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Analytical results for 89 water samples from the Papago Indian Reservation, Arizona

by

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CONTENTS

ILLUSTRATIONS

TABLES

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by

Walter H. Ficklin, Wheeler Ashton, David J. Preston, and Gary A. Nowlan

Abstract

Eighty-nine water samples were collected from the Papago Indian Reservation during 1977 and 1978 as a part of a mineral resource study. Each sample was analyzed for copper, zinc, molybdenum, arsenic, uranium, sodium, potassium, calcium, magnesium, bicarbonate, sulfate, chloride, fluoride, and silica. Temperature, pH, and specific conductance were also measured. The data are presented in accompanying tables. Also, included are the location and a description of each sample site.

Introduction

Eighty-nine water samples were collected from wells, streams, and springs during 1977 and 1978 in conjunction with a geochemical study of the potential mineral resources of the area in and around the Papago Indian Reservation in southern Arizona. A conscious effort was made to locate and sample dug wells because (1) they commonly had no metal in contact with the water; (2) they were easy to sample with the simple equipment available; (3) the water in the well could be sampled directly, in contrast to the sampling of a storage tank; (4) dug wells are usually located in areas near enough exposed bedrock so that geologic interpretations of analytical results are possible; and (5) many of the dug wells are either abandoned or remote, so that they probably would not be sampled during any present-day survey of domestic wells. Figure 1 is an index map of the area sampled. Figures 2-11 show the sites of the wells sampled for this study.

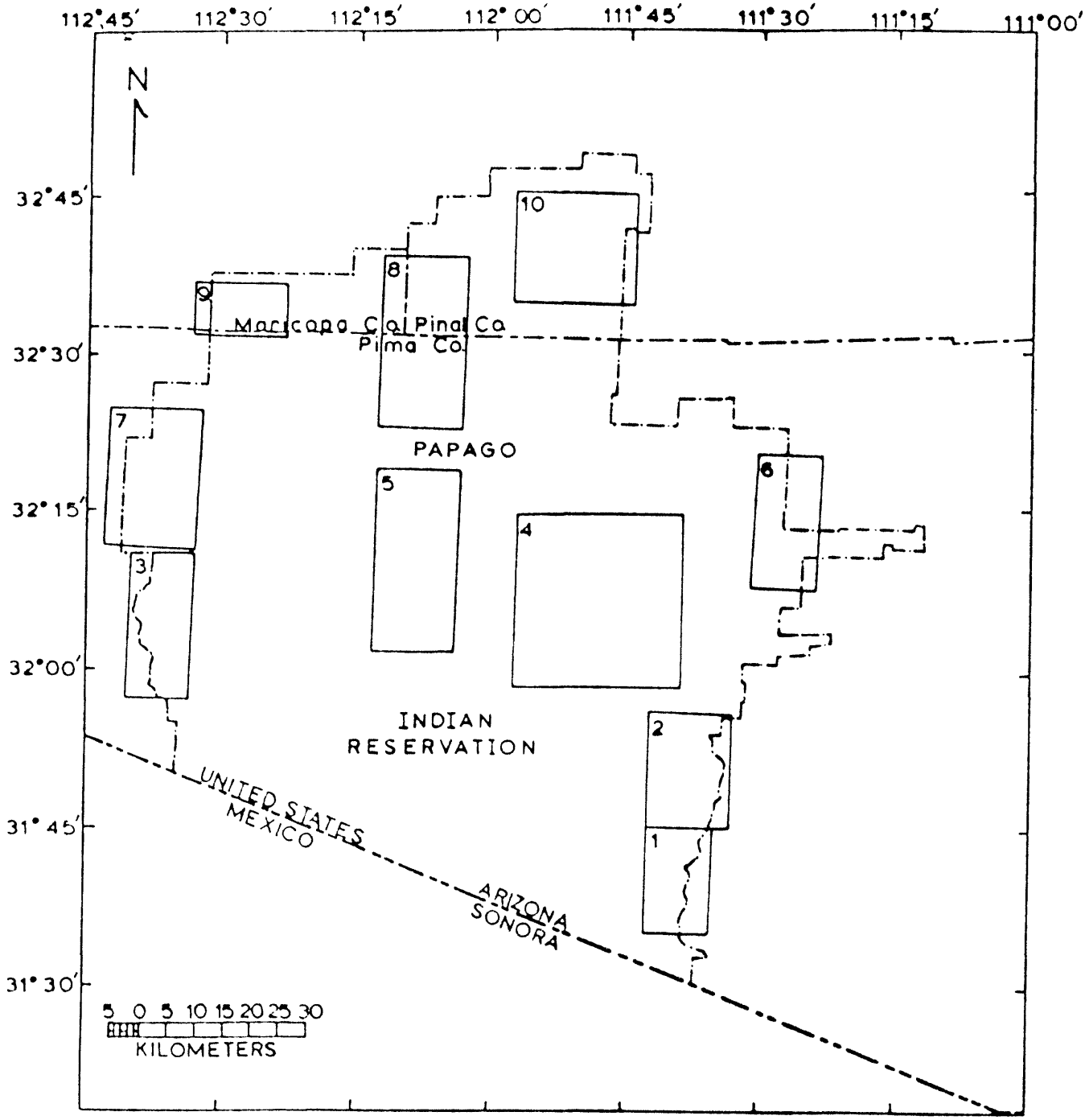

Figure 1.--Locations of areas shown in figures 2-11.

Explanation

Boundaries

International

Reservation

County

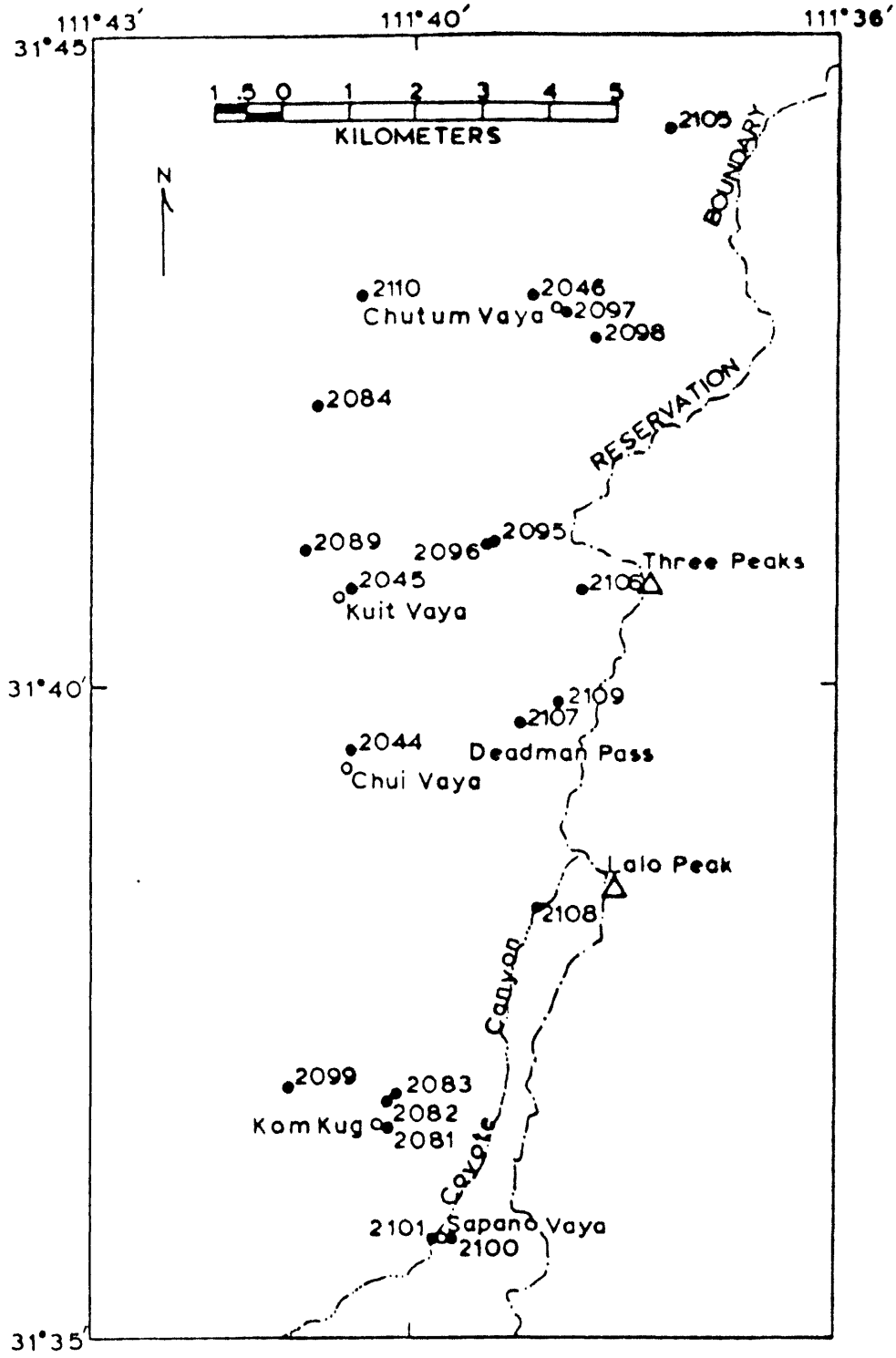

Figure 2.--Water sample sites on a portion of the Papago Indian Reservation, Arizona. Area 1 of figure 1.

Explanation

● Sample locality

—·—·—·— Intermittent stream

○ Cultural feature

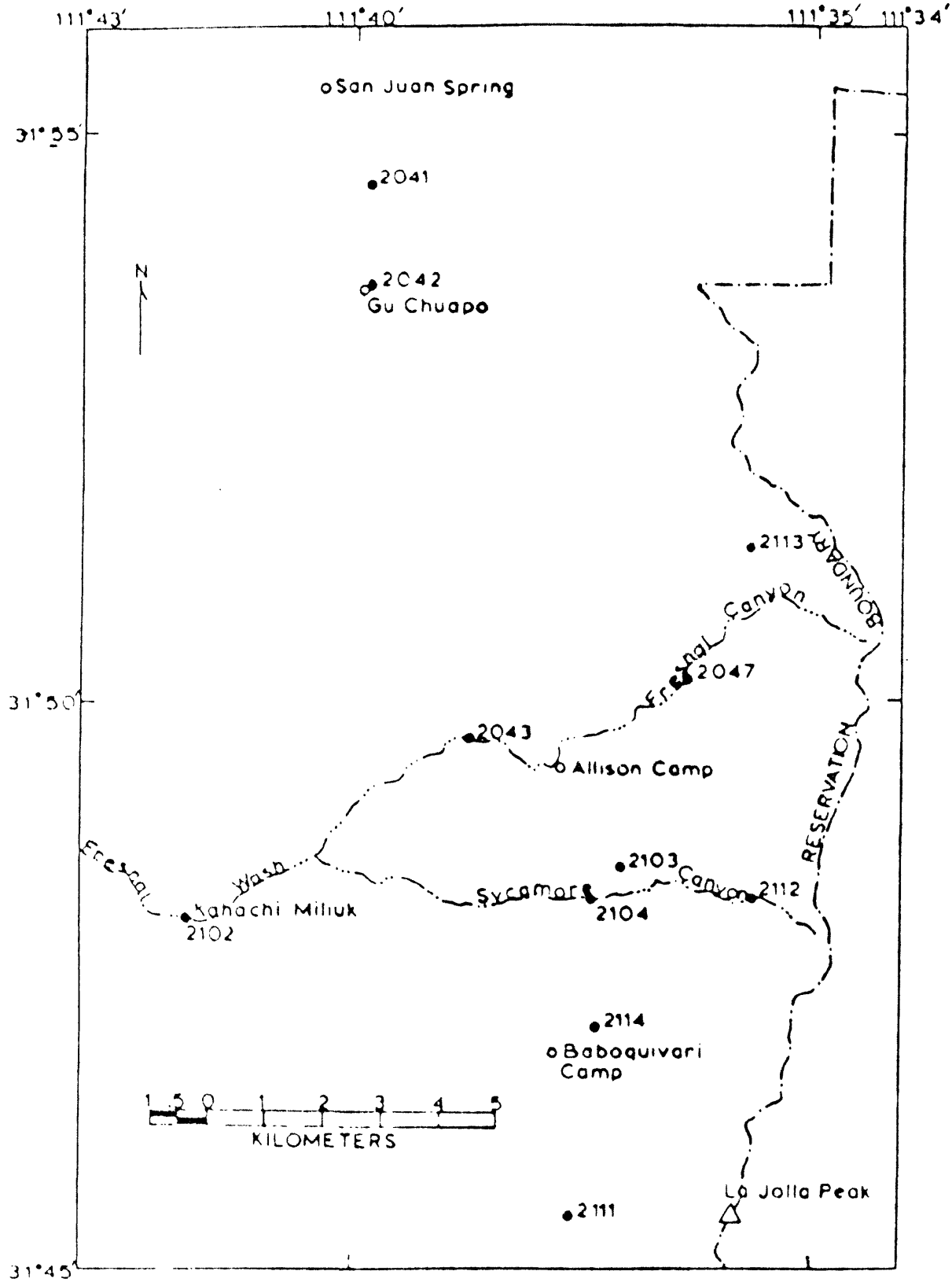

Figure 3.--Water sample sites on a portion of the Papago Indian Reservation, Arizona. Area 2 of figure 1.

Explanation

- ● Sample locality
- —·—·— Intermittent stream
- ○ Cultural feature--Where a sample locality and a cultural feature coincide, a solid dot designates both and the cultural feature is labeled.

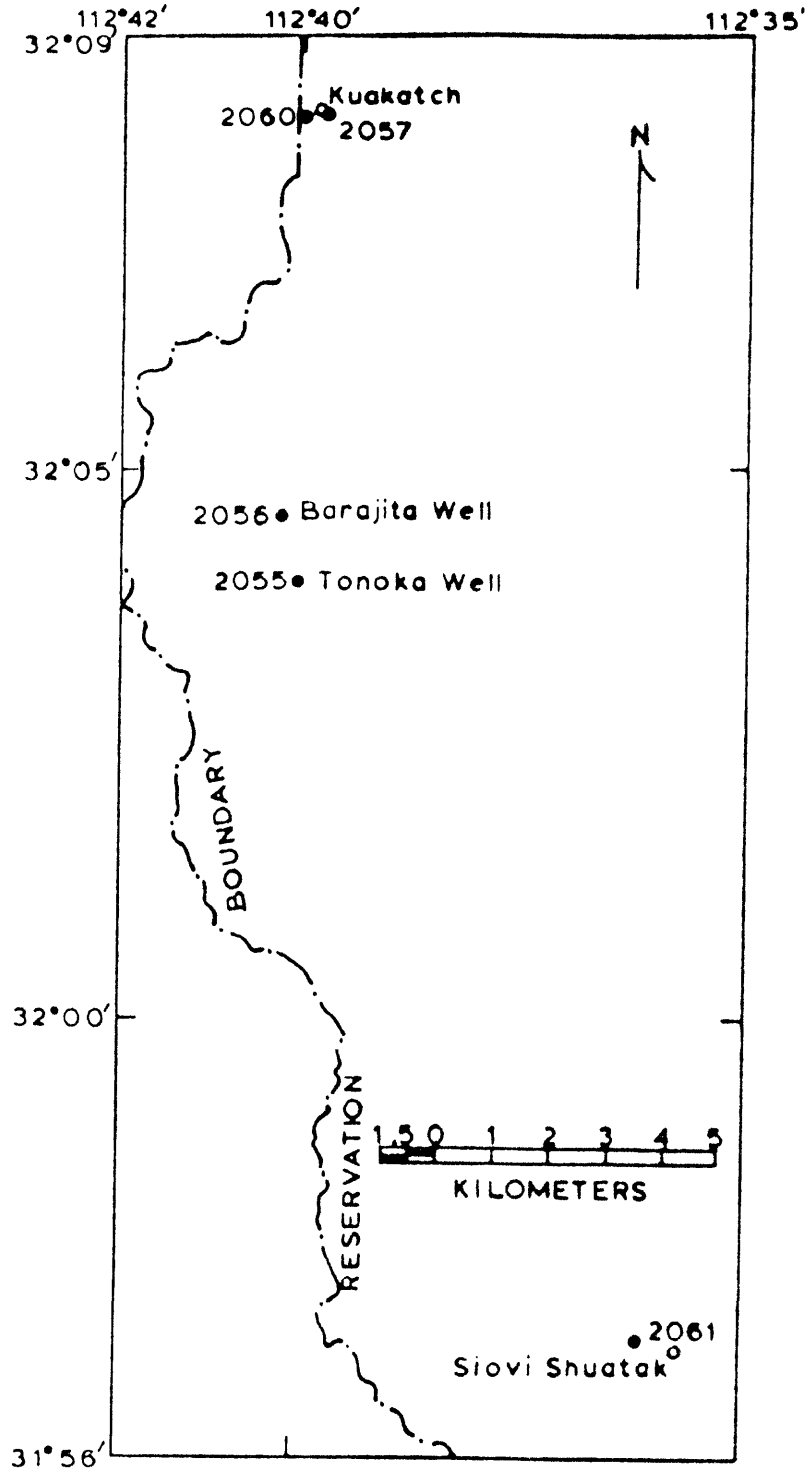

Figure 4.--Water sample sites on a portion of the Papago Indian Reservation, Arizona. Area 3 of figure 1.

Explanation

- ● Sample locality
- o Cultural feature--Where a sample locality and a cultural feature coincide, a solid dot designates both and the cultural feature is labeled.

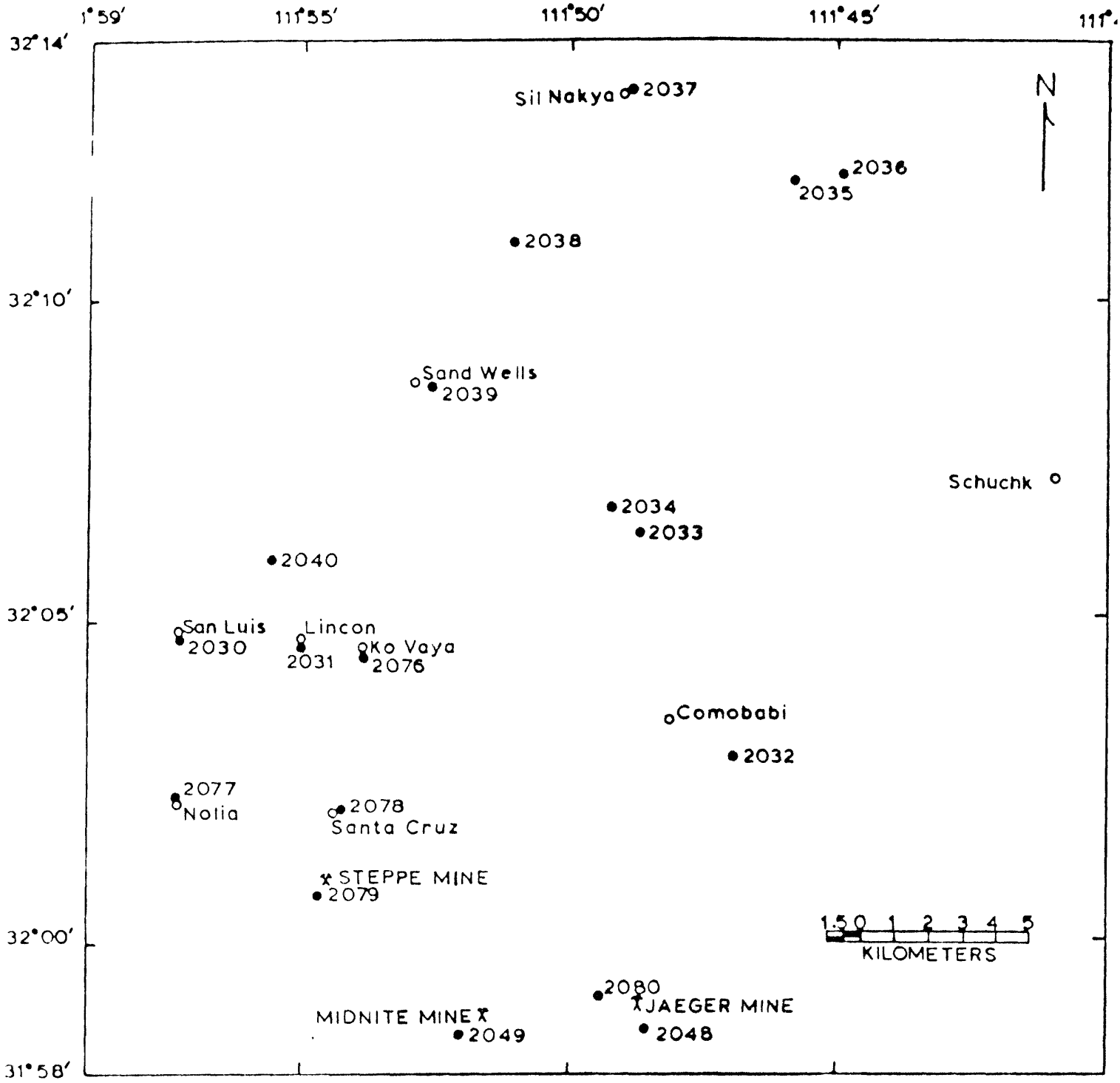

Figure 5.--Water sample sites on a portion of the Papago Indian Reservation, Arizona. Area 4 of figure 1.

Explanation

● Sample locality

⚒ Mine

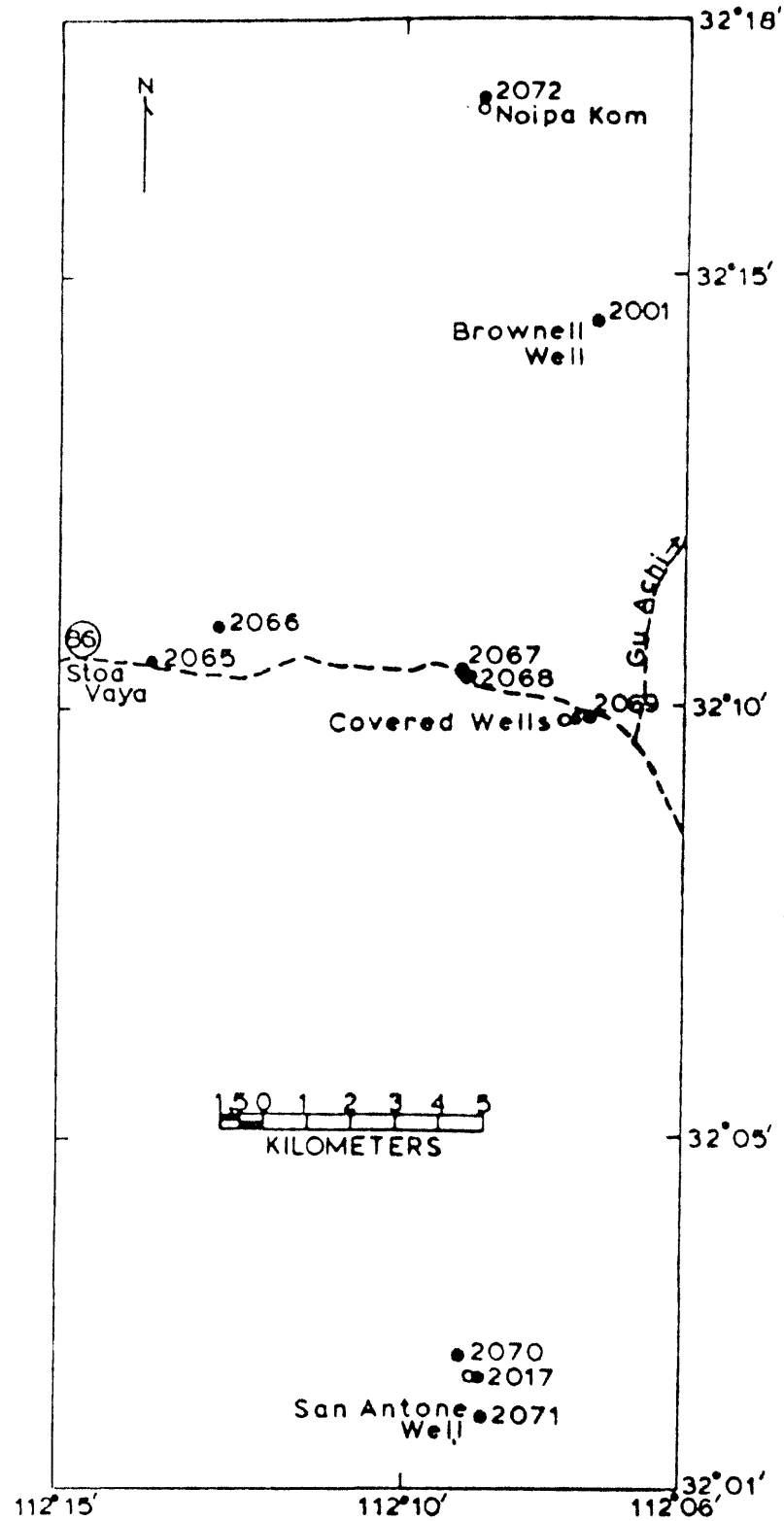

Figure 6.--Water sample sites on a portion of the Papago Indian Reservation, Arizona. Area 5 of figure 1.

Explanation

- ● Sample locality
- ★ Church
- ○ Cultural feature--Where a sample locality and a cultural feature coincide, a solid dot designates both and the cultural feature is labeled.

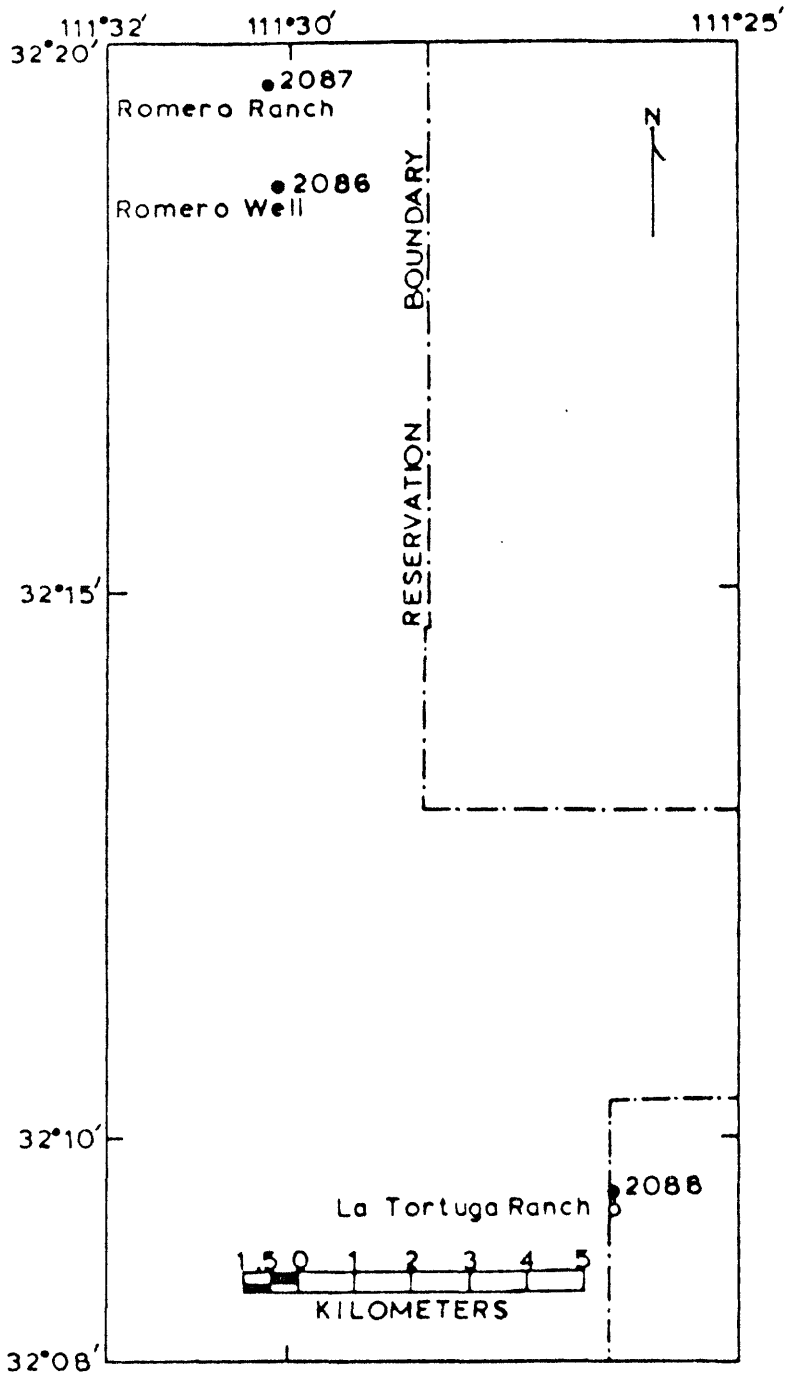

Figure 7.--Water sample sites on a portion of the Papago Indian Reservation, Arizona. Area 6 of figure 1.

Explanation

● Sample locality

o Cultural feature--Where a sample locality and a cultural feature coincide, a solid dot designates both and the cultural feature is labeled.

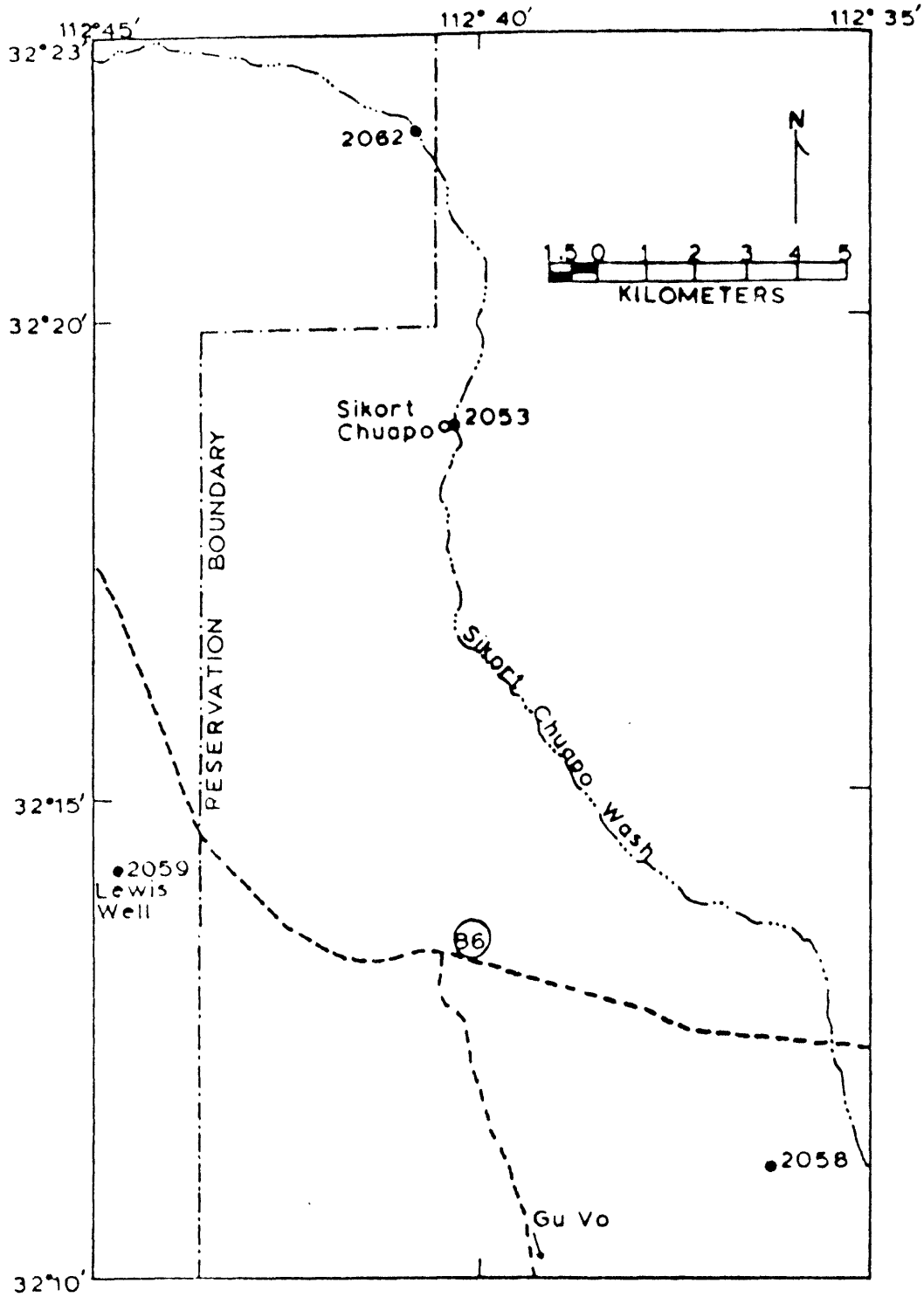

Figure 8.--Water sample sites on a portion of the Papago Indian Reservation, Arizona. Area 7 of figure 1.

Explanation

- ● Sample locality
- —··— Intermittent stream
- o Cultural feature--Where a sample locality and a cultural feature feature coincide, a solid dot designates both and the cultural feature is labeled.

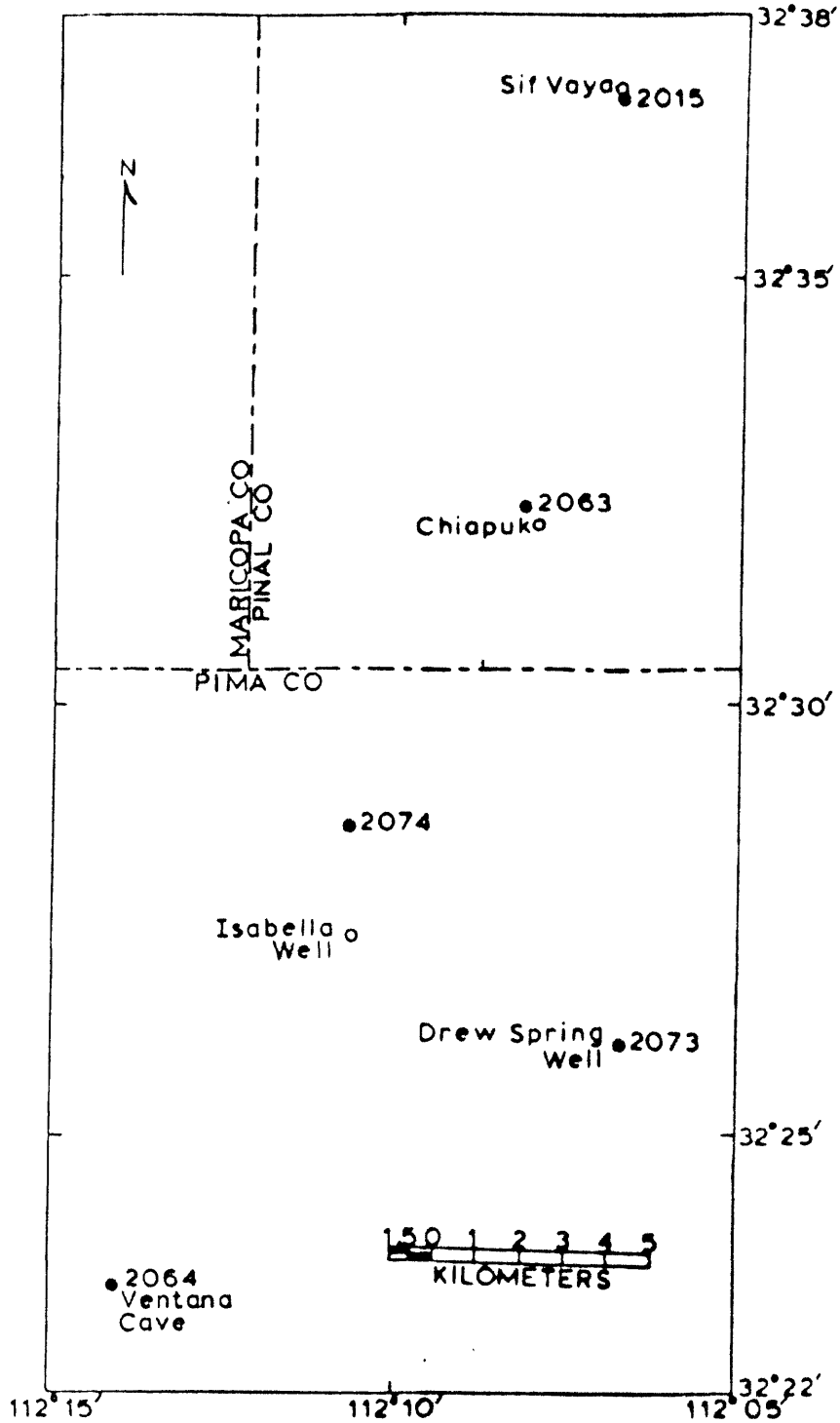

Figure 9.--Water sample sites from a portion of the Papago Indian Reservation, Arizona. Area 8 of figure 1.

Explanation

● Sample locality
o Cultural feature--Where a sample locality and a cultural feature coincide, a solid dot designates both and the cultural feature is labeled.

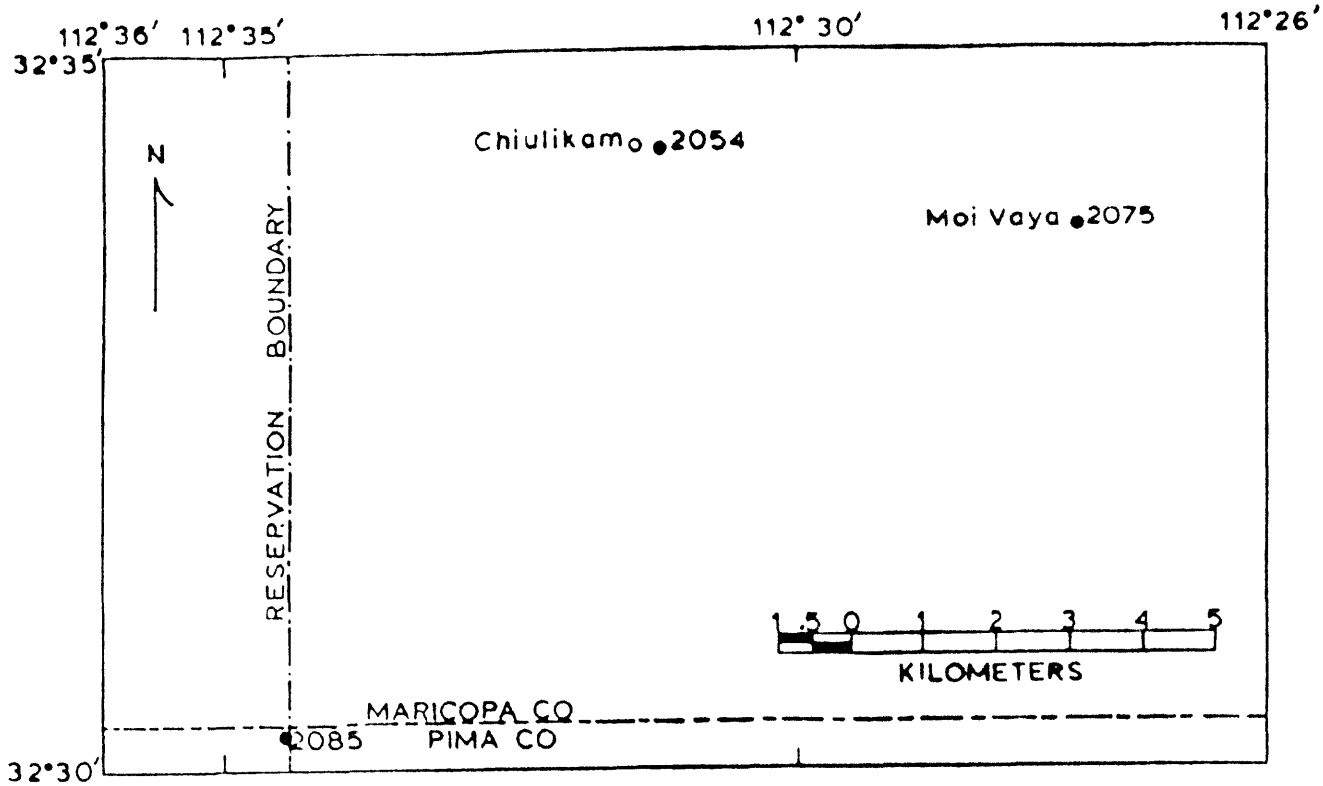

Figure 10.--Water sample sites on a portion of the Papago Indian Reservation, Arizona. Area 9 of figure 1.

Explanation

- ● Sample locality
- ○ Cultural feature--Where a sample locality and a cultural feature coincide, a solid dot designates both and the cultural feature is labeled.

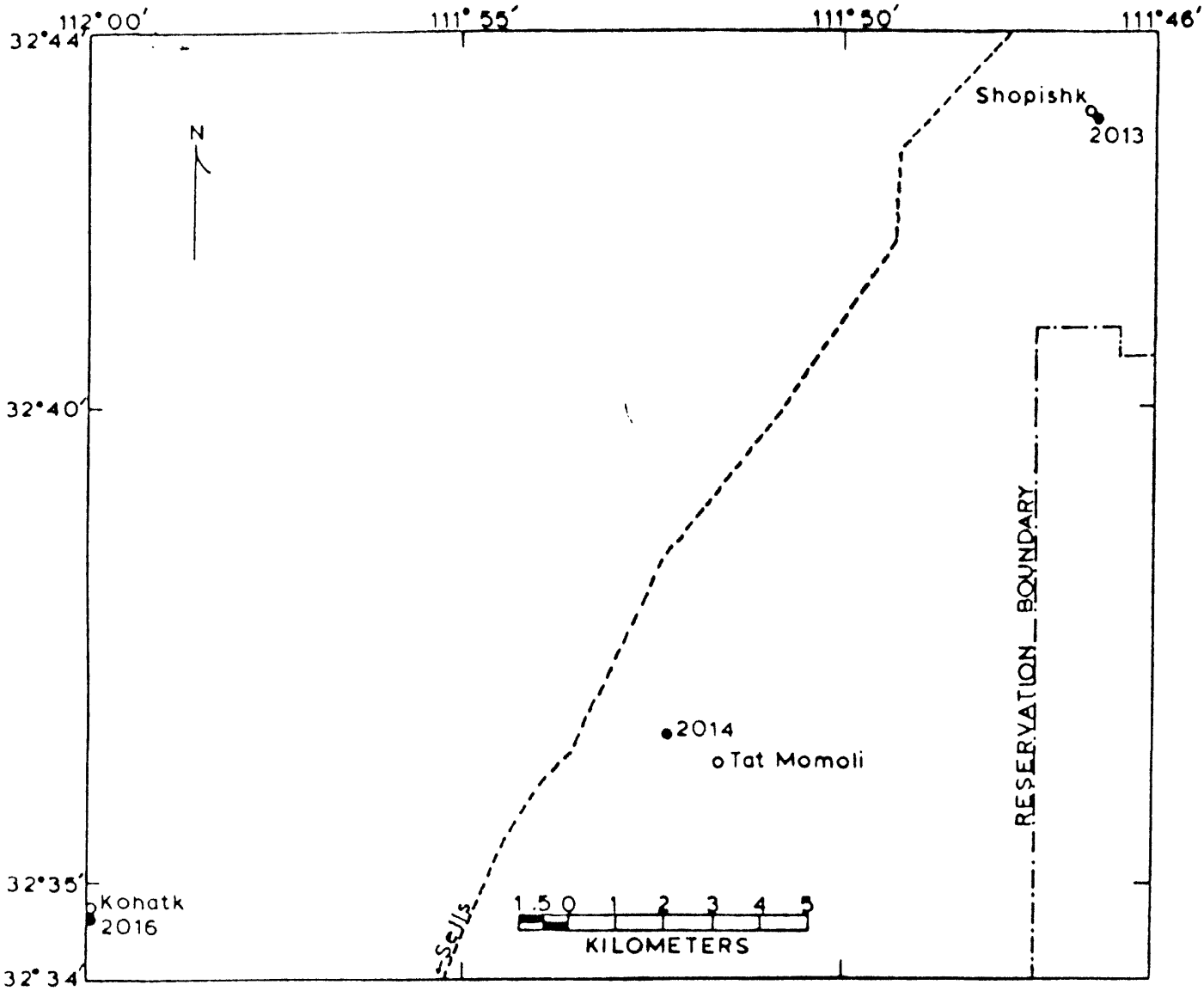

Figure 11.--Water sample sites on a portion of the Papago Indian Reservation, Arizona. Area 10 of figure 1.

Explanation

● Sample locality

o Cultural feature

Sampling Techniques

Samples were usually collected from wells by lowering a plastic bottle suspended from a cord into each well and filling the bottle with well water. Where a bottle could not be lowered into the well, an adjacent storage tank or else the stream of water from a pumping well was sampled. At the sample site a portion of the water was filtered through a 0.45-micron membrane filter and then acidified with 0.5 ml of concentrated nitric acid for each 100 ml of water sample. Another portion of the same sample was neither filtered nor acidified. The samples were stored in polyethylene bottles.

Analytical Techniques

Temperature and pH were measured at the sample site. Specific conductance was also measured at the sample site for most samples; the remainder were measured in the laboratory.

Bicarbonate, sulfate, chloride, fluoride, and silica were determined in the untreated portion of the sample. The filtered, acidified sample was used to determine copper, zinc, molybdenum, arsenic, uranium, sodium, potassium, calcium, and magnesium.

Table 1 is a list of analytical techniques employed for the analyses of each constituent and a list of references to the reports that describe the analytical methods used.

Table 1.--*Analytical methods used for water analyses, Papago Indian Reservation, Arizona*

Constituent	Method	Reference
Bicarbonate	Gran's plot titration with sulfuric acid	Orion Research, Inc. (1975).
Sulfate	Barium sulfate-turbidimetric	Tabatabai (1974).
Chloride	Gran's plot titration with silver nitrate	Orion Research, Inc. (1975).
Fluoride	Gran's plot addition	Do.
Sodium	Flame atomic absorption spectrophotometry	Perkin-Elmer Corp. (1976).
Magnesium	Flame atomic absorption spectrophotometry	Do.
Potassium	Flame atomic absorption spectrophotometry	Do.
Calcium	Flame atomic absorption spectrophotometry	Do.
Copper	Flameless atomic absorption spectrophotometry	Miller and Ficklin (1976).
Zinc	Flameless atomic absorption spectrophotometry	Do.
Molybdenum	Flameless atomic absorption spectrophotometry	Do.
Arsenic	Flameless atomic absorption spectrophotometry	Aruscavage (1977).
Uranium	Fluorometric	Ward and Bondar (1977).
Silica	Molybdate blue	Brown, Skougstad, and Fishman (1970), p. 138-140.

Results

Table 2 is a list of sample locations, sample sources, and other information for the samples shown in figures 1-11.

Table 3 is a list of the analytical results.

Table 2.--*Sample locations, sample source, and other information, Papago Indian Reservation, Arizona*

[Samples collected by Aletha L. Gruzensky, Andrew F. Harvey, Gary A. Nowlan, and David R. Zimbelman. Wells had linings of mortared stone unless noted otherwise under "Remarks." Sample source--"Well" denotes that the sample was obtained by means of a plastic bottle suspended on a cord. Leaders (---) indicate no data or not applicable.]

Site	Latitude °N	Longitude °W	Location	Sample source	Date of sample collection	Depth to water (meters)	Galvanized pipe in well	Remarks
				Area 1				
2044	31°39'31"	111°40'34"	Chui Vaya----------	Well----------	11-15-77	5	Yes	---
2045	31°40'45"	111°40'35"	Kuit Vaya----------	Well----------	11-15-77	7	No	No lining.
2045	31°40'45"	111°40'35"	--do----------	--do----------	3-23-78	4.5	--do--	Same well as the preceding.
2046	31°42'59"	111°38'51"	Chutum Vaya----------	Well----------	11-15-77	2.5	Yes	---
2081	31°36'38"	111°40'12"	Kom Kug----------	Well----------	3-23-78	3	Yes	---
2082	31°36'51"	111°40'11"	0.4 km north of Kom Kug------	Well----------	3-23-78	1	Yes(?)	---
2083	31°36'53"	111°40'08"	0.1 km northeast of site 2082	Well----------	3-23-78	2.5	No	---
2084	31°42'10"	111°40'54"	2.6 km north-northeast of Kuit Vaya.	Well----------	3-23-78	3	No	No lining.
2089	31°41'02"	111°41'02"	0.9 km northwest of Kuit Vaya	Well----------	3-27-78	1.5	No	No lining.
2095	31°41'07"	111°39'14"	2.2 km east-northeast of Kuit Vaya.	Well----------	5-17-78	2.5	Yes	---
2096	31°41'06"	111°39'17"	0.1 km west of site 2095-----	Well----------	5-17-78	1.5	No	---
2097	31°42'52"	111°38'33"	Chutum Vaya, 0.5 km east-southeast of site 2046.	Well----------	5-17-78	4.5	No	No lining.
2098	31°42'40"	111°38'18"	Chutum Vaya, 0.6 km southeast of site 2097.	Well----------	5-17-78	1.5	Yes	Concrete lining.
2099	31°36'56"	111°41'09"	1.5 km west-northwest of Kom Kug.	Well----------	5-18-78	15	Yes	---
2100	31°35'48"	111°39'36"	Sapano Vaya----------	Spring--------	5-18-78	---	---	Spring is developed.
2101	31°35'48"	111°39'46"	Sapano Vaya----------	Well----------	5-18-78	2	Yes	---
2105	31°44'17"	111°37'34"	3.0 km northeast of Chutum Vaya.	Stream--------	5-19-78	---	---	---
2106	31°40'44"	111°38'25"	0.9 km west of Three Peaks---	Spring--------	5-19-78	---	---	Spring is not developed.

Table 2.--*Sample locations, sample source, and other information, Papago Indian Reservation, Arizona*--Continued.

[Samples collected by Aletha L. Gruzensky, Andrew F. Harvey, Gary A. Nowlan, and David R. Zimbelman. Wells had linings of mortared stone unless noted otherwise under "Remarks." Sample source--"Well" denotes that the sample was obtained by means of a plastic bottle suspended on a cord. Leaders (---) indicate no data or not applicable.]

Site	Latitude °N	Longitude °W	Location	Sample source	Date of sample collection	Depth to water (meters)	Galvanized pipe in well	Remarks
				Area 1				
2107	31°39'42"	111°38'58"	1.0 km west-northwest of Deadman Pass.	Well----------	5-19-78	3	No	No lining.
2108	31°38'19"	111°38'48"	1.0 km west-southwest of Lalo Peak.	Well----------	5-19-78	2	No	---
2109	31°39'52"	111°38'34"	0.9 km north-northwest of Deadman Pass.	Spring--------	5-21-78	---	---	Spring is not developed. Spring is 15 upstream from well plotted on USGS topographic map of Presumido Peak quadrangle.
2110	31°43'00"	111°40'29"	2.8 km west of Chutum Vaya---	Well----------	5-21-78	7	No	Wood lining.
				Area 2				
2041	31°54'32"	111°39'51"	1.9 km southeast of San Juan Spring.	Stream--------	11-14-77	---	---	Well plotted on USGS topographic map of the Baboquivari Peak quadrangle is filled with gravel.
2042	31°53'39"	111°39'51"	Gu Chuapo----------	Well----------	11-14-77	13	Yes	Well not plotted on USGS topographic map of the Baboquivari Peak quadrangle.
2043	31°49'40"	111°38'42"	1.5 km west-northwest of Allison Camp.	Concrete storage tank.	11-14-77	?	Yes	Well probably drilled. Lining material not known.

Table 2.--*Sample locations, sample source, and other information, Papago Indian Reservation, Arizona*--Continued.

[Samples collected by Aletha L. Gruzensky, Andrew F. Harvey, Gary A. Nowlan, and David R. Zimbelman. Wells had linings of mortared stone unless noted otherwise under "Remarks." Sample source--"Well" denotes that the sample was obtained by means of a plastic bottle suspended on a cord. Leaders (---) indicate no data or not applicable.]

Site	Latitude °N	Longitude °W	Location	Sample source	Date of sample collection	Depth to water (meters)	Galvanized pipe in well	Remarks
				Area 2				
2047	31°50'10"	111°36'22"	2.5 km northeast of Allison Camp.	Well----------	11-15-77	3.5	Yes	---
2102	31°48'06"	111°41'47"	Kahachi Miliuk----------	Well----------	5-19-78	5	Yes	---
2103	31°48'33"	111°37'03"	North side of Sycamore Canyon, 3.4 km west of Reservation boundary.	Spring--------	5-19-78	---	---	Spring is developed.
2104	31°48'15"	111°37'23"	Sycamore Canyon, 4.0 km west of Reservation boundary.	Stream--------	5-19-78	---	---	---
2111	31°45'28"	111°37'35"	2.6 km west of La Jolla Peak	Well----------	5-21-78	3	Yes	---
2112	31°48'15"	111°35'37"	Sycamore Canyon, 1.0 km west of Reservation boundary.	Spring--------	5-22-78	---	---	Spring is developed.
2113	31°51'21"	111°35'42"	4.9 km northeast of Allison Camp.	Stream--------	5-22-78	---	---	---
2114	31°47'10"	111°37'19"	0.8 km northeast of Baboquivari Camp.	Stream--------	5-22-78	---	---	Upstream 30-50 from spring plotted on USGS topographic map of the Baboquivari Peak quadrangle.
				Area 3				
2055	32°03'59"	112°40'01"	Tonoka Well----------	Well----------	3-06-78	6	Yes	---
2056	32°04'37"	112°40'13"	Barajita Well----------	Well----------	3-06-78	2	Yes	---

Table 2.--*Sample locations, sample source, and other information, Papago Indian Reservation, Arizona*--Continued.

[Samples collected by Aletha L. Gruzensky, Andrew F. Harvey, Gary A. Nowlan, and David R. Zimbelman. Wells had linings of mortared stone unless noted otherwise under "Remarks." Sample source--"Well" denotes that the sample was obtained by means of a plastic bottle suspended on a cord. Leaders (---) indicate no data or not applicable.]

Site	Latitude °N	Longitude °W	Location	Sample source	Date of sample collection	Depth to water (meters)	Galvanized pipe in well	Remarks
				Area 3				
2057	32°08'12"	112°39'45"	Kuakatch, 0.5 km east of Reservation boundary.	Well----------	3-06-78	7	Yes	Well is not plotted on USGS topographic map of the Mt. Ajo quadrangle.
2060	32°08'12"	112°40'02"	Kuakatch, at Reservation boundary.	Well----------	3-07-78	8	Yes	Well is not plotted on USGS topographic map of the Mt. Ajo quadrangle.
2061	31°57'07"	112°36'08"	0.6 km west of Siovi Shuatak	Well----------	3-08-78	4.5	Yes	---
				Area 4				
2030	32°04'47"	111°57'17"	San Luis----------	Galvanized pipe from pumping well.	4-12-77	?	Yes	---
2031	32°04'40"	111°55'02"	Lincon----------	Stone and concrete storage tank.	4-12-77	?	Yes	---
2031	32°04'40"	111°55'02"	--do----------	Well----------	3-20-78	15	--do--	Same well as the preceding.
2032	32°02'53"	111°46'54"	1.3 km southeast of Comobabi	Well----------	11-11-77	3.5	No	---
2033	32°01'23"	111°48'38"	5.5 km north-northwest of Comobabi.	Well----------	11-11-77	4	No	---
2034	31°01'52"	111°49'11"	1.2 km north of site 2033---	Well----------	11-11-77	6	No	Wood lining.

20 (20a follows)

Table 2.--*Sample locations, sample source, and other information, Papago Indian Reservation, Arizona*--Continued.

[Samples collected by Aletha L. Gruzensky, Andrew F. Harvey, Gary A. Nowlan, and David R. Zimbelman. Wells had linings of mortared stone unless noted otherwise under "Remarks." Sample source--"Well" denotes that the sample was obtained by means of a plastic bottle suspended on a cord. Leaders (---) indicate no data or not applicable.]

Site	Latitude °N	Longitude °W	Location	Sample source	Date of sample collection	Depth to water (meters)	Galvanized pipe in well	Remarks
				Area 4				
2035	32°11'55"	111°45'48"	5.5 km southeast of Sil Nakya	Well----------	11-13-77	16	Yes	Well not plotted on USGS topographic map of the Comobabi quadrangle.
2036	32°11'59"	111°44'54"	1.4 km east of site 2035-----	Well----------	11-13-77	7	No	---
2037	32°13'18"	111°48'50"	Sil Nakya----------	Well----------	11-13-77	3	Yes(?)	Another well is 15 m north.
2038	32°10'56"	111°51'05"	5.5 km southwest of Sil Nakya	Well----------	11-13-77	2.5	Yes	---
2039	32°08'41"	111°52'35"	Sand Wells----------	Well----------	11-13-77	3	No	Concrete lining.
2040	32°05'56"	111°55'35"	2.6 km north-northwest of Lincon.	Well----------	11-13-77	12	No	No lining. Appears stagnant. Well not plotted on USGS topographic map of the Comobabi quadrangle.
2048	31°58'41"	111°48'33"	0.8 km south-southwest of Jaeger mine.	Well----------	11-16-77	12	Yes	---
2048	31°58'41"	111°48'33"	--do----------	Well----------	3-22-78	11	--do--	Same well as the preceding.
2049	31°58'37"	111°52'01"	0.8 km southwest of Midnite mine.	Well----------	11-16-77	3	Yes	---
2076	32°04'28"	111°53'49"	Ko Vaya----------	Well----------	3-20-78	2.5	Yes	---
2077	32°02'18"	111°57'21"	Nolia----------	Well----------	3-20-78	23	Yes	Concrete lining for top meter; remainder unlined.

20a (21 follows)

Table 2.--*Sample locations, sample source, and other information, Papago Indian Reservation, Arizona*--Continued.

[Samples collected by Aletha L. Gruzensky, Andrew F. Harvey, Gary A. Nowlan, and David R. Zimbelman. Wells had linings of mortared stone unless noted otherwise under "Remarks." Sample source--"Well" denotes that the sample was obtained by means of a plastic bottle suspended on a cord. Leaders (---) indicate no data or not applicable.]

Site	Latitude °N	Longitude °W	Location	Sample source	Date of sample collection	Depth to water (meters)	Galvanized pipe in well	Remarks
				Area 4				
2078	32°02'07"	111°54'15"	Santa Cruz----------	Well----------	3-20-78	7	Yes	Most easterly of three wells plotted on USGS topographic map of the Comobabi quadrangle.
2079	32°00'46"	111°54'42"	0.4 km south of Steppe mine--	Well----------	3-20-78	0.75	No	Concrete lining.
2080	31°59'10"	111°49'24"	1.0 km west of Jaeger mine---	Well----------	3-22-78	12	No	No lining.
				Area 5				
2001	32°14'28"	112°07'11"	Brownell Well----------	Concrete storage tank.	4-08-77	?	Yes	Well head is covered by concrete slab. Well is probably drilled. Lining material not known.
2001	32°14'28"	112°07'11"	--do----------	Galvanized pipe from pumping well.	4-08-77	?	--do--	Same well as the preceding.
2017	32°02'16"	112°08'53"	Piato Vava----------	Well----------	4-08-77	5	Yes	---
2017	32°02'16"	112°08'53"	--do----------	Well----------	3-15-78	2	--do--	Same well as preceding.
2065	32°10'33"	112°13'38"	Stoa Vaya----------	Well----------	3-14-78	6	Yes	---
2066	32°10'57"	112°12'42"	1.7 km east-northeast of Stoa Vaya.	Well----------	3-14-78	3	No	---

Table 2.--*Sample locations, sample source, and other information, Papago Indian Reservation, Arizona*--Continued.

[Samples collected by Aletha L. Gruzensky, Andrew F. Harvey, Gary A. Nowlan, and David R. Zimbelman. Wells had linings of mortared stone unless noted otherwise under "Remarks." Sample source--"Well" denotes that the sample was obtained by means of a plastic bottle suspended on a cord. Leaders (---) indicate no data or not applicable.]

Site	Latitude °N	Longitude °W	Location	Sample source	Date of sample collection	Depth to water (meters)	Galvanized pipe in well	Remarks
				Area 5				
2067	32°10'23"	112°09'10"	2 km west of Covered Wells, north side of Arizona Rt. 86.	Well----------	3-14-78	3	No	Most westerly of three wells within 200.
2068	32°10'18"	112°09'03"	200 m east of site 2067------	Well----------	3-14-78	5(?)	Yes	Well is covered. Sample from hydrant after pump turned on for 15 seconds.
2069	32°09'53"	112°07'17"	Covered Wells, 0.4 km east of Catholic mission church.	Hand pump-----	3-14-78	?	?	Well is covered. Sample obtained from hand pump after many liters were pumped. Probably a dug well. Lining material not known. Well is not plotted on USGS topographic map of the Quijotoa Mts. quadrangle.
2070	32°02'32"	112°09'08"	0.7 km northwest of Piato Vaya.	Well----------	3-15-78	1	No	Well is not plotted on USGS topographic map of the Quijotoa Mts. quadrangle.
2071	32°01'51"	112°08'49"	San Antone Well----------	Well----------	3-15-78	4.5	No	---
2072	32°17'05"	112°03'49"	Noipa Kam----------	Well----------	3-17-78	4.5	Yes	---

Table 2.--*Sample locations, sample source, and other information, Papago Indian Reservation, Arizona*--Continued.

[Samples collected by Aletha L. Gruzensky, Andrew F. Harvey, Gary A. Nowlan, and David R. Zimbelman. Wells had linings of mortared stone unless noted otherwise under "Remarks." Sample source--"Well" denotes that the sample was obtained by means of a plastic bottle suspended on a cord. Leaders (---) indicate no data or not applicable.]

Site	Latitude °N	Longitude °W	Location	Sample source	Date of sample collection	Depth to water (meters)	Galvanized pipe in well	Remarks
				Area 6				
2086	32°13'42"	111°30'08"	Romero Well----------	Well----------	3-27-78	8	No	No lining.
2087	32°19'38"	111°30'14"	Romero Ranch----------	Well----------	3-27-78	11	No	No lining.
2088	32°09'34"	111°26'21"	La Tortuga Ranch----------	Galvanized pipe from pumping well.	3-27-78	8	Yes	Lining material not known.
				Area 7				
2053	32°18'55"	112°40'19"	Sikort Chuapo----------	Well----------	2-27-78	11	Yes	---
2058	32°11'09"	112°36'15"	3 km west of main road to Gu Vo. South border of section 20, T. 14 S., R. 3 W.	Well----------	3-07-78	1.5	No	Well probably receives some direct surface runoff. Wood lining. Well is not plotted on USGS topographic map of the Mt. Ajo quadrangle.
2059	32°14'15"	112°44'37"	Lewis Well----------	Well----------	3-07-78	12	Yes	Concrete lining.
2062	32°21'56"	112°40'47"	On Sikort Chuapo Wash, 0.4 km west of Reservation.	Rusted steel reservoir.	3-08-78	?	Yes	Well is drilled. Lining material is not known.

Table 2.--*Sample locations, sample source, and other information, Papago Indian Reservation, Arizona*--Continued.

[Samples collected by Aletha L. Gruzensky, Andrew F. Harvey, Gary A. Nowlan, and David R. Zimbelman. Wells had linings of mortared stone unless noted otherwise under "Remarks." Sample source--"Well" denotes that the sample was obtained by means of a plastic bottle suspended on a cord. Leaders (---) indicate no data or not applicable.]

Site	Latitude °N	Longitude °W	Location	Sample source	Date of sample collection	Depth to water (meters)	Galvanized pipe in well	Remarks
				Area 8				
2015	32°37'01"	112°06'47"	Sif Vaya	Mortared stone storage tank.	4-8-77	4.5	Yes	---
2015	32°37'01"	112°06'47"	--do	Well	3-09-78	2	--do--	Same well as the preceding.
2063	32°32'20"	112°08'10"	Chiapuk	Well	3-10-78	3.5	No	---
2064	32°23'14"	112°14'02"	Ventana Cave	Spring	3-10-78	---	---	Spring is developed.
2073	32°26'01"	112°06'42"	Drew Spring Well	Well	3-17-78	0.5	No	---
2074	32°28'35"	112°10'42"	2.3 km north of Isabella Well	Stream	3-19-78	---	---	---
				Area 9				
2054	32°34'22"	112°31'12"	Chiulikam	Well	3-01-78	2.5	No	Unmortared stone lining. Well is not plotted on USGS topographic map of the Hat Mtn. quadrangle.
2075	32°33'51"	112°27'37"	Moi Vaya	Well	3-19-78	1	No	Well is not plotted on USGS topographic map of the Kaka quadrangle.
2085	32°30'12"	112°34'26"	Intersection of Reservation boundary and county line.	Stream	3-24-78	---	---	---

Table 2.--*Sample locations, sample source, and other information, Papago Indian Reservation, Arizona* --Continued.

[Samples collected by Aletha L. Gruzensky, Andrew F. Harvey, Gary A. Nowlan, and David R. Zimbelman. Wells had linings of mortared stone unless noted otherwise under "Remarks." Sample source--"Well" denotes that the sample was obtained by means of a plastic bottle suspended on a cord. Leaders (---) indicate no data or not applicable.]

Site	Latitude °N	Longitude °W	Location	Sample source	Date of sample collection	Depth to water (meters)	Galvanized pipe in well	Remarks
				Area 10				
2013	32°43'05"	111°46'44"	Shopishk----------	Metal storage tank.	4-08-77	?	Yes	Well is drilled. Lining material is not known. Well is not plotted on USGS topographic map of the Silver Reef Mts. quadrangle.
2014	32°36'33"	111°52'21"	1.3 km northwest of Tat Momoli.	Concrete storage tank.	4-08-77	?	Yes	Well is probably drilled. Lining material is not known.
2016	32°34'37"	111°59'57"	Kohatk----------	Steel storage tank.	4-08-77	?	Yes	Well is probably drilled. Lining material is not known.

Table 3.--*Results of water analyses, Papago Indian Reservation, Arizona*

[Analysts: Wheeler Ashton, Walter H. Ficklin, John B. McHugh, and Eric P. Welsch]

Site	Date of sample collection	HCO_3^- (mg/L)	$SO_4^=$ (mg/L)	Cl^- (mg/L)	F^- (mg/L)	Na (mg/L)	Mg (mg/L)	K (mg/L)	Ca (mg/L)	Cu (µg/L)	Zn (µg/L)	Mo (µg/L)	As (µg/L)	U (µg/L)	SiO_2 (mg/L)	pH	Temp. (°C)	Specific conductance (µmhos/cm)
									Area 1									
2044	11-15-77	390	48	30	1.0	92	12	7.0	38	2.6	40	34	1.9	8.2	41	7.7	22	760
2045	11-15-77	500	96	86	.9	150	25	9.0	51	2.5	2.8	140	<1.0	5.0	41	7.8	20	1,380
2045	3-23-78	530	44	78	.8	150	28	6.6	88	5.7	2.6	120	1.6	6.6	44	7.5	19	1,280
2046	11-15-77	330	40	23	.5	38	13	2.0	49	2.3	4.2	3.5	2.0	4.2	40	7.0	21	660
2081	3-23-78	350	24	81	.8	61	28	7.2	82	3.5	36	9.6	5.5	58	54	7.3	21	890
2082	3-23-78	440	45	95	.9	77	35	3.9	92	2.4	3.7	8.8	14	4.3	58	7.3	20	1,020
2083	3-23-78	350	36	60	.8	42	30	3.7	85	2.2	4.7	5.6	4.5	40	49	7.3	18	805
2084	3-23-78	410	36	43	.3	78	28	5.0	68	1.5	1.8	25	3.4	3.0	32	7.7	19	825
2089	3-27-78	660	366	280	1.4	320	42	8.7	120	9.5	2.4	430	3.2	12	37	7.7	18	2,280
2095	5-17-78	350	100	37	.3	54	21	2.5	95	2.3	5.6	30	<1.0	5.5	36	7.5	19	820
2096	5-17-78	360	140	47	.5	74	26	8.3	99	5.1	3.5	65	3.0	6.1	38	7.5	18	970
2097	5-17-78	210	40	25	.4	36	11	1.8	56	2.1	15	3.8	1.5	2.1	39	7.1	19	480
2098	5-17-78	220	54	25	.4	45	11	2.6	58	1.8	6.0	7.6	1.1	3.4	41	7.5	20	530
2099	5-18-78	520	22	110	.5	180	20	9.6	52	8.1	7.5	70	7.0	9.2	46	8.1	21	1,050
2100	5-18-78	370	8	37	.5	48	20	5.2	73	3.2	4.3	2.9	4.2	14	54	7.3	24	660
2101	5-18-78	470	23	76	1.0	84	33	5.8	80	4.0	10	6.6	4.8	27	54	7.5	20	910
2105	5-19-78	200	120	14	.4	25	17	1.1	80	2.4	2.6	<1.0	<1.0	.9	38	7.3	22	550
2106	5-19-78	360	80	46	.9	81	14	43	48	3.6	3.2	5.0	2.0	5.5	34	8.8	26	740
2107	5-19-78	870	100	280	.5	360	35	34	120	4.0	5.1	7.2	<1.0	1.2	48	8.2	21	2,150
2108	5-19-78	920	80	850	3.6	700	14	10	18	26	5.6	79	19	38	36	8.9	17	3,800
2109	5-21-78	320	90	53	.7	69	16	4.7	73	3.2	5.5	3.4	2.0	4.6	28	8.0	22	750
2110	5-21-78	420	68	36	.7	72	17	1.7	84	2.6	4.3	18	1.2	11	50	7.2	22	800
									Area 2									
2041	11-14-77	210	20	17	0.6	31	9	6.0	27	1.0	2.5	47.0	5.5	0.1	25	7.5	17	455
2042	11-14-77	370	96	40	.9	66	17	2.0	60	2.8	540	28.0	<1.0	15	41	7.3	21	880
2043	11-14-77	390	32	20	.3	32	14	2.0	39	5.2	130	<1.0	21	3.5	26	8.6	17	590
2047	11-15-77	330	28	17	.4	34	20	1.0	43	2.3	17	<1.0	<1.0	1.8	30	7.7	19	650
2102	5-19-78	240	54	29	.3	44	16	4.2	70	2.3	80	2.8	2.9	3.4	47	7.3	19	590
2103	5-19-78	140	30	11	.1	31	10	4.7	37	2.3	5.2	<1.0	4.2	.5	46	6.6	20	360
2104	5-19-78	120	40	11	.2	14	10	1.2	49	3.0	2.8	<1.0	1.2	.6	24	7.1	18	350
2111	5-21-78	310	100	17	.4	36	34	.6	82	1.9	120	5.6	<1.0	5.0	30	7.0	20	680
2112	5-22-78	130	30	5	.2	9	6	.7	55	6.2	12	1.8	1.4	2.2	20	7.6	19	340
2113	5-22-78	330	110	61	.3	50	34	9.3	94	3.5	9.0	14.5	2.7	8.7	36	8.3	25	790
2114	5-22-78	70	32	16	.1	10	8	.7	30	2.8	5.2	<1.0	<1.0	.2	20	6.9	16	260
									Area 3									
2055	3- 6-78	200	17	40	0.7	30	18	1.9	58	6.9	37	1.2	<1.0	2.1	60	7.6	16	740
2056	3- 6-78	220	31	58	.8	62	20	3.2	52	2.1	39	2.0	3.3	1.8	59	7.6	16	740
2057	3- 6-78	240	3	2	.2	8	10	4.7	65	1.2	140	1.0	1.2	1.0	45	7.4	21	420
2060	3- 7-78	310	10	12	.4	30	15	3.8	60	1.0	150	3.6	2.8	22	48	7.3	23	580
2061	3- 8-78	370	16	22	.7	44	30	2.7	55	1.1	82	2.8	7.0	1.6	65	8.0	20	650

Table 3.--*Results of water analyses, Papago Indian Reservation, Arizona*--Continued

[Analysts: Wheeler Ashton, Walter H. Ficklin, John B. McHugh, and Eric P. Welsch]

Site	Date of sample collection	HCO_3^- (mg/L)	$SO_4^=$ (mg/L)	Cl^- (mg/L)	F^- (mg/L)	Na (mg/L)	Mg (mg/L)	K (mg/L)	Ca (mg/L)	Cu (µg/L)	Zn (µg/L)	Mo (µg/L)	As (µg/L)	U (µg/L)	SiO_2 (mg/L)	pH	Temp. (°C)	Specific conductance (µmhos/cm)
									Area 4									
2030	4-12-77	549	25	170	0.7	62	42	3.3	150	13	250	2.7	3.7	2.7	54	6.9	24	1,650
2031	4-12-77	450	20	66	.4	40	43	1.9	75	18	40	2.5	47	1.4	36	8.4	20	1,180
2031	3-20-78	450	21	99	.4	40	70	1.5	70	4.5	120	2.4	38	1.4	36	7.6	22	1,040
2032	11-11-77	550	40	36	1.0	84	22	2.1	66	2.0	46	6.6	1.9	2.3	41	7.3	22	980
2033	11-11-77	280	20	33	1.0	38	13	4.6	54	1.4	56	22	<1.0	1.0	22	7.5	22	680
2034	11-11-77	310	44	43	2.0	30	21	1.1	64	2.0	17	9.4	<1.0	3.0	38	7.6	22	840
2035	11-13-77	550	8	17	2.0	85	49	4.0	21	2.6	4	4.5	17	1.4	57	8.2	22	780
2036	11-13-77	430	24	23	.8	52	27	7.0	38	2.9	2.0	3.3	18	.8	66	8.3	23	720
2037	11-13-77	280	24	40	.8	60	73	8.0	31	3.2	78	3.7	18	1.9	54	7.8	24	640
2038	11-13-77	460	40	130	.9	84	44	4.0	56	1.5	90	1.4	21	15	58	7.4	24	1,250
2039	11-13-77	450	160	170	1.3	100	57	7.0	71	3.2	58	11	1.0	1.9	45	7.2	24	1,520
2040	11-13-77	670	4	36	.7	50	36	15	76	1.2	1.4	<1.0	12	<.1	36	8.0	21	1,160
2048	11-16-77	490	160	102	1.0	130	55	4.0	50	43	87	36	<1.0	4.0	40	7.5	20	1,250
2048	3-22-78	470	160	89	.9	120	55	3.4	78	19	93	52	<1.0	4.3	42	7.9	20	1,330
2049	11-16-77	460	64	59	.2	51	51	15	49	1.7	5.5	8.6	2.0	1.7	40	8.3	23	920
2076	3-20-78	430	92	330	.5	150	75	46	130	6.4	220	9.8	64	4.0	75	7.4	21	2,090
2077	3-20-78	460	16	70	.6	38	65	3.4	78	1.4	24	2.4	4.8	4.0	49	7.9	24	995
2078	3-20-78	600	130	150	.7	140	85	9.1	72	4.6	5.9	3.8	2.2	63	44	7.6	22	1,600
2079	3-20-78	510	110	280	1.2	200	80	5.0	68	3.2	2.0	42	5.4	3.6	40	7.9	23	1,850
2080	3-22-78	720	980	540	1.3	400	250	4.9	180	4.4	2.1	51	<1.0	10	50	7.7	21	4,100
									Area 5									
2001	4- 8-77	400	110	580	0.8	170	50	1.2	260	9.1	770	6.1	6.1	1.8	57	7.5	20	3,150
2001	4- 8-77	370	120	700	.5	150	48	1.2	220	8.0	800	6.2	1.0	1.5	59	6.8	27	3,225
2017	4- 8-77	700	58	74	.7	160	38	4.0	70	2.1	160	17	19	1.9	57	7.5	21	1,420
2017	3-15-78	590	84	82	.7	150	55	8.4	53	1.9	1,170	24	17	1.7	54	7.9	20	1,320
2065	3-14-78	420	600	300	1.0	220	120	3.9	140	5.0	34	28	1.2	20	59	7.5	21	2,500
2066	3-14-78	640	53	250	1.3	270	28	8.4	58	<.5	<.5	1.1	3.5	19	47	8.1	16	1,800
2067	3-14-78	480	46	117	.3	69	70	10	93	1.4	2.5	5.3	3.8	1.3	48	7.9	19	1,200
2068	3-14-78	280	38	55	.4	43	40	1.6	65	2.0	230	7.3	10	2.0	80	7.6	19	830
2069	3-14-78	360	17	18	.5	23	28	3.0	70	5.8	320	5.4	5.1	2.3	42	7.8	21	635
2070	3-15-78	350	48	66	.4	85	25	5.1	50	1.0	1.4	5.6	5.1	1.1	34	7.5	18	825
2071	3-15-78	350	70	760	.4	200	120	11	190	.9	6.9	1.6	6.9	.6	59	7.7	21	3,000
2072	3-17-78	420	28	81	.8	62	48	8.5	65	15	29	5.8	22	2.4	47	8.1	18	970
									Area 6									
2086	3-27-78	1,110	22	87	2.2	240	90	6.2	45	0.7	1.9	14	7.2	4.4	27	8.3	23	1,450
2087	3-27-78	500	154	65	1.7	83	60	5.5	93	8.2	37	21	8.2	10	37	7.6	23	1,180
2088	3-27-78	290	8	5	.4	12	30	.5	62	39	110	2.9	18	2.4	70	7.5	23	460
									Area 7									
2053	2-27-78	280	2	1.7	0.3	21	20	1.7	53	2.7	370	1.4	1.9	2.4	62	7.5	22	520
2058	3- 7-78	420	15	170	.2	230	6	4.4	60	.5	6.9	<1.0	3.6	.5	20	8.3	18	1,270
2059	3- 7-78	120	3	1	.2	2	4	1.8	36	<.5	44	<1.0	<1.0	.2	26	7.9	18	215
2062	3- 8-78	290	12	11	.4	60	28	2.8	25	3.9	4.5	5.3	2.2	6.6	55	8.7	21	510

[Analysts: Wheeler Ashton, Walter H. Ficklin, John B. McHugh, and Eric P. Welsch]

Site	Date of sample collection	HCO_3^- (mg/L)	$SO_4^=$ (mg/L)	Cl^- (mg/L)	F^- (mg/L)	Na (mg/L)	Mg (mg/L)	K (mg/L)	Ca (mg/L)	Cu (µg/L)	Zn (µg/L)	Mo (µg/L)	As (µg/L)	U (µg/L)	SiO_2 (mg/L)	pH	Temp. (°C)	Specific conductance (µmhos/cm)
									Area 8									
2015	4- 8-77	300	40	99	0.8	170	15	1.6	30	19	7.2	3.2	3.6	3.5	30	9.0	20	990
2015	3- 9-78	380	61	180	.6	210	15	1.8	33	8.1	<.5	2.0	3.3	2.7	65	8.1	18	1,250
2063	3-10-78	100	10	2	.1	15	16	2.2	75	<1.0	6.0	1.1	2.0	2.3	28	7.3	22	540
2064	3-10-78	220	29	60	<.1	36	18	20	70	1.8	3.1	6.0	2.6	.6	50	8.2	17	730
2073	3-17-78	180	3	2	.1	7	9	8.1	45	.7	6.5	16	1.5	<.1	15	7.8	--	340
2074	3-19-78	220	44	27	.1	14	10	5.3	82	1.1	1.1	1.3	1.0	2.0	16	7.8	20	570
									Area 9									
2054	3- 1-78	350	24	49	0.3	52	25	1.7	80	0.7	7.2	1.2	3.8	0.9	65	7.2	20	815
2075	3-19-78	160	44	63	.1	19	22	2.5	55	1.6	52	2.0	1.2	.6	20	7.6	17	590
2085	3-24-78	180	26	11	.1	5	6	8.0	65	1.8	1.9	<1.0	2.0	.5	22	7.8	20	360
									Area 10									
2013	4- 8-77	200	140	83	1.9	190	5	2.5	20	7.2	100	16	17	4.3	24	8.4	24	1,080
2014	4- 8-77	280	200	520	2.3	420	33	4.0	70	14	6.6	44	3.1	28	15	8.4	18	2,900
2016	4- 8-77	220	110	110	1.0	140	21	4.1	45	3.2	50	6.3	15	6.1	27	8.0	32	1,050

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