

Availability of ground water for irrigation on the
Pojoaque Pueblo Grant, Santa Fe County,
New Mexico

By

George A. Dinwiddie

Open-File Report

Prepared in cooperation with the Bureau of Indian Affairs
U.S. Department of the Interior

February 1964

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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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Introduction

Most of the arable land in the Pojoaque Pueblo Grant is in the valleys of Pojoaque Creek and Pojoaque River. Some arable land is in the valley of the Rio Tesuque within about 2 miles of its confluence with Pojoaque Creek (fig. 1). Presently, this land is irrigated by

Figure 1.--Map showing locations of selected wells in and near the
Pojoaque Pueblo Grant, Santa Fe County, N. Mex.

diverting water from Pojoaque Creek, Rio Tesuque, and Pojoaque River. During periods of maximum demand, the diverted water is not adequate for all the arable land. A supplemental supply of water to more fully utilize the land in the Pojoaque Pueblo Grant probably can be obtained from wells.

The U.S. Geological Survey was requested by the U.S. Bureau of Indian Affairs to make a reconnaissance of the ground water situation in the vicinity of Pojoaque and to report the feasibility of developing ground water for irrigation.

A brief reconnaissance was made of the geology of the area. Well data were collected and well drillers who were familiar with the area were interviewed. The well data are listed in tables 1 and 2. Water samples were not collected; however, chemical analyses of water samples previously collected in the area by the U.S. Geological Survey are tabulated in table 3.

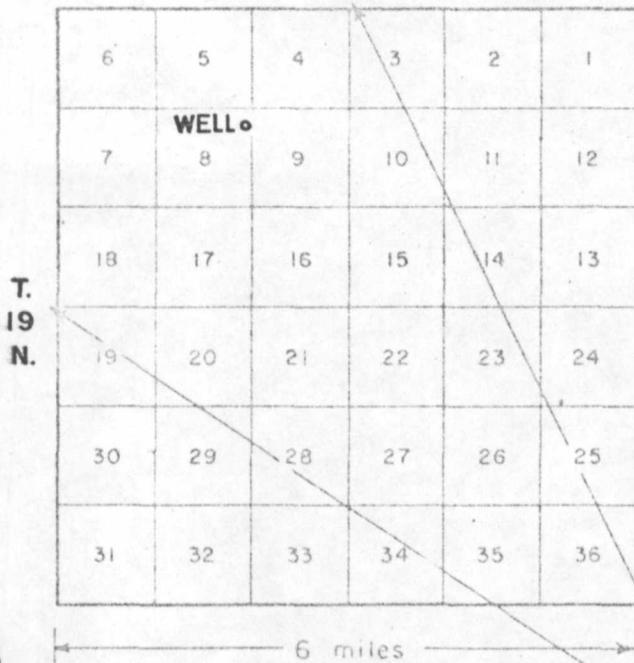
Figure 1.--Map showing locations of selected wells in and near
the Pojoaque Pueblo Grant, Santa Fe County, N. Mex.

System of numbering wells in New Mexico

All wells referred to in this report are identified by a location number used by the Geological Survey and the State Engineer for numbering water wells in New Mexico. The location number is a description of the geographic location of the well, based on the system of public land surveys. It indicates the location of the well to the nearest 10-acre tract, when the well can be located that accurately. The location number consists of a series of numbers corresponding to the township, range, section, and tract within a section, in that order, as illustrated below. If a well has not been located closely enough to be placed within a particular section or tract, a zero is used for that part of the number.

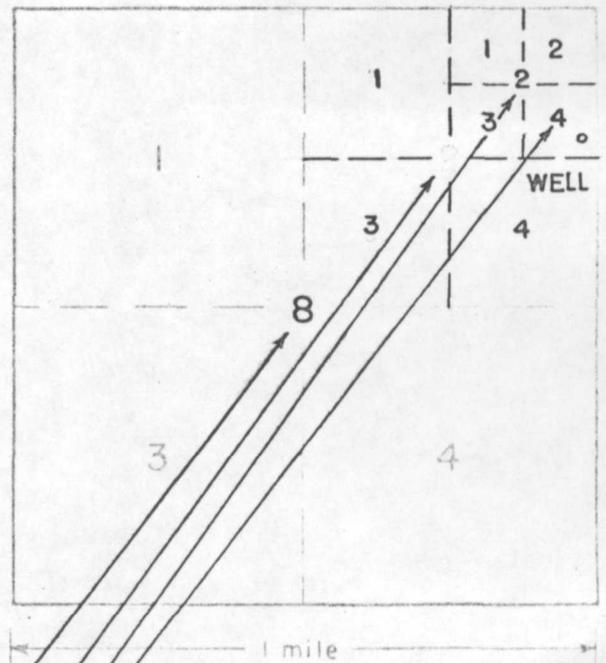
Sections within a township

R. 9 E.



Tracts within a section

SEC. 8



WELL 19.9.8.224

^{units}
Geologic ~~formations~~ and their water-bearing properties

Two geologic ^{units} ~~formations~~ crop out in the vicinity of Pojoaque--
Recent alluvium and the Santa Fe Group of ^{middle(?) Miocene to Pleistocene(?)} ~~late Tertiary and early~~
~~Quaternary~~ age. Older rocks beneath the Santa Fe Group are not
considered as sources of water in the Pojoaque Pueblo Grant area
because they are as much as 2,000 feet beneath the surface.

Santa Fe Group

The Santa Fe Group consists of clay, silt, fine sand and some
beds of sand and gravel. The Santa Fe is reported to be about 2,000
feet thick in an oil test well near the project area.

The yields of wells that tap the Santa Fe Group near Pojoaque
reportedly range from 1 to 40 gpm (gallons per minute). Wells that
tap both alluvium and the Santa Fe reportedly yield as much as 175
gpm, most of which probably comes from the alluvium. As much as
500 feet of Santa Fe has been penetrated by wells in the project
area; reportedly the Santa Fe yielded only small quantities of water
to these wells from thin beds of fine sand.

Alluvium

Alluvium in the report area occurs in the valleys of the major streams. The alluvium consists of silt, sand, and gravel, which is chiefly derived from the Santa Fe Group. The thickness of the alluvium may be as little as 10 feet, and probably does not exceed 100 feet. Well data indicate that the alluvium generally is penetrated about 60 feet by wells. The yield of water from the alluvium depends on the thickness and physical character of the sediments, mainly particle size. The average specific capacity of seven wells upstream from San Ildefonso Pueblo Grant, ^{which is west of the Pojoaque Pueblo Grant,} and yielding 200 to 400 gpm from alluvium, is 6.4 gpm per foot of drawdown according to J. R. Rapp.

Rapp, J. R., 1960, Availability of ground water for irrigation on the San Ildefonso Pueblo Grant, Santa Fe County, New Mexico: U.S. Geol. Survey open-file rept.

Well 19.9.9.144 is reported to yield 250 gpm for periods of long duration. The water level is about 12 feet below land surface and the well is 45 feet deep; therefore, the least specific capacity of the well, assuming a maximum possible drawdown, is about 7.6 gpm per foot of drawdown. Conversely, well 19.9.8.213 which is 78 feet deep and has a water level about 4.5 feet below land surface is reported to yield 14 gpm and to have a specific capacity of less than 1 gpm per foot of drawdown. The difference in specific yield between the two wells probably can be attributed to differences in the physical character of the alluvium at the two well sites.

The alluvial aquifer is recharged by infiltration of precipitation, streamflow, and water used for irrigation. Water withdrawn in periods of low streamflow would be easily replenished during periods of excess flow.

Chemical quality of water

The suitability of water for irrigation is dependent mainly on 1) the concentration of boron; 2) the concentration of dissolved solids, and 3) the SAR (sodium-adsorption-ratio).
$$SAR = \frac{Na^+}{\sqrt{(Ca^{++} + Mg^{++})/2}}$$
, where the ionic concentrations are expressed in milliequivalents per liter. The SAR is used to express the relative activity of sodium ions in exchange reactions with soil and is an index of the sodium hazard. Electrical conductivity commonly is used to indicate the total concentration of dissolved solids and is an index of the salinity hazard.

In general, irrigation waters may be classified by use of a diagram that was prepared for that purpose in a publication by L. V. Wilcox.

Wilcox, L. V., 1955, Classification and use of irrigation waters:
U.S. Dept. Agriculture Circ. 969, 19 p.

Eight chemical analyses, made by the U.S. Geological Survey, are listed in table 3. These analyses are of waters that were collected from wells upstream and downstream from Pojoaque Pueblo Grant and that tap water in the Santa Fe Group and in alluvium. One analysis is of surface water from the Pojoaque River. In four samples the SAR ranged from 0.9 to 6.3, in eight samples the conductance ranged from 427 to 760 micromhos. The boron content was 0.06 ppm (parts per million) in the one sample analyzed for that ion. Thus, according to the Wilcox classification, the water is of medium salinity hazard and low sodium hazard and is suitable for irrigation.

Suggested program of test drilling

The ~~best~~ area in which ^{the largest yields from} ~~to tap water in~~ the alluvium ^{can be expected} is in the valley of the Pojoaque River and Pojoaque Creek. Wells drilled along the floodplain might yield as much as 300 gpm; however, because available data indicate that the thickness and water-yielding characteristics of the alluvium are variable it would be advisable to consider a program of test drilling. Small-diameter test wells could be used to determine the character and thickness of saturated material. Test wells, which indicate favorable conditions, could be enlarged to make production wells. The alluvium in the valley of the Rio Tesuque is not known to yield large quantities of water to wells in the report area; however, this does not preclude the possibility that irrigation wells might be developed in that valley. If irrigation wells are required in the Rio Tesuque valley, test drilling is recommended

Available data indicate that drilling into the Santa Fe Group to a reasonably ^y ~~and~~ economic depth would not substantially increase the production of a well; therefore, if more than 200 or 300 gpm is required at a specific location, more than one shallow well would be required.

^{The}
First test wells should be drilled ^{near} ~~at places along~~ the
Pojoaque River and Pojoaque Creek convenient to existing ditches.
If these wells are not satisfactory subsequent drilling would
have to be at less convenient locations.

Wells in the alluvium should fully penetrate the alluvium
and should be bottomed in beds of clay of the Santa Fe Group.
It is unlikely that such wells would be more than 100 feet deep.

Table 1.--Driller's logs of wells in the Pojoaque Pueblo

Grant, Santa Fe County, N. Mex.

Well 19.9.5.312

Material	Thickness (feet)	Depth (feet)
Topsoil -----	2	2
Clay, yellow, sandy -----	46	48
Sand, yellow -----	27	75
Gravel, yellow (water) -----	10	85
Clay, blue -----	<u>7</u>	92
Total depth	92 feet	

Well 19.9.8.224

Material	Thickness (feet)	Depth (feet)
Samples not described -----	90	90
Clay, yellow -----	30	120
Clay, blue -----	5	125
Clay, blue, sandy -----	5	130
Clay, yellow -----	<u>10</u>	140
Total depth	140 feet	

Table 1.--Driller's logs - Continued

Well 19.9.9.121

Material	Thickness (feet)	Depth (feet)
Clay with streaks of sand -----	150	150
Sand -----	10	160
Clay -----	15	175
Sand -----	5	180
Clay, red -----	<u>320</u>	500
Total depth		500 feet

Table 2.--Records of selected wells in and near the Pojoaque Pueblo
Grant, Santa Fe County, N. Mex.

Depth: All depths are reported.

Altitude: Estimated from U.S. Geological Survey topographic
quadrangle maps.

Water level: R, reported.

Stratigraphic unit: Qal, alluvium; ^{QTS}~~Tsf~~, Santa Fe Group.

Remarks: hp, horsepower; gpm, gallons per minute.

Table 2.--Records of selected w

Location number	Year completed	Owner	Depth (feet)	Altitude (feet)	Water level		Geologic source	
					Depth below land surface (feet)	Date	Stratigraphic unit	Material
19. 8.10.324	-	J. E. Roybal	150	5,680	60 R	1- 7-64	QTs	Sandstone
11.311	-	Community of El Rancho	54	5,675	6 R	1- 7-64	Qal	Sand and gravel
12.321	-	J. I. Staley	52	5,730	2.29	1-15-64	do.	do.
12.412	-	N. A. Owings	80	5,760	-	-	do.	do.
19. 9. 3.311	1947	A. Madrid	140	6,050	15 R	1- 7-64	QTs	Fine sand
5.312	1959	R. Lopez	92	5,885	35 R	8-25-59	do.	Gravel
5.411	1960	I. M. Roybal	150	5,905	46.65	1-14-64	Qal and QTs	Fine sand
7.222	1952	L. Sena	54	5,835	6.14	1-15-64	Qal	Sand and gravel
8.213	1952	I. M. Roybal	78	5,875	4.48	1-14-64	do.	Fine sand
8.221	-	Wooley	-	-	-	-	do.	Sand and gravel

Well No.	Location	Date	Remarks	Depth (feet)	Flow	Remarks
Domestic well.			Equipped with a 1-hp electric motor on a jet pump			
Irrigation well.			Equipped with a 7½-hp electric motor on a turbine pump. Well yields about 200 gpm			
Irrigation well.			Equipped with a 10-hp electric motor on a turbine pump. Well yields about 200 gpm			
Irrigation well.			Equipped with a high-capacity turbine pump. Well probably yields about 300 gpm			
Domestic well.			Equipped with a ¾-hp electric motor on a jet pump. Well yields 1 gpm			
Domestic well.			Well yields about 40 gpm. Driller's log available			
Domestic well.			Equipped with a 1-hp electric motor on a jet pump. Well yields more than 30 gpm			
Domestic well.			Equipped with a ¾-hp electric motor on a jet pump			
Domestic well.			Equipped with an electric motor on a submersible pump. Well yields 14 gpm			
Irrigation well.			Equipped with a turbine pump. Reportedly yields 400 gpm			

Location number	Year completed	Owner	Depth (feet)	Altitude (feet)	Water level		Geologic source	
					Depth below land surface (feet)	Date	Stratigraphic unit	Material
19. 9. 8.224	1953	V. L. Stevenson	140	5,915	50 R	8- -59	QTs	Clay
9.121	1954	Hoyt	500	5,960	8 R	1954	Qal and QTs	Clay and sand
9.144	1948	R. McKinney	45	5,940	12.50	1-14-64	Qal	Sand and gravel
10.122	1959	T. Roybal	400	6,060	30 R	1959	Qal and QTs	Sandstone
17.411	1959	A. Ortiz	87	5,930	28 R	1959	Qal	Sand
20.223	1962	Hedges and Simms Oil Co.	130	5,970	15.30	1-13-64	QTs	-

s of selected wells - Continued

Source							
Material				Remarks			
Clay				Domestic well. Well yielded 13 gpm with 90 feet of drawdown in 1959. Driller's log available			
Clay and fine sand				Irrigation well. Well yielded 175 gpm with about 100 feet of drawdown in 1954. Driller's log available			
Sand and gravel				Irrigation well. Equipped with a 15-hp electric motor on a turbine pump. Well yields about 250 gpm			
Sandstone				Domestic well. Equipped with a 1½-hp electric motor on a submersible pump. Well yields 10 gpm, but draws down rapidly			
Sand				Domestic well. Equipped with a 1-hp electric motor on a jet pump. Well yields about 10 gpm			
-				Domestic well. Equipped with a 3/4-hp electric motor on a submersible pump. Reported three separate zones of water			

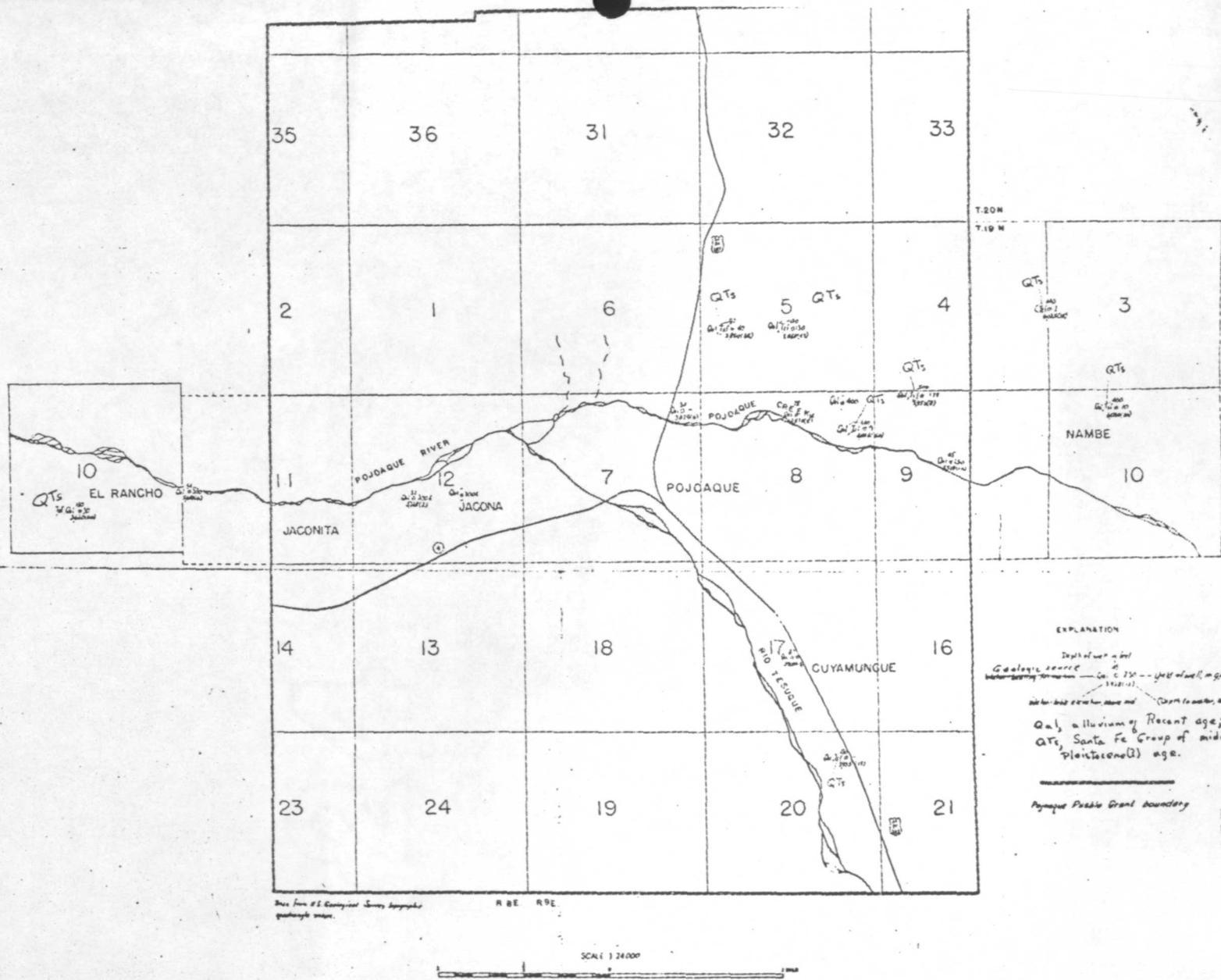
Table 3. Chemical analyses of water in and near the Pojoaque Pueblo, N. M.

(Analyses by the U.S. Geological Survey. Chemical constituents are in ppm)

Geologic source: Qal, alluvium; QTs, Santa Fe Group

Dissolved solids: Determined from residue after evaporation or by sum of determined constituents, designated by an "a"

Location number	Owner	Geologic source	Date collected	Temperature (°F)	Silica (SiO ₂)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO ₃)	Carbonate (CO ₃)
19. 8. 6.441	E. Peterson	Qal	Dec. 1950	56	18	-	30	4.2	140		321	-
8.421 ^{a/}	A. C. Duran	do.	Apr. 1959	56	32	-	91	5.7	55	3.8	340	-
10.144	Pojoaque River	-	Apr. 1959	54	-	-	66	7.4	51	-	287	-
10.321	La Acequia de los Indios	Qal, QTs	Dec. 1950	-	26	-	65	6.8	29		199	-
12.412	N. A. Owings	Qal	12-28-50	52	22	-	70	8.3	21		260	0
19. 9.10.400	Nambe Pueblo	Qal(?)	2- 9-54	-	10	-	84	6.2	58		351	0
11.330	do.	do.	2- 9-54	-	23	-	70	5.5	33		252	-
11.330a	do.	QTs	7-20-54	-	-	-	-	-	-		114	21
^{a/} Boron content 0.06 ppm												



EXPLANATION

Depth of well in feet

Geologic source of water-bearing formation

Qal, alluvium of Recent age;

QTs, Santa Fe Group of middle(?) Miocene to Pleistocene(?) age.

Possible Grant boundary

Data from U.S. Geological Survey hydrographic quadrangle maps.

R BE R RE

SCALE 1:24,000

FIGURE 1.-- MAP SHOWING LOCATIONS OF SELECTED WELLS IN AND NEAR THE POJOAQUE PUEBLO GRANT, SANTA FE COUNTY, N. MEX.

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