GROUND-WATER-LEVEL MONITORING NETWORK, HOLLISTER AND SAN JUAN VALLEYS, SAN BENITO COUNTY, CALIFORNIA

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CONVERSION FACTORS

The inch-pound system of units is used in this report. For readers who prefer metric units, the conversion factors for the terms used in this report are listed below:

Multiply	By	To obtain
ft (feet)	0.3048	m (meters)
inches	25.4	mm (millimeters)
mi (miles)	1.609	km (kilometers)
mi^2 (square miles)	2.590	km^2 (square kilometers)

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ABSTRACT

The addition of 17 wells to the existing 86-well network is proposed to improve the ground-water-level monitoring in the Hollister and San Juan Valleys.

The new wells were selected on the basis of well-construction data availability, location, accessibility, use, and condition, either to replace wells that are no longer accessible or to furnish needed additional data for planning artificial recharge, preparing water-level-contour maps, and digital ground-water modeling.

INTRODUCTION

Water-level data were collected in San Benito County from the early 1900's to 1966 by various agencies, including the U.S. Water and Power Resources Service (formerly the Bureau of Reclamation), California Department of Water Resources, Pacheco Pass Water District, San Benito County Water Conservation and Flood Control District, University of California Cooperative Extension, and U.S. Geological Survey. In 1966, San Benito County requested that the Geological Survey review these data and select wells suitable for a water-level monitoring network. The Survey completed its review in 1967 and released an open-file report (Helley, 1967) which presented tabulated well data and water-level records for the wells that were selected. The water-level network designed by the Survey included 93 wells in the Hollister and San Juan Valleys, which are located in the northern part of San Benito County about 40 miles southeast of San Jose (fig. 1). The valleys cover about 102 mi^2 within the Gilroy-Hollister ground-water basin (California Department of Water Resources, 1975) and are separated by the Lomerias Muertos and Flint Hills (pl. 1). The San Benito County Water Conservation and Flood Control District was designated as the agency responsible for operation of the network.

Since 1967, the areal distribution of irrigation wells and pumping stresses has changed. Some network wells have been destroyed, and others have been rendered unmeasurable. As a result the present water-level network is no longer adequate to monitor water-table and storage changes in the two valleys.

The purposes of this study were to evaluate the effectiveness of the ground-water-level network now operated by the District in the Hollister and San Juan Valleys, to propose modifications to improve the network, and to provide data for evaluating an artifical-recharge program planned for areas along the San Benito River. In scope, the study encompassed computer storage of water-level data; analysis of hydrographs, water-level-contour maps, geology, and well-construction data; and selection of additional wells for the network.

Appreciation is extended to the residents of Hollister and San Juan Valleys who provided information and allowed access to their property for collection of hydrologic data.

Special thanks are extended to Bill Coates, University of California Cooperative Extension, and to George Thomas and Rocky Lydon, San Benito County Water Conservation and Flood Control District, for their help in locating wells and obtaining data.

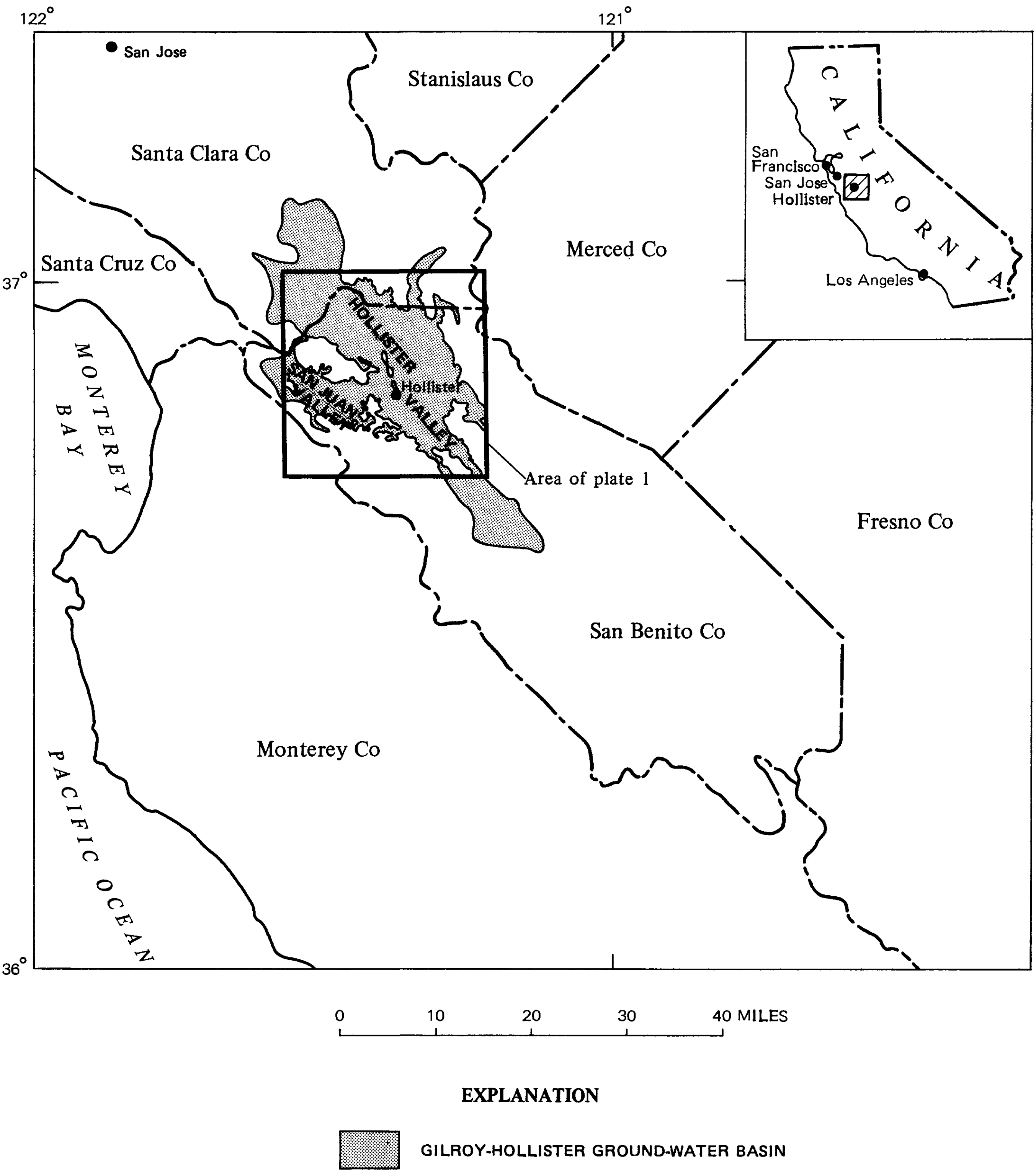
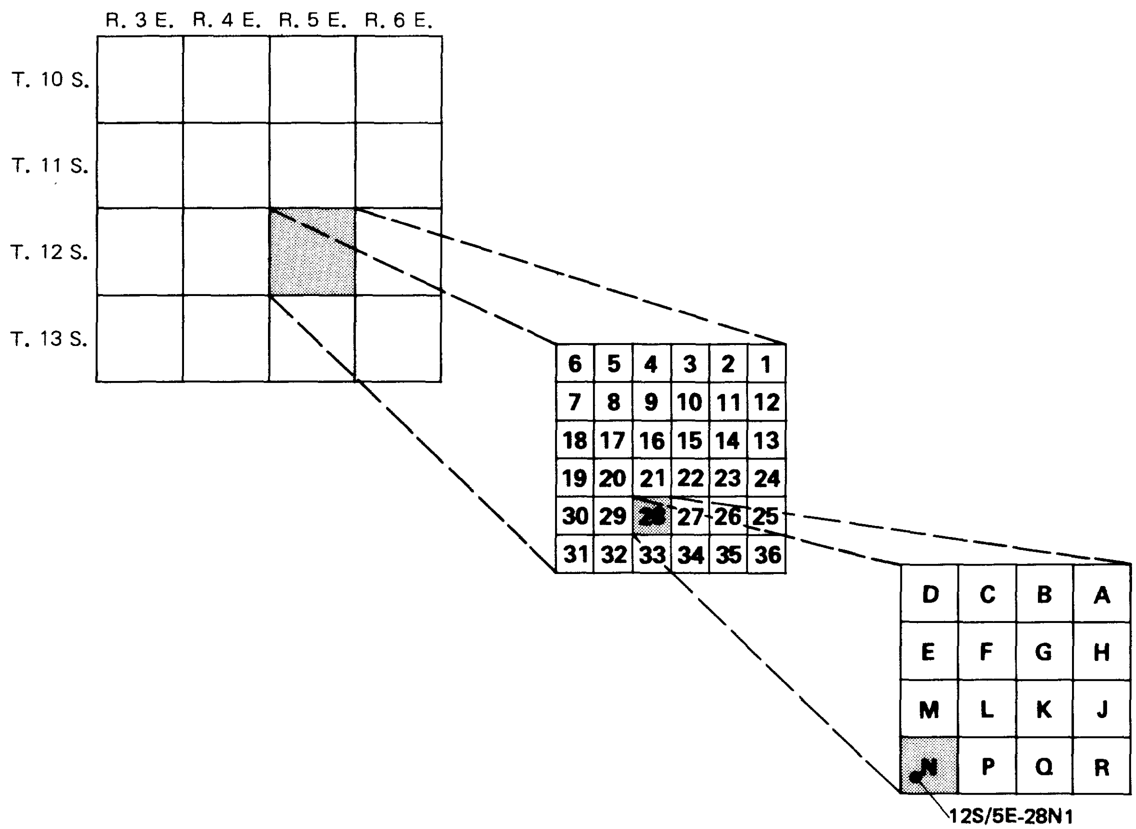


FIGURE 1.--Location of study area.

WELL-NUMBERING SYSTEM

Wells are numbered according to their location in the rectangular system for subdivision of public land. A well number, such as 12S/5E-28N1, is a series of numbers and letters which identify the 40-acre parcel of land on which the well is located. That part of the number preceding the slash indicates the township (T. 12 S.); the number and letter following the slash indicate the range (R. 5 E.); the number following the hyphen indicates the section (sec. 28); the letter following the section number indicates the 40-acre subdivision of the section; the last number is a serial number for wells in the 40-acre subdivision. All well numbers in this report are referenced to the Mt. Diablo baseline and meridian.



GEOLOGIC AND HYDROLOGIC FRAMEWORK

The Gilroy-Hollister ground-water basin is bounded on the east by the Diablo Range and on the west by the Gabilan Range. These mountain ranges are made up of consolidated rock of Jurassic, Cretaceous, and early Tertiary age. Similar consolidated rock underlies the ground-water basin at depth. This rock is virtually not water bearing and forms the boundaries of the ground-water basin. The water-bearing part of the basin consists of a sedimentary sequence of unconsolidated and poorly consolidated rocks of Tertiary and Quaternary age as much as several thousand feet in thickness. This sedimentary sequence consists of clay, silt, sand, gravel, and their consolidated equivalents.

The San Andreas and Calaveras faults transect the Gilroy-Hollister ground-water basin and act as barriers to ground-water movement. Both are major, active fault systems that have produced vertical and horizontal displacement in the rock units.

The part of the Gilroy-Hollister ground-water basin that includes Hollister and San Juan Valleys (fig. 1) was subdivided by Kilburn (1972) into the Hollister, Gilroy-Bolsa , and San Juan subbasins. The ground-water subbasin boundaries are defined by bedrock outcrops; the trace of the San Andreas, Calaveras, and Sargent faults; and the axis of the Sargent anticline (pl. 1).

Sand and gravel beds in the alluvium, the San Benito Gravels of Lawson (1893), the Purisima Formation, and undifferentiated Tertiary rocks are the principal water-bearing units in the Hollister and San Juan Valleys.

Ground water occurs under both confined and unconfined conditions in the two valleys. Differences in hydraulic head (measured as water levels in wells) occur between some of the water-bearing units. The conditions of occurrence and the head differences between water-bearing units were considered in the water-level-monitoring network design.

The alluvium, the San Benito Gravels, and some of the undifferentiated Tertiary rocks are virtually undistinguishable in the subsurface and function mostly as a single hydrologic unit in much of the Hollister subbasin. Where this is true the geographic location of the monitoring wells is of prime importance. In other areas, where the separate aquifers are distinguishable and artesian conditions prevail, the well depth, perforated interval, and subsurface geology are of more importance in selecting the monitoring wells.

A detailed discussion of the geology and hydrology of the Hollister and San Juan Valleys is given in Kilburn (1972).

EVALUATION OF GROUND-WATER-LEVEL MONITORING NETWORK

In order for a ground-water-level monitoring network to provide meaningful data, sufficient information must be known about the construction of each well in the network.

Well-construction information required includes drilling method, depth drilled, material drilled, type of finish, casing record, and depth and type of openings in the casing. This information helps in identifying the aquifer or aquifers and in understanding water-level response in a particular well to pumping, recharge, and climatic conditions in the ground-water basin.

Each observation well in a network is classified on the basis of four key items of well-construction information: (1) Well depth, (2) casing record, (3) opening record (perforated intervals), and (4) lithologic log.

Depending on whether these four key items are known, the wells are assigned to one of four classes:

Class 1 - All four key items of information are available.
Class 2 - The opening record is available, but one or more remaining key items of information is lacking.
Class 3 - The opening record is lacking, but one or more remaining key items of information is available.
Class 4 - All key items of information are lacking.

In addition to well-construction information, the utility of a particular well as a water-level observation site is influenced by (1) access to the site, (2) access, into the well, for measuring equipment, (3) use of the well (does the pumping schedule permit sufficient recovery time prior to water-level measurement?), (4) condition of the well (are the openings obstructed?), and (5) location of the well relative to geologic structures, hydrologic boundaries, and centers of discharge and recharge.

In 1967 the water-level-observation well network consisted of 93 wells in which water levels were measured every March and October by the San Benito County Water Conservation and Flood Control District. March was selected for the annual high ground-water level measurement and October for the annual low measurement. Since 1967, 18 of the original 93 wells have been eliminated from the observation-well network (pl. 1) because of access problems or well destruction. During the period 1967-79, replacement wells were found for some of the unusable wells. Very little well-construction information was available for most of these replacement wells, however.

During the current network evaluation, well-construction information was tabulated, and a classification of wells was made on the basis of the availability of data for four key items (table 1). The water-level data for each well in the network were examined to determine whether the well was responsive to changes in ground-water storage in the subbasins. Water-level-contour maps were prepared to determine in which areas additional data sites were needed to monitor ground-water storage.

TABLE 1. - Well data and classification of wells in the proposed water-level-monitoring network

[Finish: F, gravel packed with perforations; P, perforated or slotted. Type of logs available: D, drillers; E, electric. Principal aquifer: 110ALVM, Quaternary alluvium; 111ALCR, alluvium of the Coast Ranges (Pliocene and Holocene); 111ALVM, Holocene alluvium; 120TRTR, Tertiary System; 121PRSM, Purisima Formation. Well classification: 1, all four key items of information are available; 2, the opening record is available, but one or more remaining key items of information is lacking; 3, the opening record is lacking, but one or more remaining key items of information is available; 4, all key items of information are lacking]

Well No.	Depth of well below land surface (feet)	Casing diameter (inches)	Finish	Depth to first opening (feet)	Type of logs available	Principal aquifer	Well classification
11S/4E-24C2[1]							
11S/4E-25H2	631	12	F	216	D	121PRSM	1
11S/4E-26B1	642	15	F	149	--	121PRSM	2
11S/4E-34A1	100	14	--	--	--	110ALVM	3
11S/5E-12E1	103	13	P	52	--	111ALCR	2
11S/5E-13D1	125	12	--	--	--	111ALCR	3
11S/5E-20N1	300	12	--	--	--	121PRSM	3
11S/5E-21E2	220	16	P	100	D	111ALCR	1
11S/5E-23R2	118	8	F	43	D	110ALVM	1
11S/5E-24C1	134	--	--	--	--	110ALVM	3
11S/5E-24C2	165	14	P	70	--	111ALCR	2
11S/5E-24E1	150	--	--	--	--	110ALVM	3
11S/5E-24L1	70	13	--	--	--	110ALVM	3
11S/5E-25G1	225	12	P	--	--	111ALVM	3
11S/5E-26N2	232	14	P	95	D	120TRTR	1
11S/5E-26R3	225	12	P	65	--	111ALCR	2
11S/5E-27P2	331	14	P	67	D	120TRTR	1
11S/5E-28B1	198	14	P	125	D	111ALCR	1
11S/5E-28P4	140	8	F	80	D	111ALCR	1
11S/5E-30H1	280	14	--	240	D	121PRSM	1
11S/5E-31F1	515	12	F	312	D	121PRSM	1
11S/5E-33B1	125	12	--	--	--	111ALCR	3
11S/5E-35C1	180	13	P	--	--	111ALCR	3
11S/5E-35G1	230	12	--	--	--	111ALCR	3
11S/5E-35W3	644	16	F	152	D	111ALCR	1
11S/5E-36C1	98	--	P	--	D	110ALVM	3
11S/5E-36M10	131	12	P	87	D	110ALVM	1
11S/6E-31M2	188	10	P	155	D	111ALCR	1
12S/4E-17L0	96	12	P	64	D	110ALVM	1
12S/4E-20C1	736	12	--	--	D	121PRSM	3
12S/4E-21M1	250	14	--	--	--	121PRSM	3
12S/4E-26G1	876	12	F	240	D	121PRSM	1
12S/4E-28F1	196	--	--	--	--	121PRSM	3
12S/4E-28R1	300	--	--	--	--	121PRSM	3
12S/4E-34H1	387	12	F	120	D	111LAVM	1
12S/4E-35A1	325	12	P	110	D	121PRSM	1
12S/4E-36N1	556	16	F	153	D,E	121PRSM	1
12S/5E-01F6	430	--	F	--	--	111ALCR	3
12S/5E-01G2	300	--	--	--	--	111ALCR	3
12S/5E-01G3	300	--	--	--	--	111ALCR	3
12S/5E-02H4	168	14	P	--	D	111ALCR	3
12S/5E-02H5	128	12	P	42	--	111ALCR	2
12S/5E-02L2	170	12	--	--	--	111ALCR	3
12S/5E-03B1	128	14	P	100	D	111ALCR	1
12S/5E-05G1	500	12	F	150	D	121PRSM	1
12S/5E-06L1	--	--	--	--	--	--	4
12S/5E-07P1	750	16	F	360	D	121PRSM	1
12S/5E-09K1	195	14	P	88	D	111ALCR	1
12S/5E-09M1	240	14	P	105	D	121PRSM	1
12S/5E-12R1	350	12	F	150	D	111ALCR	1

See footnote at end of table.

TABLE 1. - Well data and classification of wells in the proposed water-level-monitoring network--Continued

Well No.	Depth of well below land surface (feet)	Casing diam-eter (inches)	Finish	Depth to first opening (feet)	Type of logs available	Principal aquifer	Well classi-fication
12S/5E-14N1	--	14	P	--	--	110ALVM	4
12S/5E-16F2	315	14	P	146	D	121PRSM	1
12S/5E-17D1	950	12	F	314	D	121PRSM	1
12S/5E-21Q1	500	14	--	--	--	121PRSM	3
12S/5E-22C1	237	14	--	102	D	111ALCR	1
12S/5E-22J2	355	12	P	120	D	111ALVM	1
12S/5E-22N1	372	14	P	250	D	121PRSM	1
12S/5E-23A20	862	8.62	F	178	D	111ALCR	1
12S/5E-24N1	300	14	P	182	D	111ALCR	1
12S/5E-26Q2	370	14	P	162	D	111ALCR	1
12S/5E-27E1	175	14	P	--	D	121PRSM	3
12S/5E-28J1	220	--	P	--	D	121PRSM	3
12S/5E-28L1	425	12	F	--	D	121PRSM	3
12S/5E-28N1	408	12	F	168	D	121PRSM	1
12S/5E-30H1	240	--	--	--	--	121PRSM	3
12S/5E-30R1	199	14	P	87	D	121PRSM	1
12S/5E-31G1	201	14	P	--	--	110ALVM	3
12S/5E-33A3	204	12	P	145	D	121PRSM	2
12S/5E-33E2	121	14	P	81	D	121PRSM	1
12S/5E-34P1	195	12	P	153	D	121PRSM	1
12S/5E-35N2	612	14	F	288	D	111ALCR	1
12S/5E-35Q1	451	14	F	200	D	120TRTR	1
12S/5E-36B20	500	--	F	430	--	120TRTR	2
12S/6E-06K1	260	12	P	16	D	111ALCR	1
12S/6E-06L4	235	20	G	50	D	111ALCR	1
12S/6E-07P1	147	--	--	--	--	111ALVM	3
12S/6E-18G1	198	12	P	70	D	111ALVM	1
12S/6E-19E5	160	12	F	116	D	111ALVM	1
13S/4E-01K1	209	--	--	--	--	121PRSM	3
12S/6E-30A1[1]							
13S/4E-3H1	312	14	F	168	D	110ALVM	1
13S/4E-4A3	195	12	P	48	D	110ALVM	1
13S/4E-1D1	950	12	F	255	D,E	121PRSM	1
13S/5E-2P1	196	12	P	77	D	111ALCR	1
13S/5E-3H1	189	14	P	121	D	121PRSM	1
13S/5E-3L1	126	--	--	--	D	121PRSM	3
13S/5E-4G1	320	12	F	100	D	121PRSM	1
13S/5E-10B3	392	14	P	120	D	121PRSM	1
13S/5E-10L1	252	12	P	52	D	110ALVM	2
13S/5E-11B6	450	--	P	--	--	121PRSM	3
13S/5E-11E2	161	12	P	82	D	121PRSM	1
13S/5E-11Q1	178	--	P	61	--	121PRSM	2
13S/5E-12D3	500	12.75	F	200	D,E	112SNBN	1
13S/5E-12N20	352	12	P	301	D	121PRSM	1
13S/5E-13F1	134	--	P	30	D	121PRSM	1
13S/5E-13H1	252	12	P	112	D	112SNBN	1
13S/5E-13J2	180	12	P	--	--	121PRSM	3
13S/5E-13Q1	185	12	P	44	D	121PRSM	1
13S/6E-6E1	471	12	F	443	D	111ALCR	1
13S/6E-19J1	340	12	P	128	D	112SNBN	1
13S/6E-19K1	211	--	P	--	D	112SNBN	3
13S/6E-10K1	96	12	P	34	--	111ALVM	2
13S/5E-12K1[1]							

[1]Data not available at present.

PROPOSED GROUND-WATER-LEVEL MONITORING NETWORK

The proposed network was designed to ensure that sufficient water-level data are collected throughout Hollister and San Juan Valleys to monitor changes in ground-water storage caused by climatic variations and ground-water withdrawal. The network must provide sufficient data for construction of water-level-contour maps, which show the areal head distribution for the ground-water reservoir.

The proposed network consists of 103 wells in which water levels can be measured semiannually, in March and October. Eighty-six of these wells are part of the existing network, and 17 are new wells (table 1 and pl. 1).

Of the 17 new wells, 11 were selected in areas where additional data are needed to monitor changes in ground-water storage. Specifically, additional data are needed in areas where (1) artificial recharge is planned with imported water, (2) data are inadequate for preparation of water-level-contour maps, and (3) more detailed data are needed for simulations using a digital ground-water model.

The other six new wells, were selected to replace wells that were dropped from the existing network due to problems concerning access to the site or access of measuring equipment into the well.

Classification of 100 of the 103 wells in the proposed network is shown in table 1. Fifty-six of the wells are class 1, 10 are class 2, 32 are class 3, and 2 are class 4. Three wells are not classified because data are not available at present. Ideally the network would include only class 1 wells, but practical considerations require that some wells with incomplete well-construction information be retained in areas where no substitute well could be found. Although the aquifer tapped by the two class 4 wells is not known, the wells are retained in the network in order to continue a 13-year period of record of water-level measurements. If future wells with complete well-construction information should be drilled near observation wells in class 2, 3, or 4, they could be considered as replacements.

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