

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

INVENTORY OF WELLS AND SPRINGS
WITHIN A 10-MILE RADIUS OF PROJECT
GASBUGGY, RIO ARriba COUNTY, NEW MEXICO

By

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Open-file report

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This report is preliminary and has not
been edited for conformity with Geological
Survey format and nomenclature.

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ABSTRACT

Inventoried wells range in depth from 54 to 229 feet and generally are completed in the alluvium, which occurs in the valleys of the intermittent streams draining the area. Field specific conductance values obtained from the well water range from 700 to 2,600 micromhos per cm at 25°C.

Inventoried springs are of the "contact type" and discharge from sandstones in the San Jose Formation. Some springs are seeps with little or no visible flow; others have yields that range from less than 1 gpm to more than 8 gpm. Field specific conductance measurements on spring water range from 370 to 2,300 micromhos per cm at 25°C.

INTRODUCTION

Project Gasbuggy, a Plowshare project, is a cooperative effort between government and industry to determine the effect of a NE (nuclear explosion) on the yield of a low-yield, natural gas formation.

The U.S. Geological Survey, as a part of its participation in the safety program of the U.S. Atomic Energy Commission, inventoried the wells and springs in the vicinity of Project Gasbuggy during June 1967. All known wells and springs within a 5-mile radius of ground zero (SW¼ sec. 36, T. 29 N., R. 4 W., Rio Arriba County, New Mexico) were inventoried, and readily accessible wells and springs between the 5- and 10-mile radius were also inventoried; their locations are shown on figure 1.

Also, 95 percent of the area within a 10-mile radius of the area is within either the Carson National Forest or the Goshute Indian Reservation (fig. 2). Of the remainder, more than 90 percent is in the public domain managed by the U.S. Bureau of Land Management. The remainder is privately controlled.

Assistance in locating and providing data on wells and springs in the Project Gasbuggy area was provided by personnel from El Paso Natural Gas Co., U.S. Bureau of Indian Affairs, U.S. Forest Service, and the U.S. Bureau of Land Management. Personnel of Isotopes, Inc., assisted in the collection of field data.

OBJECTIVES

The well and spring inventory will provide background data to assist in appraising possible claims of shock damage on the wells, springs, and pumping facilities, caused by the nuclear explosion. During the well and spring inventory, personnel of Isotopes, Inc., collected water samples for radiochemical analysis. These analyses will provide information on water quality before the nuclear explosion.

WELL-NUMBERING SYSTEM

All wells and springs referred to in this report are identified by a location number used by the Geological Survey and the State Engineer for numbering wells in New Mexico. The location numbers are based on townships, ranges, sections, and tracts within a section as illustrated on page 5. The first three parts of the number, separated by decimal

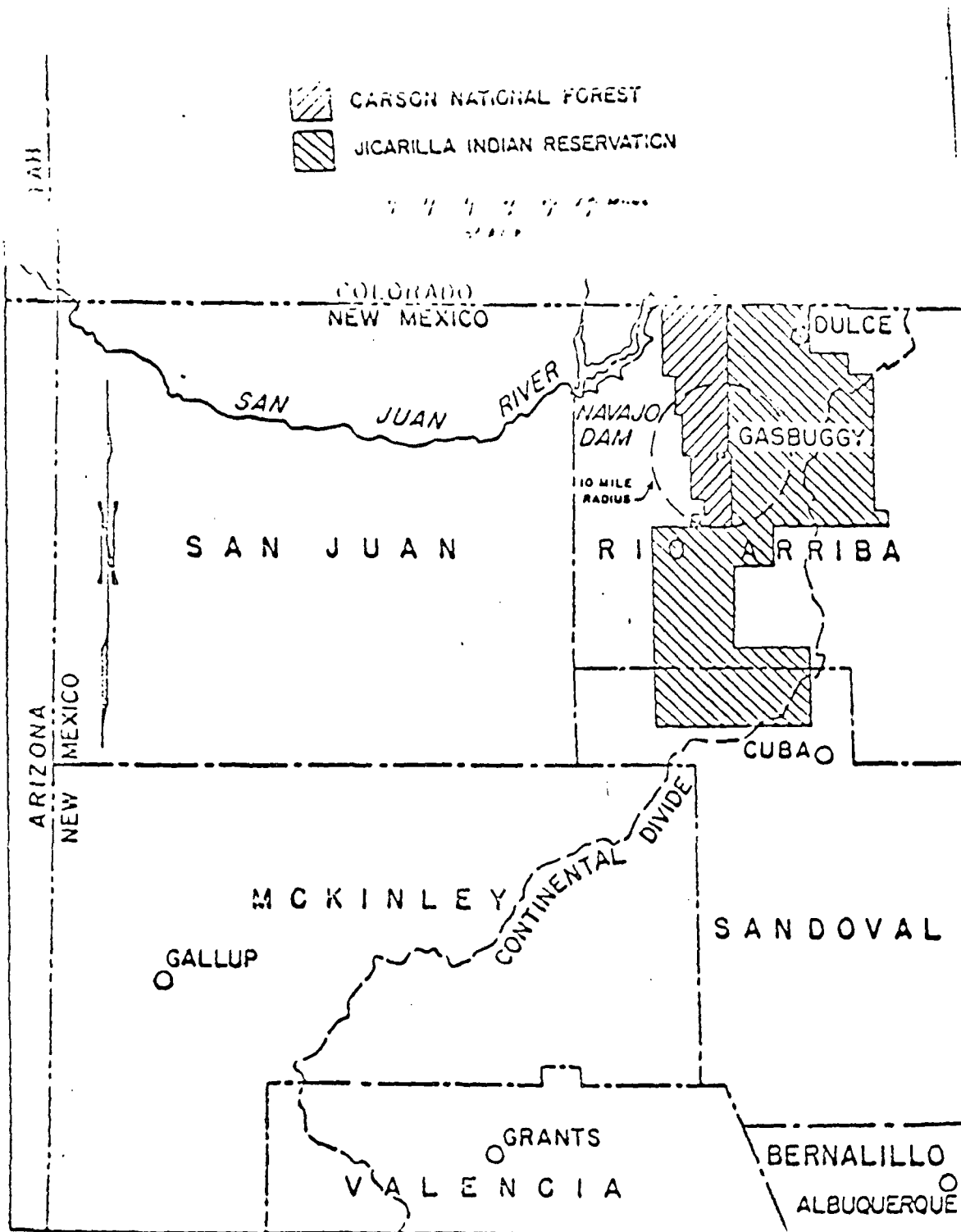


Figure 2.--General location map showing boundary of land near subject Gasbuggy.

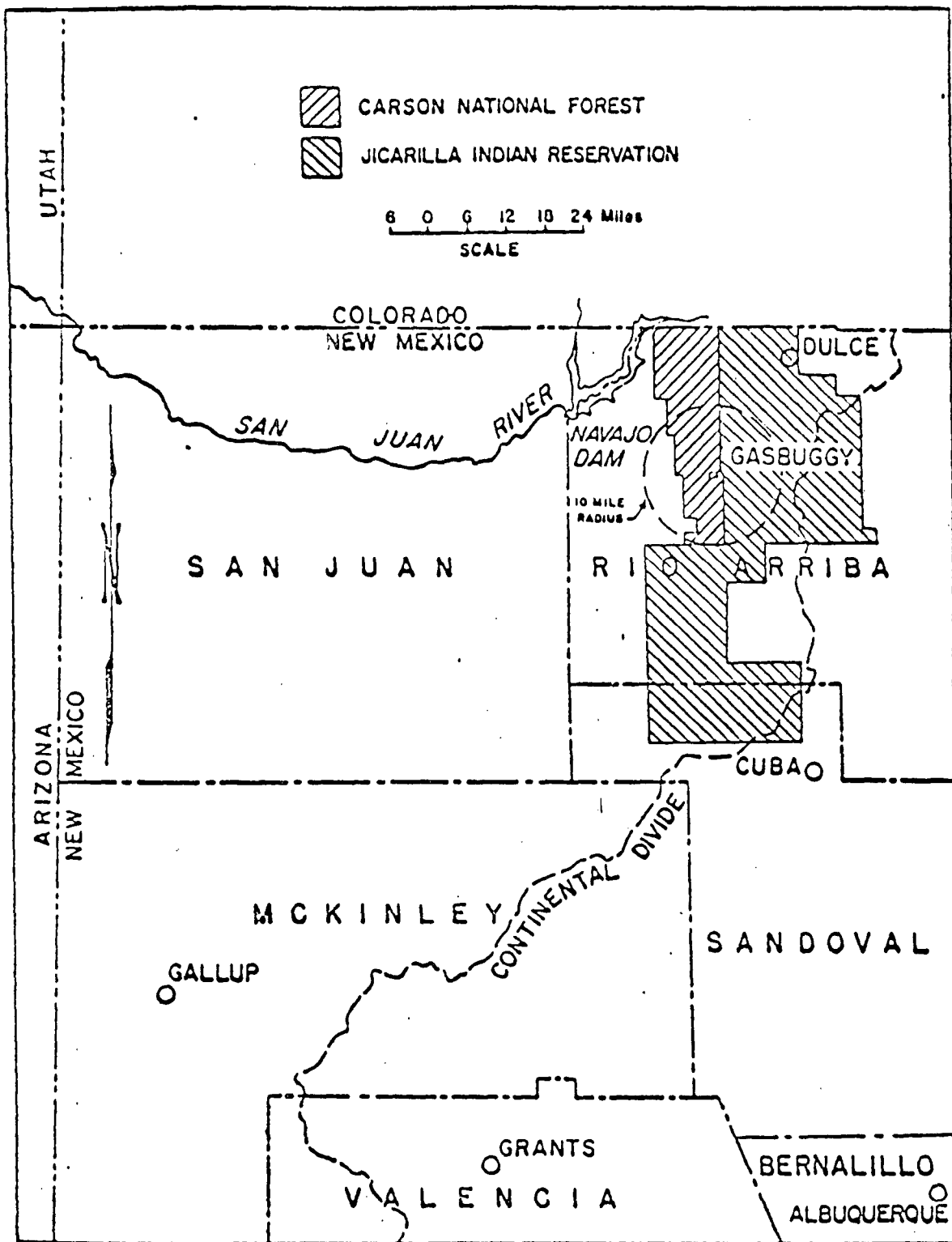
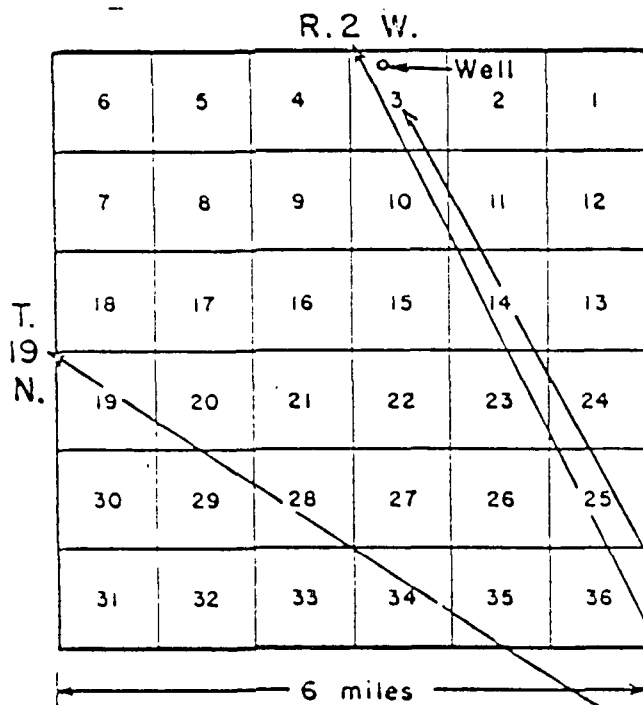


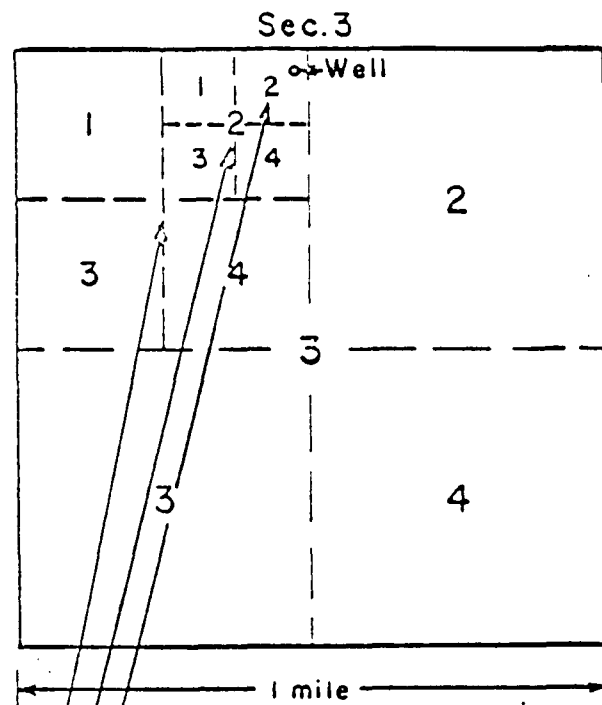
Figure 2.--General location map showing ownership of land near Project Gasbuggy.

points, represent the township north, range west, and section number respectively. For convenience, the quarters of a section are numbered 1, 2, 3, and 4. The first of the last part of the number gives the quarter section, the second digit gives the quarter of that quarter and the third digit designates the 10-acre tract. Letters a, b, c, and so on are added to the last part of the number to designate the second, third, fourth, and succeeding wells or springs listed in the same 10-acre tract. For example, well 19.2.3.122 in Rio Arriba County is located in NE $\frac{1}{4}$ NE $\frac{1}{4}$ of sec. 3, T. 19 N., R. 2 W. Springs are numbered in the same manner, except that the letter "s" precedes the number.

Sections within a township



Tracts within a section



Well 19.2.3.122

SUMMARY OF WELL DATA

The 13 wells inventoried range in depth from 54 to 229 feet. The shallow wells are completed in the alluvium, which occurs in the valleys of the intermittent streams draining the area. The deeper wells tap either the lower part of the alluvium or the underlying sandstones of the San Jose Formation of Tertiary age. Water levels could not be measured in some wells in the area because of well construction; other wells reported to be in the area could not be inventoried because they could not be located and were probably plugged or abandoned. No water wells that tap any of the formations associated with the nuclear experiment were found within the 10-mile radius.

The yield of water from an individual well is generally low; yields range from 1 to 3 gpm. The wells are used for stock and domestic supplies and are equipped with windmills.

Well data and distances of wells from ground-zero are summarized in table 1.

Table 1.--Records of wells inventoried within a 10-mile radius of Project Gasbuggy, Rio Arriba County, New Mexico

Location number: See text for explanation of well-numbering system.
Depth: Depths are in feet below land surface. Depths listed are measured depths to the nearest foot.
Diameter: Diameter of the casing to the nearest inch.
Altitude: Altitude of land surface at well. Altitude interpolated from U.S.G.S. topographic maps, scale 1:24,000 and contour interval 20 feet.
Water level: Measured depths below land surface, to nearest tenths of a foot.
Stratigraphic unit: Qal - Alluvium.
Type of pump: P - plunger or cylinder; N - none.
Use of power: W - wind; I - internal combustion.
Use of water: D - domestic; S - stock.
Specific conductance: Microhos per centimeter at 25°C.
Note: Unless specified, all wells are drilled and cased to total depth.

Location No.	Owner or Name	Year completed	Depth (feet)	Diameter (inches)	Altitude (feet)	Water level		Stratigraphic unit	Pump	Power	Use of water	Distance from gd-zero (miles)	Specific conductance (microhos)	Remarks
						Depth below land surface (feet)	Date							
28.2.15.144	Jicarilla Apache Res.	-	152	6	7,234	110.2	6-29-67	Qal	P	W	S	10.2	2,100	Upper Burro Canyon well
18.331	do	-	229	6	7,089	72.2	6-29-67	Qal	P	W	S	7.1	3,000	Lower Burro Canyon well
28.3.33.233	do	-	81	6	6,920	51.8	6-29-67	Qal	P	I	S	6.3	-	--
28.5.16.213	U.S. Bur. Land Mgmt.	-	95	6	6,580	57.5	6-30-67	Qal	P	I	S	8.6	-	--
22.221	do	-	-	-	6,698	-	-	-	P	W	S	7.5	700	Yield 1 gpm, winterized temp 50°F
35.144	Russel Arnold	1950	-	6	6,630	-	-	Qal	P	I	D.S	7.9	-	Rept. yield 11 gpm, reported depth 54 ft
29.2.22.441	Jicarilla Apache Res.	1962	198	6	7,150	174.1	6-29-67	Qal	P	W	S	10.2	1,500	Yield 1 gpm, temp 44°F
29.3.20.234	do	-	75	7	6,875	22.2	6-29-67	Qal	P	W	S	3.1	2,600	Yield 3 gpm, temp 43°F
29.4.1.223	U.S. Forest Service	1953	115	7	6,680	29.9	6-30-67	Qal	N	N	N	5.6	-	Vaqueros well Old Banger Station
29.5.28.422	U.S. Bur. Land Mgmt.	-	130?	7	6,650	122.4	6-30-67	Qal	P	W	S	8.2	-	--
30.3.29.132	Jicarilla Apache Res.	-	-	7	7,235	-	-	-	P	W	S	7.5	850	Yield 2 gpm, temp 47°F
32.343	do	-	200	7	7,038	64.1	6-29-67	Qal	P	W	S	5.9	-	--
30.4.35.221	Fred Bixler	-	175	6	7,140	52.7	6-29-67	Qal	P	W	D	6.6	-	Reported yield 3 gpm

SUMMARY OF SPRING DATA

Within a 10-mile radius from ground zero, 23 springs were inventoried. Nearly all the major springs are inside the boundaries of Carson National Forest. All permanent springs, except Caesar Spring in Valencia Canyon (fig. 2), discharge directly from sandstone beds in the San Jose Formation. The water-bearing sandstones are underlain by relatively less permeable shales that retard downward percolation of water; thus the springs have been classified as contact springs. Surface observation indicates Caesar Spring discharges from the alluvium in the bottom of an arroyo in Valencia Canyon; however, the source of the water is probably the underlying San Jose Formation. Most major springs are partially developed with outlet pipes or dammed up to provide water for stock.

Some of the springs are seeps with little or no visible flow; others yield from less than 1 gpm to more than 8 gpm. A few of the springs have recently "dried up" owing to dry conditions in the area during the inventory period.

Spring data, including distances of springs from ground-zero are summarized in table 2.

Table 2.--Records of springs inventoried within a 10-mile radius of Project Gasbugey, Rio Arriba County, New Mexico

Location number: Number preceded by S designates spring location (see text for explanation of well-numbering system).
 Altitude: Altitude of land surface at spring, altitude interpolated from U.S.G.S. topographic map, scale 1:24,000 and contour interval 20 feet.
 Stratigraphic unit: Qal - Alluvium; Tsj - San Jose Formation.
 Yield: Measured unless specified.
 Use: N - none; S - stock.
 Specific conductance: Micromhos per centimeter at 25°C.

Location No.	Owner	Name	Topographic situation	Altitude (feet)	Stratigraphic unit	Yield (gpm)	Date	Use of water	Temperature (°F)	Distance from road-zero (miles)	Specific conductance (micromhos)	Remarks
S27. 4. 1.222	U.S. Forest Service	Piedra Blanca	Stream channel	6,960	Tsj	0.2	6-29-67	S	-	4.9	-	Temp 55°F at discharge point, developed spring
2.232	do	Chosa	do	7,095	Tsj	.1	6-27-67	N	46	5.0	1,400	Discharge from SS over SH
2.234	do	Willow	do	7,050	Tsj	.1	6-27-67	N	43	5.2	2,200	--
S27. 5. 1.224	do	Tecolote	do	7,190	Tsj	-	6-30-67	S	48	7.0	850	Dammed, yield not measured
S28. 4. 9.342	do	Cedar	Hillside	7,350	Tsj	<.1	6-21-67	S	47	2.6	470	Partially developed
9.414	do	Aqua Bonita	do	6,730	Tsj	8.6	6-26-67	S	49	7.1	1,500	Good spring, developed
14.113	do	Arnold	do	7,200	Tsj	<.1	6-23-67	N	47	1.3	950	--
17.331	do	Cave	do	7,410	Tsj	.1	6-21-67	S	48	4.2	370	Partially developed, stock tank
21.444	do	Gettem	Stream channel	7,200	Tsj	.2	6-28-67	S	44	3.4	1,400	--
21.444a	do	-	do	7,200	Tsj	<.1	6-28-67	N	43	3.4	-	--
22.134	do	Mud	do	7,210	Tsj	-	6-27-67	S	52	2.9	-	Series of seeps. Called Hungry by U.S. Forest Service

Table 2.--Records of springs inventoried within a 10-mile radius of Project Gasbuggy, Rio Arriba County, New Mexico--Continued

Location No.	Owner	Name	Topographic situation	Altitude (feet)	Stratigraphic unit	Yield (gpm)	Date	Use of water	Temperature (°F)	Distance from road-zero (miles)	Specific conductance (micromhos)	Remarks
S28. 4.22.241	U.S. Forest Service	Horse	Stream channel	7,260	Tsj	-	6-23-67	N	43	2.4	-	Seep
23.234	do	Caesar	do	7,130	Qal	~.6	6-23-67	S	-	2.1	1,950	Developed, stock tank seepage in excess of measured flow
26.312	do	Horn	do	7,180	Tsj	.1	6-27-67	N	48	3.4	2,300	Called Aspen by U.S. Forest Service
S28. 4.27.444	U.S. Forest Service	Aspen	Stream channel	7,135	Tsj	0.1	6-27-67	N	54	3.8	-	Seep, called Horn by U.S. Forest Service
29.221	do	Manoz	Hillside	7,080	Tsj	.5	6-21-67	S	43	4.3	-	--
S28. 5.25.142	Arnold Ranch	-	Valley flat	6,780	Tsj?	-	6-30-67	S	48	6.4	-	Seep
25.142a	do	-	do	6,790	Tsj?	-	6-30-67	S	47	6.4	-	Seep
S29. 4.19.412	do	Bubbling	do	6,555	Tsj	4.3	6-23-67	S	45	5.1	1,290	Developed
19.421	do	-	do	6,570	Tsj	4.0	6-23-67	N	45	4.9	900	--
25.241	do	Campo	Stream channel	6,920	Tsj	-	6-22-67	N	45	1.5	-	Seep
S29. 5.24.413	do	Amarante	Hillside	6,570	Tsj	.6	6-23-67	N	44	5.8	815	--
25.132	do	Burro	do	6,580	Tsj	~.3	6-23-67	S	50	6.0	740	Developed, stock tank

CHEMICAL QUALITY OF WATER

Radiochemical analyses of water samples collected by personnel of Isotopes, Inc., were not available at the time this report was written.

Specific conductance measurements of the well and spring water were made during the inventory with field equipment. Conductance values of water from wells ranged from 700 to 2,600 micromhos; water from springs ranged from 370 to 2,300 micromhos.

WELL AND SPRING MONITORING SITES

Certain wells and springs will be closely monitored before and after the Gasbuggy experiment to record any changes on the hydrologic regime or on the well pumping facilities, which may result from the shock produced by the explosion. Wells and springs to be monitored are listed below.

<u>Wells</u>	<u>Owner</u>	<u>Well Name</u>
28.3.33.233	Jicarilla Apache Reservation	-
28.5.16.213	U.S. Bureau of Land Management	-
28.5.35.144	Russel Arnold	-
29.3.20.234	Jicarilla Apache Reservation	-
29.4. 1.233	U.S. Forest Service	Vaqueros well

<u>Springs</u>	<u>Owner</u>	<u>Spring Name</u>
S28.4. 9.342	U.S. Forest Service	Cedar
S28.4.14.413	do	Arnold
S28.4.23.234	do	Caesar
S27.4. 9.414	do	Aqua Bonita
S29.4.25.241	do	Campo
S29.5.25.132	do	Burro