-9.9	-9.9	-9.9	-9.9	-9.9	170.	110.	-9.9	-9.9	1280.	-9.9	7.8	-9.9	18.5	-9.9
321423-1085043	63.	19.	4.7	-9.9	-9.9	210.	28.	140.	4.7	730.	505.	8.2	140.	19.5	-9.9
321512-1085414	56.	4.	.5	-9.9	-9.9	340.	24.	95.	7.1	850.	551.	8.1	190.	18.0	-9.9
321427-1085442	-9.9	-9.9	-9.9	-9.9	-9.9	170.	130.	-9.9	-9.9	1600.	-9.9	7.8	-9.9	19.0	-9.9
321234-1085619	41.	4.3	11.	-9.9	-9.9	320.	14.	110.	4.3	739.	503.	7.7	110.	20.0	-9.9
320855-1084953	140.	22.	1.5	-9.9	-9.9	160.	80.	460.	13.	1510.	1110.	7.8	320.	34.0	-9.9
320843-1085033	100.	61.	6.6	360.	16.	210.	150.	540.	6.4	1960.	1350.	8.0	-9.9	33.5	520.
320843-1085020	110.	68.	4.9	420.	15.	140.	110.	830.	6.6	2310.	1630.	7.7	-9.9	32.0	430.
320845-1084957	140.	19.	1.2	-9.9	-9.9	170.	78.	460.	11.	1540.	1130.	-9.9	330.	38.0	450.
320845-1084957	100.	18.	.1	300.	16.	32.	69.	490.	12.	1560.	1070.	9.1	-9.9	35.5	450.
320844-1084736	33.	28.	11.	-9.9	-9.9	190.	19.	56.	.2	481.	308.	7.3	60.	-9.9	-9.9
321004-1085440	-9.9	66.	12.	-9.9	-9.9	290.	17.	150.	-9.9	780.	545.	-9.9	93.	-9.9	-9.9
320844-1085245	42.	27.	1.8	-9.9	-9.9	160.	6.	49.	1.2	388.	267.	8.1	57.	19.0	-9.9
320803-1085107	-9.9	110.	44.	-9.9	-9.9	230.	26.	150.	-9.9	4427.	3160.	-9.9	110.	-9.9	-9.9
320803-1085107	38.	-9.9	-9.9	-9.9	-9.9	210.	28.	110.	3.6	651.	-9.9	-9.9	100.	-9.9	-9.9
320803-1085107	36.	147.	29.	208.	6.9	190.	158.	520.	3.6	1790.	1220.	8.0	-9.9	20.5	210.
320803-1085107	37.	180.	34.	210.	-9.9	170.	140.	510.	2.9	2050.	1340.	7.1	210.	19.0	-9.9
320803-1085058	36.	150.	29.	120.	6.9	190.	160.	520.	3.6	1790.	1220.	8.0	-9.9	20.5	210.
320732-1085111	36.	45.	7.4	-9.9	5.0	200.	61.	140.	3.2	846.	550.	7.8	-9.9	15.5	200.
320750-1085115	-9.9	41.	11.	-9.9	-9.9	230.	26.	150.	-9.9	739.	516.	-9.9	110.	-9.9	-9.9
320752-1085245	34.	24.	2.9	-9.9	-9.9	160.	4.8	46.	1.2	368.	248.	8.2	54.	21.0	-9.9
320739-1085432	-9.9	66.	11.	-9.9	-9.9	250.	48.	211.	-9.9	1091.	768.	-9.9	130.	-9.9	-9.9
320647-1085337	-9.9	34.	3.9	-9.9	-9.9	190.	7.	64.	-9.9	436.	265.	-9.9	61.	19.0	-9.9

TABLE 1 (cont.) - Water-quality analyses presented by O'Brien (1981). Boron concentrations given in µg/ℓ, other dissolved species in mg/ℓ.

GEOLOGICAL SURVEY GROUNDWATER QUALITY DATA (FROM WATSTORE) CONTINUED

STATION NUMBER	SiO2	Ca	Mg	Na	K	HCO3	Cl	SO4	F	SC	TDS	pH	Na+K	Temp	B
320647-1085337	24.	65.	5.8	-9.9	-9.9	360.	7.	-9.9	1.6	574.	338.	7.6	57.	20.0	-9.9
320645-1085108	38.	24.	6.8	-9.9	-9.9	140.	16.	45.	.6	352.	247.	8.0	45.	-9.9	-9.9
320540-1085130	39.	30.	4.4	-9.9	-9.9	210.	28.	110.	3.6	661.	-9.9	-9.9	100.	-9.9	-9.9
320540-1085042	37.	35.	11.	-9.9	-9.9	240.	20.	130.	3.6	726.	476.	7.8	110.	22.0	-9.9
320540-1085042	-9.9	-9.9	-9.9	-9.9	-9.9	210.	74.	-9.9	-9.9	1030.	-9.9	7.6	-9.9	22.0	-9.9
320540-1085042	30.	33.	3.8	110.	5.0	230.	19.	130.	3.0	687.	448.	7.8	-9.9	24.0	180.
320540-1085042	29.	34.	3.4	-9.9	-9.9	230.	18.	130.	2.8	688.	455.	8.1	120.	24.0	650.
320312-1085417	-9.9	34.	4.9	-9.9	-9.9	190.	7.	78.	-9.9	480.	283.	-9.9	65.	19.0	-9.9
320340-1085333	-9.9	24.	3.5	-9.9	-9.9	180.	8.	64.	-9.9	444.	260.	-9.9	70.	16.5	-9.9
320313-1085158	-9.9	19.	3.1	-9.9	-9.9	150.	6.8	30.	-9.9	322.	186.	-9.9	49.	23.0	-9.9
320225-1085608	-9.9	-9.9	-9.9	-9.9	-9.9	190.	9.	-9.9	2.8	399.	-9.9	-9.9	-9.9	23.0	-9.9
315708-1084820	38.	-9.9	-9.9	-9.9	-9.9	160.	4.	24.	.6	311.	-9.9	-9.9	31.	20.0	-9.9
315616-1084916	43.	24.	5.9	-9.9	-9.9	170.	6.	55.	.8	388.	277.	7.8	57.	21.0	-9.9
315802-1085000	-9.9	-9.9	-9.9	-9.9	-9.9	180.	9.8	-9.9	-9.9	404.	-9.9	8.0	-9.9	20.0	-9.9
315802-1085000	-9.9	-9.9	-9.9	-9.9	-9.9	180.	7.5	-9.9	-9.9	413.	-9.9	7.7	-9.9	-9.9	-9.9
315802-1085000	70.	30.	5.1	-9.9	-9.9	160.	6.3	45.	.4	367.	286.	8.0	45.	21.0	90.
315723-1085042	-9.9	28.	3.5	-9.9	-9.9	190.	7.0	65.	1.6	464.	276.	-9.9	72.	20.0	-9.9
315702-1085302	42.	31.	8.8	-9.9	-9.9	180.	7.0	82.	.4	498.	331.	7.5	66.	-9.9	-9.9
315125-1084758	-9.9	28.	2.2	-9.9	-9.9	180.	5.	77.	2.0	469.	283.	-9.9	76.	25.5	-9.9

GROUNDWATER QUALITY DATA COLLECTED BY OBRIEN (1981)

STATION NUMBER	SiO2	Ca	Mg	Na	K	HCO3	Cl	SO4	F	SC	TDS	pH	Na+K	Temp	B
323355 1084750	32.	9.1	1.2	110.	3.4	215.	17.	59.	3.7	570.	-9.9	8.3	-9.9	27.0	150.
322808 1085524	28.	30.	4.9	170.	2.6	106.	160.	170.	1.4	1000.	-9.9	8.1	-9.9	26.0	170.
322601 1085322	29.	96.	17.	300.	4.0	64.	190.	650.	0.6	1800.	-9.9	7.7	-9.9	22.0	140.
322636 1090159	38.	31.	10.	40.	2.4	200.	17.	12.	0.5	460.	-9.9	7.9	-9.9	30.0	50.
322614 1085802	39.	6.9	0.44	320.	1.5	205.	150.	300.	8.1	1570.	-9.9	8.6	-9.9	28.0	870.
323403 1084127	29.	17.	2.7	53.	1.8	140.	14.	26.	0.8	282.	-9.9	8.1	-9.9	25.5	50.
322513 1084930	30.	4.5	0.55	68.	0.8	71.	16.	28.	1.7	470.	-9.9	8.7	-9.9	24.0	100.
322448 1084443	30.	29.	3.0	28.	2.3	120.	18.	25.	0.7	275.	-9.9	7.9	-9.9	27.5	30.
322320 1085603	41.	35.	11.	650.	2.3	440.	340.	800.	3.7	2930.	-9.9	7.8	-9.9	24.0	1300
322247 1085212	49.	41.	17.	440.	2.9	270.	200.	720.	3.3	2300.	-9.9	7.8	-9.9	24.0	890.
322126 1085216	32.	2.6	2.3	490.	1.2	764.	69.	240.	22.0	2300.	-9.9	8.9	-9.9	26.0	1000
322333 1085708	48.	46.	14.	530.	2.9	164.	370.	720.	3.5	3050.	-9.9	7.9	-9.9	28.0	650.
321921 1084944	37.	42.	29.	260.	6.1	824.	65.	110.	9.5	1380.	-9.9	7.4	-9.9	23.5	590.
321807 1085658	28.	1.3	0.6	3500.	4.8	3880.	1000.	2600.	90.	13800.	-9.9	9.3	-9.9	45.5	8900
321515 1085650	31.	1.6	0.36	310.	0.8	530.	43.	150.	14.	1500.	-9.9	9.0	-9.9	25.0	380.
315949 1083955	34.	24.	5.4	97.	2.3	190.	21.	30.	2.3	420.	-9.9	8.0	-9.9	24.0	120.
315848 1084232	35.	34.	4.7	79.	3.8	234.	19.	30.	6.9	482.	-9.9	7.7	-9.9	25.0	180.
315839 1083743	42.	9.2	0.7	120.	4.9	260.	20.	41.	4.3	600.	-9.9	8.2	-9.9	26.0	190.
315655 1084538	25.	20.	7.8	87.	2.9	264.	14.	44.	0.8	398.	-9.9	7.9	-9.9	20.0	140.

TABLE 1 (cont.) - Water-quality analyses presented by Schwennesen (1918), Doty (1960), Reeder (1957), Bureau (1981). Boron concentrations given in µg/ℓ, other dissolved species in mg/ℓ.

SCHWENNESEN GROUNDWATER QUALITY DATA (not in WATSTORE) 1913-1915 Analyses

STATION NUMBER	SIO2	Ca	Mg	Na	K	HCO3	Cl	SO4	F	SC	TDS	pH	Na+K	Temp	B
321133-1083358	-9.9	104.	28.	-9.9	-9.9	281.	126.	253.	-9.9	-9.9	861.	-9.9	-9.9	-9.9	-9.9
321411-1083631	-9.9	17.	12.	-9.9	-9.9	209.	36.	138.	-9.9	-9.9	466.	-9.9	-9.9	-9.9	-9.9
321555-1083632	-9.9	115.	68.	-9.9	-9.9	363.	313.	785.	-9.9	-9.9	2059.	-9.9	-9.9	-9.9	-9.9
321950-1083908	-9.9	11.	11.	-9.9	-9.9	180.	49.	81.	-9.9	-9.9	477.	-9.9	-9.9	-9.9	-9.9
322043-1084040	-9.9	7.2	6.1	-9.9	-9.9	256.	46.	78.	-9.9	-9.9	452.	-9.9	-9.9	-9.9	-9.9
322320-1084446	-9.9	17.	7.4	-9.9	-9.9	136.	43.	88.	-9.9	-9.9	405.	-9.9	-9.9	-9.9	-9.9
322523-1084924	-9.9	16.	7.4	-9.9	-9.9	177.	20.	30.	-9.9	-9.9	236.	-9.9	-9.9	-9.9	-9.9
322555-1085257	-9.9	100.	19.	-9.9	-9.9	64.	196.	655.	-9.9	-9.9	1413.	-9.9	-9.9	-9.9	-9.9
312023-1084820	-9.9	6.8	3.	-9.9	-9.9	21.	5.8	12.	-9.9	-9.9	135.	-9.9	-9.9	-9.9	-9.9
320044-1083446	-9.9	439.	66.	-9.9	-9.9	393.	167.	4072.	-9.9	-9.9	6913.	-9.9	-9.9	-9.9	-9.9
315836-1083010	-9.9	130.	57.	-9.9	-9.9	332.	63.	392.	-9.9	-9.9	955.	-9.9	-9.9	-9.9	-9.9
315808-1083620	-9.9	22.	9.1	-9.9	-9.9	272.	17.	72.	-9.9	-9.9	421.	-9.9	-9.9	-9.9	-9.9
315624-1083518	-9.9	40.	21.	-9.9	-9.9	275.	35.	70.	-9.9	-9.9	430.	-9.9	-9.9	-9.9	-9.9
315557-1083649	-9.9	18.	6.9	-9.9	-9.9	316.	49.	79.	-9.9	-9.9	501.	-9.9	-9.9	-9.9	-9.9
315741-1083751	-9.9	20.	8.6	-9.9	-9.9	281.	40.	77.	-9.9	-9.9	476.	-9.9	-9.9	-9.9	-9.9

DOTY GROUNDWATER QUALITY DATA (1956)

STATION NUMBER	SIO2	Ca	Mg	Na	K	HCO3	Cl	SO4	F	SC	TDS	pH	Na+K	Temp	B
315819-1083640	50.	21.	1.4	-9.9	-9.9	265.	79.	116.	4.	948.	594.	7.9	187.	22.2	1.2
315552-1083240	-9.9	-9.9	-9.9	-9.9	-9.9	235.	60.	125.	1.4	799.	-9.9	7.6	-9.9	-9.9	-9.9

REEDER GROUNDWATER QUALITY DATA (NOT INCLUDED IN WATSTORE,1949)

STATION NUMBER	SIO2	Ca	Mg	Na	K	HCO3	Cl	SO4	F	SC	TDS	pH	Na+K	Temp	B
315802-1084957	-9.9	28.	3.9	-9.9	-9.9	173.	7.	40.	-9.9	376.	216.	-9.9	50.	-9.9	-9.9

BUREAU GROUNDWATER QUALITY DATA (TEST HOLE 1,1981)

STATION NUMBER	SIO2	Ca	Mg	Na	K	HCO3	Cl	SO4	F	SC	TDS	pH	Na+K	Temp	B
322514 1085624	-9.9	6.2	1.66	400.	3.1	213.	23.	642.	-9.9	2000.	1183.	7.35	-9.9	-9.9	-9.9
322514 1085624	-9.9	20.	11.	580.	4.1	213.	36.	1079.	-9.9	2800.	1837.	7.2	-9.9	-9.9	-9.9

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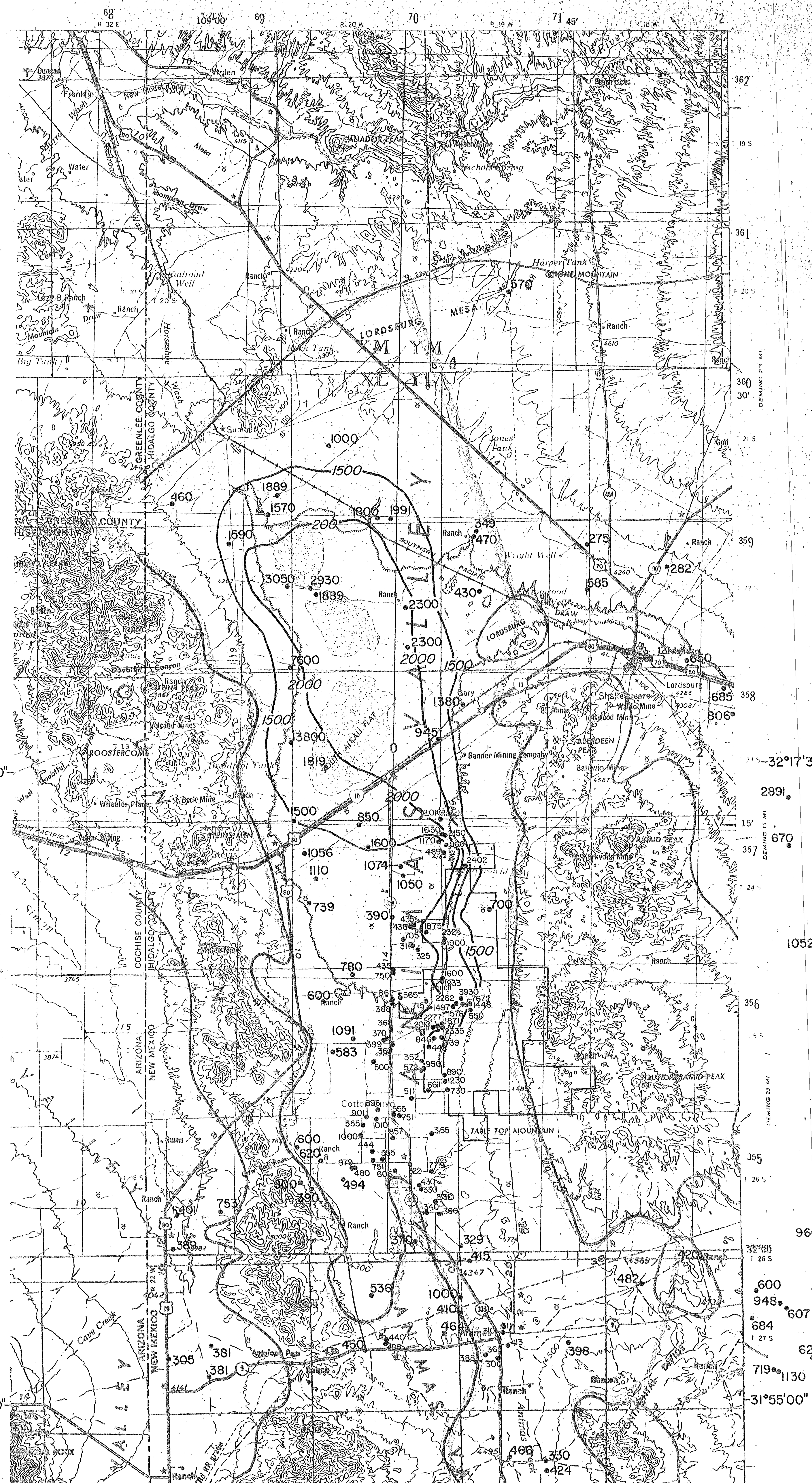

Plate I Specific Conductance Map
(micromhos/cm)

Animas Basin

(OF 131)

Plate 2 – Silica Plot (mg/ℓ)

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Animas Basin

Plate 3 Boron Plot (ug/l)

Animas Basin

(OF 131)

Plate 4 - Chloride Plot (mg/l)

Animas Basin

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