UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Ground Water Branch

DATA ON WATER WELLS IN BORREGO, OCOTILLO, SAN FELIPE, AND VALLECITO VALLEY AREAS, EASTERN SAN DIEGO COUNTY, CALIFORNIA.

By

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Prepared in cooperation with the
California Division of Water Resources

Not reviewed for conformance with the stratigraphic nomenclature and editorial standards of the U. S. Geological Survey.

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TABLES

Accordingly, the scope of the work carried on by the Geological Survey in each area has included: (1) Very brief reconnaissance mapping of major geologic features to define the extent and general characteristics of the deposits that contain the ground-water bodies; (2) visiting and examining virtually all the water wells in the area, determining and recording their location in relation to geographic and cultural features and the public land net wherever possible, and recording well depths and sizes, types and capacities of installed equipment, uses of the water, and other pertinent information available at the well site; (3) measurement of the depth to the water surface below an established and described measuring point at or near the land surface; (4) selection of representative wells to be measured periodically in order to detect and record changes of water levels; and (5) collection and assembly of well records, including well logs, water-level measurements, and chemical analyses.

The work has been carried on by the Geological Survey, United States Department of the Interior, under the direction of A. N. Sayre, chief of the Ground Water Branch; under the general supervision of J. F. Poland, district geologist in charge of ground-water investigations in California; and under the immediate supervision of G. F. Worts, Jr., geologist in charge of the Long Beach area office.

LOCATION AND GENERAL FEATURES OF THE AREA

The Borrego, Ocotillo, San Felipe, and Vallecito Valley areas comprise approximately 250 square miles of the nearly 900-square-mile drainage area of the San Felipe-Vallecito Creek part of the San Felipe Creek system that drains the east slopes of the Peninsular Ranges and flows into Salton Sea. The area lies in the northeastern one-third of San Diego County and extends eastward into western Imperial County, California.

Situated along and immediately adjacent to the great escarpments that mark the northeastern margin of the Peninsular Ranges of southern California, the valleys are mostly of structural origin and receive the debris-laden runoff from surrounding precipitous mountain areas of high relief. Although each of the valleys is essentially a distinct physiographic and hydrologic unit, they are interconnected by the principal streams which cut through the mountains separating the ground-water basins. Plate 1 shows the principal ground-water basins, the stream system, and the location of the canvassed wells.

Borrego and Ocotillo Valley Areas

The largest and most highly developed valleys investigated are the Borrego and Ocotillo Valley areas. Borrego Valley, which has undergone a period of rapid and intensive agricultural development since 1945, has an area of approximately 100 square miles, is in the northwest part of the area, and is watered by the intermittent runoff from Coyote Creek which drains a large region of relatively high precipitation in the Peninsular Ranges. The agriculture practiced in Borrego Valley requires large quantities of water for irrigation, virtually all of which must be pumped from underground supplies. A total of 146 wells, of which 68 are irrigation wells, were canvassed in Borrego Valley.

Northeast of Borrego Valley and separated from it by Coyote Mountain is Clark Valley which occupies a closed depression approximately 40 square miles in extent. Only three wells were located in this valley, which is essentially undeveloped.

The Ocotillo Valley (locally called the Lower Borrego Valley), which extends southeastward from Borrego Valley to the eastern margin of the area, has only a very small irrigated acreage, but many wells have been constructed in connection with real estate developments and homesteads. A total of 23 wells were canvassed in Ocotillo Valley.

San Felipe Valley Area

The headwater part of San Felipe Creek, upstream from the narrow canyon traversed by State Highway 78 at the south edge of Borrego Valley, is considered here as the San Felipe Valley area. San Felipe Valley proper is a northwest-trending elongate structural depression containing San Felipe, Earthquake, Blair, and Little Blair Valleys (pl. 1). The entire area, with the exception of a few small homesteads, is devoted to livestock raising, and the shallow small-capacity wells of the area provide sufficient water for domestic and stock use. A total of 17 wells were canvassed in the developed part of the San Felipe Valley.

Between the junction of Sentenac and Grapevine Canyons and the narrow canyon 8 miles downstream, San Felipe Creek traverses a narrow alluviated valley. Within this reach is the headquarters of the Anza Desert State Park. The two wells in this valley are at the park headquarters. Yaqui Well, which is actually a developed spring, yields water of poor quality and is used only for stock watering.

Vallecito Valley Area

Mason Valley and the narrow, ribbon-like valley along Vallecito Creek comprise the Vallecito Valley area. Small domestic wells for homesteads in Mason Valley and shallow stock wells are the only demand upon the underground waters of the upstream half of this area. A small perennial surface flow in the narrow canyon downstream from Mason Valley is utilized for pasture irrigation by the Campbell Ranch.

Between the Vallecito County Park (the old Vallecito stage station) and the junction of Vallecito and Carrizo Creeks, the valley is a narrow barren desert area nearly devoid of vegetation. A few small homestead cabins are clustered around the mouth of Canebrake Canyon where springs and intermittent surface flow provide domestic water. In this valley segment a county park is established at Agua Caliente Hot Springs. In the broad sandy region surrounding and just upstream from the junction of Vallecito and Carrizo Creeks, several irrigation wells have been drilled. A total of 11 wells were canvassed in the Vallecito Valley area.

The upstream part of Canebrake Wash (pl. 1) is in a broad alluviated upland valley which is utilized entirely for livestock raising. Surface streams and springs provide the water supply for this purpose.

ACKNOWLEDGMENTS

During the course of the investigation, the California Division of Water Resources supplied all information on the area available in its files, thus aiding materially in the completeness of the data presented in the tabulation. The Soil Conservation Service, U. S. Department of Agriculture, made available aerial photographs of the area and provided access to maps and information concerning section corners and property lines. Ranger Whitefield of the California Park Service provided access to maps which aided in the positioning of the public land net. Walter A. Borden, well-drilling contractor in Borrego Valley, furnished logs of wells and assisted in their location. Claude E. Kelley of Coachella, James E. Wright of Indio, the Mann Brothers Drilling Co. of Thermal, and the Pacific Coast Drilling Co. of Bakersfield also supplied well logs.

J. S. Di Giorgio provided logs of the Di Giorgio Fruit Corp.'s wells, and the ranch manager, Mr. Whitman, assisted in the field location of the wells. Samuel Fortiner, Richard Weir, and many other local residents contributed data and assistance which materially aided the work.

WELL-NUMBERING SYSTEM

The well-numbering system used in the Borrego, Ocotillo, San Felipe, and Vallecito Valley areas conforms to that used in essentially all ground-water investigations made by the Geological Survey in California. It has been adopted as official by the California Division of Water Resources and by the California Pollution Control Boards throughout the State.

The wells are assigned numbers according to their location in the rectangular system for the subdivision of public land. For example, in the number 11/6-11D1, which was assigned to a well on the Kosky Ranch, the part of the number preceding the bar indicates the township (T. 11 S.), the part between the bar and the hyphen is the range (R. 6 E.), the number between the hyphen and the letter indicates the section (sec. 11), and the letter indicates the 40-acre subdivision of the section as shown in the accompanying diagram.

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

11

Within the 40-acre tract the wells are numbered serially as indicated by the final digit. Thus, well 11/6-11D1 is the first well to be listed in the NW¼NW¼ sec. 11. The entire area lies south and east of the San Bernardino base and meridian lines; and therefore the township and range numbers are sufficient.

For some wells the letter following the section number is designated X. This indicates that the well has been field located and is accurately plotted with respect to its position on the map, but that the control for the public land net is too poor to warrant assigning a more accurate location number.

WELL LOCATION

Plate 1 shows the location of wells and limited reconnaissance geology. The map was compiled from the 15-minute Santa Ysabel, Clark Lake, Borrego, Agua Dulce, Barrell Spring, Cuyapaipe, and Carrizo Mountain quadrangles made by the U. S. Army Map Service at a scale of 1:62,500. These maps do not contain a public land net, and therefore, it was necessary to establish on the maps the accurate position of as many section corners as could be located in the field and to construct and project from these a section net that could be used as reference lines in assigning location numbers to the wells. The section markers used in the valley areas were those of the so-called Norman O. Glover survey of 1943-45, which has been reported to be the officially accepted survey of the area. Because a part of the section net shown on plate 1 is approximate, the location of some lines is subject to revision. However, the position of the wells in relation to the map is accurate, and they were referenced to the constructed section net for the purpose of assigning the location numbers.

Table 1A.- Data on water wells in Borrego, Ocotillo, San Felipe, and Vallecito Valley areas, eastern San Diego County, California

Altitude: Altitude given is the land-surface datum or plane of reference at the well interpolated from U. S. Army Engineers or Army Map Service topographic maps with a 100-foot contour interval.

Depth of well: Depths given in whole feet are reported or from drillers' logs; those given in feet and tenths were measured below land-surface datum by the Geological Survey.

Type of well: D dug, C cable tool, R rotary, G gravel packed. Well diameter is given in inches.

Type of pump and power: The first symbol indicates the type of pump as follows: L lift or cylinder, J jet, C centrifugal, S submersible turbine, T turbine. The second symbol indicates the type of power as follows: G gasoline (or diesel) engine, H hand operated, W windmill; for electric motors only the rated horsepower is given.

Use of well: Dm domestic, I irrigation, PS public supply, S stock, U unused, D destroyed.

Measuring point: Bnc bottom of notch in casing, Bpb bottom edge of pump base, Bhc bottom of hole in casing, Bap bottom edge of access pipe, Hpb hole in pump base, Tb top edge of board covering or curbing, Tc top edge of casing, Bcv bottom casing cover, Thc top of hole in cover, Tcc top of concrete curb, Tcl top clamp around pipe. The suffix letters N, S, E, or W indicate the side north, south, east, or west where measured. The distance of the measuring point in feet and tenths above or below (-) land-surface datum is given. For reported water levels no measuring point is given.

Water level: The water level is given in feet above (+) or below land-surface datum; measured depth to water is given in feet, tenths, and usually hundredths; and reported or approximate depth to water is given in whole feet.

Other data available: L log and C chemical analyses. These data are in the files of the Geological Survey; most are included in tables 2A and 3A.

Part 1.- Borrego Valley Area

Geological Survey well number	Owner or user	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter	Type pump and power	Use	Measuring point (feet)	Water level Date	Water level (feet)	Temp. °F	Other data available
10/5-36A1	Calif. State Park	1949	718	350	C 10	T 10	PS	Bpd 1.2	11-14-53	213		C
10/6- 5F1	Buerkle Bros. (formerly Fazio)	1951	809	704	RG 30	T 150	I		6-26-52	274		C,L
8A1	Buerkle Bros.	1952	760	624	RG 16	T 150	I		3- ?-53	256	83	C,L
8B1	do	1945?	760	690	C 16	T 150	I					
8Q1	A. A. Bernand		725	223.0	12		U	TcN 0	1- ?-53	213.19		
									11-17-53	218.45		
8R1	Widliska	1936?	710		C		I,Dm					
9E1	Buerkle Bros.	1945	736	350	C 16	S	Dm	Tc 0.2	6-27-52	226.75		
9F1	J. J. Kovacevich	1951	718	783	RG 16	T 100	I					L
9N1	S. Fortiner	1945	709	560	C 16	T G	I	TcW 0	8- ?-45	190		C,L
									11-20-53	212.9		
9N2	do		709	210.0	C 12		D					
10M1	J. A. Marovich	1951	700	762	RG 16	T 100	I					L
14G1	John Hanna	1949	640	420	C 12	L	U	Thc 4.3	11-19-53	107.8		
14M1	James Tillery	1944	635	416	C 12	T G	U					
15D1	Di Giorgio Fruit Corp.	1946	685	711	RG 16	T 100	I					C,L
15D2	do	1952	685	700	16	T 100	I					C,L
16K1	A. A. Bernand		680	430	14		U	Tc 0	6-27-52	168.03		
									1- ?-53	164.52		
									11-20-53	172.9		
16N1	Di Giorgio Fruit Corp.	1950	676	797	RG 16	T 100	I					C,L

Geological Survey well number	Owner or user	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter	Type pump and power	Use	Measuring point		Water level		Temp. °F	Other data available
									(feet)	Date	(feet)		
10/6-17C1	Borrego Co-op Farms	1951	721	558	RG 14	T 75?	I	Hpb	1.0	6-26-52	213.91	82	L
17J1	Di Giorgio Fruit Corp.		680			T 100	I	BncS	0.4	11-20-53	179		C
17K1	Dr. Konald	1952	680	535	C 12	T 75	I						C
17L1	Kuhrts	1952	695	361.0	RG 16		U	TcE	0	6-27-52	175.28		
										1- ?-53	175.29		
										11-20-53	181.18		
20A1	Di Giorgio Fruit Corp.	1950	655	668	RG 16	T 100	I						C,L
20B1	do	1945	657	662	RG 16	T 100	I						C,L
21A1	do	1936?	664	322.0	C 12		U	TcN	0.5	6-24-52	136.86		
										2-24-54	138.79		
21B1	do		664	672	RG 16	T 100	I						C,L
21C1	do	1945	652	964	RG 16	S 100	I						C,L
21D1	do	1945	655	648	RG 16	T 100	I						C,L
21E1	do	1952	639	900	RG 16	T 100	I						C,L
21H1	do	1952	651	752	RG 16	T 100	I						C,L
21L1	do	1946	633	644	RG 16	T 100	I						C,L
21M1	do	1945	632	645	RG 16	T 100	I						C,L
21N1	do	1952	618	900	RG 16	T 100	I						C,L
22A1	J. J. Lynn Ranch	1953	650	785	RG 14	T 100	I	Tc	1.0	4- ?-53	133		C,L
										11-17-53	131.24		
22A2	do	1953	640	908	RG 14	T 100	I			11-17-53	118		L
22B1	do	1952	660		RG 16		D	Tc	0.8	6-25-52	125.22		
22B2	do	1952	655	750	RG 14	T 100	I			11-18-53	157		L

Table 1A

Geological Survey well number	Owner or user	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter	Type pump and power	Use	Measuring point		Water level		Temp. °F	Other data available
									(feet)	Date	(feet)		
10/6-22B3	J. J. Lynn Ranch	1952	659	680	RG 16		D						
22B4	do	1952	650	770	RG 14		D			11- ?-52	111		L
22D1	Dr. L. C. Campbell	1951	640	735	RG 16	T 100							C,L
22D2	Brinniger		644			L							
22D3	Capt. Kimball		645	300	C 12	T G	U						
23B1	J. J. Lynn Farms	1953	630	908	RG 14	T 75	I			11-18-53	100		L
23C1	do	1952	640	680	RG		D			10- 3-52	119		
23C2	do	1953	640	888	RG 14	T 125	I	Tc	1.8	2-11-53	110		L
23D1	do	1952	642	700	RG 16		D						
23M1	do	1953	630	912	RG 14	T 100	I			5- ?-53	103		L
										11-18-53	100		
23M2	do	1953	625	912	RG 14	T 100	I			6- ?-53	106		L
24C1	Mrs. Pallman	1948	650	150	C 12	T 10	Dm	Hpb	0.8	2-17-53	107.17		L
24H1	O. J. Brodin	1950	650	136	C	T 9	Dm			6-25-52	98		
24K1	do	1928	600	160	C 12	J G	Dm,I	TclS	0	1- ?-53	66.68		
										11-18-53	69.65		
										2-24-54	69.45		
25G1	Zeutzius	1952	565	510	RG 14	T G	I	BncW	0	6-26-52	89.02		C
										1- ?-53	61.75		
26P1			585	100	11		U	Tc	1.0	11-20-53	56.17		
26P2			585	224	C 12		U	Tc	0.9	11-20-53	56.15		
26Q1			580	34.0	11	L W	D			11-20-53	dry		
28B1	Di Giorgio Fruit Corp.	1946	614	915	RG 16	T 100	I						C,L

Geological Survey well number	Owner or user	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter	Type pump and power	Use	Measuring point		Water level		Temp. °F	Other data available
									(feet)	Date	(feet)		
10/6-28D1	Di Giorgio Fruit Corp.	1946	607	644	RG 16	T 100	I						C,L
28N1			575			L G	U						
29B1	Di Giorgio Fruit Corp.	1946	610	662	RG 16	T 100	I						C,L
29K1	do		595	599	RG 16	T 100	I						C
29M1	Wick Hauser	1953	605	648	C 14	T 100	I	BpbE	2.0	11-19-53	101.28		
29N1	do	1950	595	385	RG 16	T 75	I	HpbW	0.7	11-19-53	90.94		
										2- 3-54	94.12		
										2-24-54	93.48		
30C1	A. A. Bernand		680	180	12	T 30	Dm, I						
31D1	Hoberg Desert Resort		705		12	T 30	Dm						
32R1	A. A. Bernand		580		12	T 40	PS	TcW	0.5	11-17-53	83.6		
33D1	J. J. Kovacevich	1950	576	500	RG 16	T 50	I						C,L
33M1	A. A. Bernand		570	400		T 60	I	Bhc	0.3	6-25-52	69.83		
33M2	do		570	400	16		U	TcN	1.5	6-25-52	69.16		
										1- ?-53	58.7		
34D1	J. W. Baker	1951	570	426	RG 16	T 50	I						
34D2	do	1936?	574	57	8	T 5?	Dm			6-26-52	46		
34F1	J. V. Costello		570	438	RG 14	T 75	I	Hpb	1.0	6-26-52	44.03		L
34H1	N. J. Benson	1951	569	465	RG 14	T 75	I	Hpb	0.6	8- ?-51	34		L
34K1	R. E. Estabrook	1916	552	203	12	T G	I	HpbS	0	6-26-52	31.71		
										2- ?-53	33.2		
										2-24-54	34.0		
34K2	do	1916	553	94	4	L .5	Dm						
35N1	Borrego Airport		539	325		T 3	Dm						C

Geological Survey well number	Owner or user	Year drilled	Altitude (feet)	Depth (feet)	Type well	Diameter	Type pump	Power	Use	Measuring point	Measuring point (feet)	Water level Date	Water level (feet)	Temp. °F	Other data available
10/6-36A1	McGinnis		540	40.0	D	48			D			11-18-53	dry		
36Q1	J. E. Jones	1951	535	356	C	10			U	Thc	1.0	1- ?-53	38.61		L
												11-19-53	45.65		
												2-24-54	46.10		
10/7-19M1	Sell, Inc.	1952	599	418	RG	16	T	G	I	BncN	0.8	6-26-52	87.22	92.5	C
												1- ?-53	85.51		
												11-18-53	89.42		
												2-24-54	a112.55		
30E1	R. Pederson		587			8	L		U	Tcc	2.0	1- ?-53	66.09		
30F1	do	1951	597	560	RG	14	T	G	I			6-26-52	91		L
30F2	do	1935	599	160	C	12			U	Tc	0.6	11-19-53	97.65		
11/6- 1C1	C. E. Massae	1953	535	425	RG	14	T	30	I	BapE	0.7	1- ?-53	23.65	84	C,L
												11-19-53	28.79		
												2-24-54	33.56		
2C1	Audette		538	300	RG		T	20	I	TcS	0.5	11-19-53	22.25		C
2C2	do		535			12	T		U	BhcE	0.2	11-19-53	16.64		
2C3	Beatty		538				L	W							
3C1	A. A. Bernand	1953	540	360	RG	14	T	40	I	TcN	1.0	12- 5-53	39	81	L
3D1	Borrego Springs School	1936	540	78	C	8	T	2	Dm						
3E1	P. Bernand		538	300	RG	10	T	20	I					79.5	
3M1	do		540	107	C	10			U						L
3M2	do		540		C	10	T	5	I						
3M3	do		542	105	C	10	T	5	I	TcW	1.5	12- 8-53	23.9		L
3N1	do		535	120	R	10	T	10	I	BhcW	1.0	12- 7-53	15.1		

a. Pumping.

Geological Survey well number	Owner or user	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter	Type pump and power	Use	Measuring point		Water level		Temp. °F	Other data available
									(feet)	Date	(feet)		
11/6- 3N2	P. Bernand		536	120	C 10	T 10	I	TcS	2.0	12- 7-53	16.07		L
3N3	do		536	120	R 10	T 10	I	BhcS	0.8	12- 7-53	17.02		
3N4	do		538	105	C 10	T 10	I	BhcS	0	12- 7-53	19.28		L
4A1	Hutton	1947	545	122.5	C 12	J 3	Dm,I	HpbW	0.1	11-19-53	39.8		L
4A2	W. A. Borden	1953	543		C 10		U						
4B1	Wm. Yuhas		548	118	C 10	T 7.5	Dm,I					79.5	
4D1	Kellsey	1933	575	384	C 10	T 7.5	Dm,I	HpbW	0.5	11-19-53	65.02		L
4M1	Ensign Ranch	1913?	565		C 6	L .5	Dm	TcS	1.0				
4M2	do	1936	564	500	C 12	T 20	I	HpbW	0.4	12- 8-53	a 87.6		
4N1	do		560	63.5	C 12		U	TcE	1.4	2-18-53	49.12		
										12- 8-53	49.95		
4P1	do	1945	550	600	C 16	T 25	I						
5C1	A. A. Bernand		600				Dm						
5H1	Justice		560	50	D 60		U	Tcc	0	12- 8-53	48.0		
5P1	M. Schindler		600	180.9	C 16		U	TcW	2.1	2-18-53	117.43		
										11-19-53	120.94		
										2- 3-54	121.52		
										2-24-54	121.65		
7K1	A. A. Bernand		730				PS						C
7R1	Larsen (old Garner well)		695	241.0	12		U	TcE	0	2-18-53	212.70		
										11-19-53	215.81		
8H1	Dr. Walters	1951	590	298	C 10	T 30	Dm,I			12- 8-53	128		
8J1	Small	1953	595	170	C 6	T 5	Dm	TcW	1.3	12- 8-53	134.8		
9B1	Ensign Ranch		545	400	C	T 25	I						C
9B2	do		545		C	C .25	Dm						

a. Pumping.

Geological Survey well number	Owner or user	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter	Type pump and power	Use	Measuring point (feet)	Water level Date	Water level (feet)	Temp. °F	Other data available
11/6-10B1			505			L W	U					
10D1	Dr. Ostrum	1953	530	215.0	C 10	T	U	TcS 0.5	12- 7-53	30.3		
10E1			550	25.0	4		U	TcS 1.2	12- 7-53	14.4		
10M1	R. Jacobs		550	23.0	D 60		U	TbN 1.0	12- 7-53	15.05		
10N1	do	1946	560	387	RG 16	T 40	Dm,I	Tc 1.0	2-18-53	48.0		C
									12- 8-53	55		
10N2	do		565	30	D 36		U	TbS 0	12- 8-53	27.05		
11D1	Kosky and Hagenbuch	1946	499	693	RG 16	T 40	Dm,I	TcN 0.4	11-16-53	20.50		C
11D2	do	1946	497	218.0	C 14		U	TcN 1.0	11-16-53	17.53		L
									2-24-54	19.49		
11E1	do	1912?	486		5		U	Tc 1.0	10- ?-52	8.47		
									11-20-53	7.37		
11M1	Dr. Campbell		487	105.0	C 3		U	Bnc 0.7	2-18-53	5.3		
									12- 8-53	6.45		
									2- 3-54	6.39		
									2-24-54	9.19		
11M2	Dr. Campbell		487		C 3	L H	Dm					
14C1			495	25.0	D 60	C	U	Tcc 0	12- 8-53	21.16		
14D1			495		C		Dm					
14G1	McCloud		478	80	3	C G	Dm	Tc 0.4	2-18-53	+ 0.43		
									12- 8-53	0.65		
15B1	Leona Wood		510	42	D 8	L H	Dm					
15E1	P. Grimm	1951	565	152	C 12	T 10	Dm,I		1- ?-51	44		L
15E2	MacDonald	1953	530	117	C 10	J 1	Dm	ThcN 1.4	12- 9-53	43.06		

Geological Survey well number	Owner or user	Year drilled	Altitude (feet)	Depth (feet)	Type well	diameter	Type pump	power	Use		Measuring point (feet)	Water level Date	Water level (feet)	Temp. °F	Other data available
11/6-15F1	C. Van Marter	1950	560	122	C	10	T	2	Dm,I	Hpb	1.0	2- ?-53	40.77		C
												12- 8-53	45.7		
15F2	Ritz	1950	550	122	C	10	T	7.5	Dm,I			1950	30		L
15F3	E. Burnham		520	140	C	12	J	1.5	Dm	TcS	1.0	12- 9-53	35.0		
15H1	E. DuVall	1927	500	100	C	12	L	W	Dm	Tc	0	12- 9-53	23.5		
16H1	P. Grimm	1950	585	350	C	12	T		I			10-14-50	47		L
22A1	N. Bacco	1948	500	116	C	10	J	1	Dm	TcS	0.4	2-19-53	50.1		C,L
												11-30-53	50		
												2-24-54	a53.63		
22A2	Kuhrts	1953	500	280	R	10	T	25	Dm,I			11- ?-53	55		
22J1	P. Bartlett	1947?	620												
23D1	Kuhrts	1932	500	125	C	12	T	10	Dm			4- ?-53	55		L
24P1	Laag Ranch		405	35.0	D	48	L		U	Tb	0	2-18-53	33.74		
												12-10-53	34.15		
11/7- 7N1	P. Bartlett (formerly LeNeis)	1936?	495	140	C	12	T		U	BapE	3.6	11-20-53	28.8		
												2-24-54	28.31		
20P1	R. Wear	1951	560	368	C	12	T	30	I	BncN	0.4	2-18-53	72.5		C
												12- 9-53	a80		
												2-23-54	73.08		
												2-24-54	72.83		
30G1	E. Fletcher		520	69.0	D	60	L	3	Dm	TbS	0.5	12-10-53	61.32		
30G2			530	89.0	D	60	L	H	U	Tb	2.0	2-18-53	76.17		
												12-10-53	76.76		
30K1	E. Fletcher		530		D	8	T	5	Dm						
30K2	R. L. Stow	1950	585	146	C	10			Dm	Tc	0.5	2-19-53	96.89		C
32Q1	D. Hayden	1952	730	463	C	12	T	G	I			12-? -53	188		C,L

a. Pumping.

Table 1A

Geological Survey well number	Owner or user	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter	Type pump and power	Use	Measuring point (feet)	Water level Date	Water level (feet)	Temp. °F	Other data available
					Clark Valley							
9/6-36A1	E. Dickerson	1953	595	334	C 12		U	Thc 2.5	11-18-53 1- 6-54	17.17 16.79		
9/7-32A1	Gilbert Rock		595		D 10	L H	Dm					
33B1	Thompson		595		D 40 / C 4	J 0.5	Dm					

Part 2.- Ocotillo Valley Area

Geological Survey well number	Owner or user	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter	Type pump and power	Use		Measuring point (feet)	Water level Date	Water level (feet)	Temp. °F	Other data available
12/8- 2N1	L. Holmes		180			T G	Dm,I						
6P1	Magill	1952	410	293.0	RG 10		Dm	Tc	1.0	12-10-53	179.8		C,L
										2-24-54	179.96		
8K1	Kenck		295		7	J 10	Dm	Bcv	1.0	12-11-53	240.0	89	C
8M1	Stransky		380	360.0	C 12		U	Tc	1.8	1- 8-54	276.95		
9H1	J. B. Craig	1952	185	174	RG 6	L 1	Dm			10-17-52	128		L
9J1			160	120		L				1-24-49	115		
10B1			190	53.7	C		D	TcE	0.8	12-15-53	dry		
10E1	Scott (Store)		175	115	D 36	T 1.5	Dm	Tb	0	12-11-53	112		
10E2	C. Lewis		180			L 1.5							
10N1	J. Sundquist	1950	125	222	C 12	T 15	Dm			9- 2-50	117	97	C,L
10N2	Mrs. LeBard	1952	135	232	C 12	T 20	Dm			3-16-52	116	99	
15E1	Scott (Home)		125	140	D	J	Dm	Thc	0.2	12-15-53	131.8		
15M1	J. W. Moore	1952	130	232	C 8	T 10	Dm,I						
17X1			270	253.5	C 8		U	Tc	1.0	1- 7-54	209.37		
22E1	A. F. Demes	1929	120	226	C 16	T 40	Dm,I	BpbS	1.4	12-15-53	102.93		C
										2-24-54	102.19		
22R1			95	56.0	D 48		D	Tcc	0	12-11-53	dry		
24Q1	J. Brooks		95	220	C 12	T 50	Dm,I	TcN	1.4	1- 8-54	85.6	84	C
25G1			50	36.0	D 10		D	Tc	0	12-11-53	dry		
27B1	Borrego Wells Mutual Water Co.	1947?	98	214	C 12	T 15	U	HpbS	1.8	12-11-53	71.0		
27D1			160	156.0	C 12		U	TcW	1.0	12-11-53	113.6		
27F1			110	99.9	C 8		U	TcN	1.1	12-15-53	86.69		
12/9-22A1	P. B. Zilk	1953	10	445	RG 6	T	I						L
23D1	Buerkle Bros.	1953?	10	628	12	T 75	I	BpbN	0	12-15-53	64.17	84	
										2-24-54	65.79		

Part 3.- San Felipe Valley Area

Geological Survey well number	Owner or user	Year drilled	Altitude (feet)	Depth (feet)	Type well	diameter	Type pump	power	Use	Measuring point (feet)	Water level Date	Water level (feet)	Temp. °F	Other data available
11/4-33D1	San Diego County Hwy. Maintenance Dept.	1946	3,070	137		10	T	5	Dm	TcS	1.2	11-23-53	84.54		
33E1	B. Hayman	1948	3,070	165	C	12	L	W	S	TcW	0.8	11-23-53	a 91.11		
12/4-14G1	San Felipe Ranch		2,500	74.0	C	12	L	W	S	TcN	1.5	11-24-53	59.6		
24K1	do		2,430	97.0	C	12	L	W	S	TcE	1.15	11-24-53	18.43		C
24L1	do	1942	2,430		C		L	W	Dm,S						
24P1	do		2,425	143.5	C	14	L	W	U	TcN	1.3	11-24-53	10.95		
25X1	do		2,430	43.0	C	10	L	G	S	TcE	1.4	11-24-53	a 30.22		
36X1	do		2,570	85.5	C	12	L	W	S	TcE	1.2	11-24-53	a 50.04	66	
12/5-34X1 [b]	do		2,215		D	48			U	TbW	0	11-24-53	10.5		
34X2	do		2,230	25.0	D	36			U	TbW	0	1- 4-54	20.0		
34J1 [b]	Mrs. Bushore		2,280		C	10	L	W	Dm	Tcl	0.7	11-24-53	57.3		C
34J2	do		2,280	89.0	C	9			U	Tc	1.0	11-24-53	51.83		
35N1	A. J. Carroll	1949	2,300	92	C	12	L	G	Dm	Thc	0.5	11-24-53	65.55		
35P1	O. Creighton	1949	2,335	159	C	8			U	Tc	0.6	11-24-53	138.08		
												2- 2-54	138.18		
12/6-17X1	Calif. State Park		1,395	60.3	C	8	J	1	PS	BpbE	1.4	12-14-53	a 40.95	79	C
17X2	do	1953	1,395	263.1	C	8	J		PS	Tc	2.5	12-14-53	53.15		
18X1 [b]	do, Yaqui well		1,460	4.4	D	36			S	Tcc	0.5	12-14-53	3.0		C
13/5- 2X1	Las Arenas Ranch		2,340	175	D	12	L		U	ThcE	0	11-25-53	150.64		

a. Pumping.
b. U. S. Geological Survey Water Supply Paper 490-A.

Part 4.- Vallecito Valley Area

Geological Survey well number	Owner or user	Year drilled	Altitude (feet)	Depth (feet)	Type well	Diameter	Type pump	Power	Use	Measuring point	Water level (feet)	Water level Date	Water level (feet)	Temp. °F	Other data available
14/5- 2X1	Strahlmann-Mayer Rancho		2,060	104	C	10	T	G	Dm,I	TcS	0.5	11-25-53	70.64		
3X1	Ritzerson		2,110	98.5	C	10	L		U	Bpb	0	1- 5-54	96.55		
3X2	Miller		2,105	200	C	12	L		U	TcW	0.3	1- 5-54	91.29		
14/6- 3X1	San Diego Co. Park Vallecito Stage Sta.		1,490		D	14	L	H	PS	Thc	1.7	12-14-53	2.3	69	C
9X1	Campbell Ranch		1,510				L	W	Dm,S						
10X1	do		1,505		C	10	L	W	S					73	C
16X1	do		1,670	62.0	C	12			U	TcW	0.2	1- 5-54	21.15		
17X1	do		1,680	74	C	8	L	W	S	BhcN	1.5	1- 5-54	70.05		
15/7-12X1			760	163.0	C	14			D	Tc	2.5	1- 5-54	dry		
15/8- 7X1	Stubb Ranch		600	106.0	C	12			U	TcN	0	1- 5-54	49.22		C
8X1	do		600	100	C	10			U	TcS	0	12-14-53	52.49		

Table 2A.- Chemical analyses of well waters

Constituents: Constituents shown in parentheses are calculated. Where the value of sodium is preceded by the letter a it indicates sodium and potassium expressed as sodium.

Footnotes: Well numbers followed by footnote 1/ indicate sample collected from irrigation water distribution system and may contain gypsum or other agricultural chemicals. Dates followed by footnote 2/ indicate date sample was analyzed.

Analysis by: DWR, State of California, Department of Public Works, Division of Water Resources; UC, University of California Agricultural Extension Service, Riverside, California; GS, U. S. Geological Survey, Quality of Water Branch; H, Hornkohl Laboratory, Bakersfield, California; PL, private laboratory, name not ascertained.

Part 1. - Borrego Valley Area

(Analyses in parts per million)

	10S/5E-36A1	10S/6E-5F1	10S/6E-8A1	10S/6E-9N1
Calcium (Ca)	49	109	125	104
Magnesium (Mg)	17	18	10	5
Sodium (Na)	43	90	a125	a110
Potassium (K)	4.3	9.9	-	-
Carbonate (CO_3)	0	0	Trace	-
Bicarbonate (HCO_3)	171	229	145	190
Sulfate (SO_4)	95	282	340	270
Chloride (Cl)	35	65	(107)	65
Fluoride (F)	.4	1.0	-	-
Nitrate (NO_3)	8.4	5.4	-	-
Boron (B)	0.04	0.12	0.05	0.28
Sum of determined constituents (Sum)	338	695	(780)	649
Percent sodium (% Na)	32	35	48	50
Specific conductance (Sp C) Micromhos @ 25°C (EC x 10^6 @ 25°C)	541	968	1210	1010
pH	7.3	7.5	8.5	7.7
Total hardness as $CaCO_3$ (Total H)	192	346	(353)	(280)
Non-carbonate hardness (N.C.H.)	-	-	-	-
Depth, in feet	350	704	624	560
Temperature (°F)	72	72	-	-
Date collected (Date)	1-13-53	1-13-53	-	10-22-51 2/
Analyzing Laboratory (Lab.)	DWR	DWR	PL	UC
Laboratory Number (No.)	2712	2717	-	8755

Table 2A

	10S/6E-15M1/	10S/6E-15D2/	10S/6E-16N1/	10S/6E-17J1/	10S/6E-17K1	10S/6E-20A1/
Ca	176	178.8	202	138.4	78	226
Mg	4.9	3.7	4.9	1.2	20	4.9
Na	a61.4	a46.5	a37.9	a96.1	115	a260.3
K	-	-	-	-	10.3	-
CO_3	0	0	0	0	0	0
HCO_3	184.2	176.3	165.3	212.3	204	89.7
SO_4	294.4	273.1	282.3	209.4	270	815.6
Cl	96.5	95.1	126.3	119.2	69	161.7
F	-	-	-	-	.6	-
NO_3	34	21	20	26	5	19
B	0.05	.1	.01	.1	.16	.2
Sum	759	706	756	697	670	1,533
%Na	22	18	14	37	46	49
Sp C	1,774	1,765	2,115	1,617	968	2,619
pH	7.6	7.7	7.4	7.3	7.8	7.2
Total H	450	462	525	351	277	585
N.C.H.	-	-	-	-	-	-
Depth, in feet	711	700	797	-	535	668
°F	- 2/	- 2/	- 2/	- 2/	82.5	- 2/
Date	4-28-52	4-28-52	4-28-52	4-28-52	1-13-53	4-28-52
Lab.	H	H	H	H	DWR	H
No.	64818	64821	64822	64819	2714	64823

	10S/6E-20B1/	10S/6E-21B1/	10S/6E-21C1/	10S/6E-21D1/	10S/6E-21F1/	10S/6E-21H1/
Ca	90	144	248	214	163.2	212
Mg	4.9	26	7.3	2.4	7.3	34.2
Na	a143.9	135	a92.7	a124.7	a91.5	a125.8
K	-	11.2	-	-	-	-
CO_3	0	0	0	0	0	0
HCO_3	91.5	171	148.8	128.1	125.7	326.4
SO_4	337.8	428	526	511.5	366.8	441.6
Cl	92.9	100	129.1	126.3	107.8	137.6
F	-	.7	-	-	-	-
NO_3	29.2	90	20.4	22.6	13.9	19
B	.15	.26	.1	.2	.35	.2
Sum	745	1,021	1,098	1,066	814	1,134
% Na	56	40	24	33	31	29
Sp C	1,666	1,543	2,391	2,391	1,833	2,291
pH	7.5	7.7	7.7	7.7	7.4	7.5
Total H	235	(467)	650	545	430	670
N.C.H.	-	-	-	-	-	-
Depth, in feet	662	672	964	648	900	752
°F	- 2/	-	- 2/	- 2/	- 2/	- 2/
Date	4-28-52	1-1-53	4-28-52	4-28-52	4-28-52	4-28-52
Lab.	H	DWR	H	H	H	H
No.	64811	2642	64809	64808	64826	64824

Table 2A

	10S/6E-21L1 [1]	10S/6E-21M1 [1]	10S/6E-21N1 [1]	10S/6E-22A1	10S/6E-22D1 [1]	10S/6E-25G1
Ca	264	202	146.8	89	100	79
Mg	12.2	4.9	6.1	13	2.4	13
Na	a163.5	a132.9	a160.5	130	a121.2	165
K	-	-	-	8.2	-	7.9
CO_3	0	0	0	0	0	0
HCO_3	96.9	75.6	99.4	161	127.5	159
SO_4	716.1	535.6	498	305	287.1	350
Cl	170.3	137.6	100	75	85.1	95
F	-	-	-	.8	-	.8
NO_3	9.4	16.6	24	6.5	24.1	5.0
B	1.05	.2	.01	.12	.05	.34
Sum	1,385	1,068	985	708	684	796
% Na	33	36	47	50	50	59
Sp C	2,148	2,500	1,833	1,098	1,447	1,187
pH	7.6	7.5	7.3	7.7	7.4	7.9
Total H	710	525	392	(276)	260	(251)
N.C.H.	-	-	-	-	-	-
Depth, in feet	644	645	900	785	735	510
°F	- [2]	- [2]	- [2]	-	- [2]	85
Date	10-27-52	4-28-52	4-28-52	7-14-53	4-28-52	2-17-53
Lab.	H	H	H	DWR	H	DWR
No.	68246	64810	64825	3275	64820	2866

	10S/6E-28B1 [1]	10S/6E-28D1 [1]	10S/6E-29B1 [1]	10S/6E-29K1 [1]	10S/6E-33D1	10S/6E-35N1
Ca	228	164	98.9	150	143	71
Mg	2.4	4.9	4.9	3.7	21	9
Na	a242.4	a106.5	a36.1	a11.7	80	125
K	-	-	-	-	4	6.4
CO_3	0	0	0	0	2	0
HCO_3	85.4	104.9	117.7	149.5	159	101
SO_4	748	410.2	149.6	160.2	147	316
Cl	183	105	64.5	89.4	103	71
F	-	-	-	-	.6	.8
NO_3	19.4	27.6	28.6	29.8	207	3.5
B	.1	.05	.05	.01	.06	.12
Sum	1,466	871	442	520	787	653
% Na	48	35	23	6	28	55
Sp C	3,395	1,833	1,122	1,250	1,084	930
pH	7.5	7.3	7.7	7.4	8.1	7.8
Total H	580	430	255	390	(443)	214
N.C.H.	-	-	-	-	-	-
Depth, in feet	915	644	662	599	500	325
°F	- [2]	- [2]	- [2]	- [2]	70	75
Date	4-28-52	4-28-52	4-28-52	4-28-52	4-1-52	1-13-53
Lab.	H	H	H	H	DWR	DWR
No.	64816	64813	64815	64817	1970	2718

Table 2A

	10S/7E-19M1	11S/6E-1C1	11S/6E-2C1	11S/6E-7K1	11S/6E-9B1	11S/6E-10N1
Ca	88	66	75	10	42	128
Mg	2	10	5	.2	9	22
Na	210	135	a140	88	76	225
K	10.3	8.2	-	2.5	4.3	8.1
CO_3	0	0	-	10	0	0
HCO_3	34	83	105	68	134	156
SO_4	354	331	320	(61)	122	(382)
Cl	215	75	70	60	56	270
F	.8	.6	-	-	.7	-
NO_3	3.5	0	-	.1	5.4	3.9
B	.22	.24	.28	-	.04	-
Sum	901	668	663	(266)	382	(1,117)
% Na	66	60	58	87	53	54
Sp C	1,453	946	1,010	483	584	1,550
pH	7.5	7.9	7.4	9.1	7.6	7.7
Total H	228	(206)	(208)	26	142	410
N.C.H.	-	-	-	0	-	282
Depth, in feet	418	425	300	-	400	387
°F	90	84	- 2/	62	64	76
Date	1-13-53	2-17-53	8-7-52	1-5-54	1-13-53	1-8-54
Lab.	DWR	DWR	UC	GS	DWR	GS
No.	2715	2864	8879	10198	2713	10211

	11S/6E-11D1	11S/6E-15F1	11S/6E-22A1	11S-7E-20P1	11S/7E-30K2	11S/7E-32Q1
Ca	17	26	28	172	22	15
Mg	4	3.5	8	33	2	.6
Na	80	75	72	225	110	89
K	2.5	3.4	4.5	9.6	5.9	4.6
CO_3	10	0	0	0	0	0
HCO_3	54	100	127	108	88	52
SO_4	121	(102)	54	(596)	100	(82)
Cl	32	41	70	250	88	62
F	1.0	-	.6	-	.04	-
NO_3	5	1.1	4.5	5.4	10.4	29
B	.04	-	.06	-	.06	-
Sum	300	(302)	305	(1,345)	382	(308)
% Na	74	66	61	46	80	81
Sp C	442	521	549	2,100	676	550
pH	8.2	8.0	7.9	7.8	7.7	8.2
Total H	58	80	(103)	564	(63)	40
N.C.H.	-	0	-	476	-	0
Depth, in feet	693	122	116	368	146	463
°F	81	77	-	83	76	86
Date	1-13-53	1-6-54	2-19-53	1-8-54	2-19-53	1-7-54
Lab.	DWR	GS	DWR	GS	DWR	GS
No.	2716	10203	2867	10210	2865	10204

Table 2A

Part 2.- Ocotillo Valley Area

(Analyses in parts per million)

	12S/8E-6P1	12S/8E-8K1	12S/8E-10N1	12S/8E-22E1	12S/8E-24Q1
Calcium (Ca)	16	20	20	16	97
Magnesium (Mg)	1.6	3.3	1.8	1.8	14
Sodium (Na)	109	112	232	177	385
Potassium (K)	4.1	3.5	3.8	3.4	10
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate(HCO_3	102	118	78	96	76
Sulfate (SO_4)	(40)	(62)	(232)	(145)	(590)
Chloride (Cl)	116	106	185	147	335
Fluoride (F)	-	-	-	-	-
Nitrate (NO_3)	.2	.5	.1	.3	.6
Boron (B)	-	-	-	-	-
Sum of determined constituents	(338)	(366)	(714)	(538)	(1470)
Percent sodium	82	78	89	88	73
Specific conductance Micromhos @ 25°C (EC x 10^6 @ 25°C)	639	692	1,210	936	2,280
pH	7.8	7.9	8.0	7.7	7.5
Total hardness as $CaCO_3$	46	64	58	48	300
Non-carbonate hardness	0	0	0	0	237
Depth, in feet	293	-	222	226	220
Temperature (°F)	93	89	97	-	84
Date collected	1-8-54	1-8-54	1-8-54	1-8-54	1-8-54
Analyzing laboratory	GS	GS	GS	GS	GS
Laboratory number	10208	10209	10207	10206	10205

Part 3.- San Felipe Valley Area

(Analyses in parts per million)

	12S/4E-24K1	12S/5E-34J1	12S/6E-17X1
Calcium (Ca)	56	108	260
Magnesium (Mg)	15	31	83
Sodium (Na)	60	a189	320
Potassium (K)	2.5	-	17
Carbonate (CO_3)	0	-	0
Bicarbonate (HCO_3)	228	189	216
Sulfate (SO_4)	(81)	400	(1062)
Chloride (Cl)	44	181	300
Fluoride (F)	-	-	-
Nitrate (NO_3)	2.0	2.5	1.6
Boron (B)	-	.27	-
Sum of determined constituents	(374)	1006	(2152)
Percent sodium	39	51	41
Specific conductance Micromhos @ 25°C (EC x 10^6 @ 25°C)	662	1490	3000
pH	7.9	8.4	7.4
Total hardness as $CaCO_3$	201	(397)	990
Non-carbonate hardness	14	-	813
Depth, in feet	97	-	60
Temperature (°F)	-	-	79
Date collected	1-4-54	4-30-52	1-8-54
Analyzing laboratory	GS	DWR	GS
Laboratory number	10197	2412	10212

Table 2A

Part 4.- Vallecito Valley Area

(Analyses in parts per million)

	Mason Valley (3)	Vallecito Valley (4)	14S/6E-3X1	14S/6E-10X1	15S/8E-7X1
Calcium (Ca)	90	129	185	80	41
Magnesium (Mg)	27	40.2	48	29	6.0
Sodium (Na)	90	130	180	116	84
Potassium (K)	5.0	5.5	7.8	3.4	1.0
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	160	486	244	242	224
Sulfate (SO_4)	(258)	372	(597)	(269)	(39)
Chloride (Cl)	96	116	170	68	60
Fluoride (F)	-	1.1	-	-	-
Nitrate (NO_3)	2.9	2.5	0	.5	2.8
Boron (B)	-	.3	-	-	-
Sum of determined constituents	(649)	1,040	(1,310)	(687)	(346)
Percent sodium	36	36	37	44	59
Specific conductance Micromhos @ 25°C (EC x 10^6 @ 25°C)	1,080	1,440	1,920	1,120	622
pH	7.1	7.5	7.6	7.6	7.8
Total hardness as $CaCO_3$	336	(486)	659	318	127
Non-carbonate hardness	204	-	459	120	0
Depth, in feet	-	-	shallow	-	106
Temperature (°F)	73	-	69	73	-
Date collected	1-5-54	4-30-52	1-5-54	1-5-54	1-5-54
Analyzing laboratory	GS	PL	GS	GS	GS
Laboratory number	10199	P-285	10201	10200	10202

3. Sample taken from effluent stream (fed by ground water) at lower end of valley.

4. Sample taken from spring near Campbell ranch.

Table 3A.- Drillers' logs of water wells

Part 1.- Borrego Valley Area

10S/6E-5F1. Buerkle Bros. Drilled by Pacific Coast Drilling Co. (C. E. Covey). 16-inch casing. Altitude about 809 feet. Perforated: 250-700 feet. Reported yield: 2,400 gpm; drawdown 26 feet.

Material	Thickness (feet)	Depth (feet)
Sand	10	10
Boulders	35	45
Sand and gravel	30	75
Sand, gravel and boulders	33	108
Boulders	12	120
Coarse sand	45	165
Sandy clay	5	170
Coarse sand	34	204
Boulders	14	218
Coarse sand	22	240
Boulders	30	270
Coarse sand	61	331
Boulders	14	345
Sand	59	404
Medium sand	16	420
Boulders	11	431
Boulders and sand	24	455
Coarse sand	10	465
Boulders	15	480
Coarse sand	10	490
Boulders	7	497
Coarse sand	53	550
Boulders and coarse sand	23	573
Coarse sand and gravel	39	612
Boulders	48	660
Sand and gravel	8	668
Boulders	12	680
Coarse sand	3	683
Boulders	7	690
Sand	5	695
Boulders	9	704

Table 3A

10S/6E-8A1. Buerkle Bros. Drilled by Mann Brothers Drilling Co. 16-inch casing. Altitude about 760 feet. Perforated: 300-624 feet.

Material	Thickness (feet)	Depth (feet)
Surface	90	90
Hard sand and rocks	22	112
Medium and fine sand	8	120
Medium coarse sand and rock	16	136
Medium fine sand	16	152
Fine and hard sand	11	163
Rock	13	176
Medium fine with rock streaks	27	203
Medium sand and conglomerate	23	226
Medium and medium fine sand	34	260
Fine tight sand	20	280
Medium coarse sand with rock	38	318
Medium and medium fine sand	30	348
Medium sand	22	370
Rock	20	390
Medium sand	30	420
Shale and medium fine sand	30	450
Medium sand	16	466
Hard shale	12	478
Medium sand and rock	8	486
Medium coarse sand	56	542
Shale	8	550
Rock	10	560
Rock and shale	8	568
Medium sand	12	580
Medium coarse sand	20	600
Gravel	24	624
Medium fine sand		624

10S/6E-9F1. J. J. Kovacevich. Drilled by Pacific Coast Drilling Co. 16- and 12-inch casing. Altitude about 718 feet. Perforated: 244-780 feet. Reported yield: 2,350 gpm, drawdown 21 feet.

Material	Thickness (feet)	Depth (feet)
Sand	80	80
Coarse sand	40	120
Fine sand	40	160
Gravel and coarse sand	125	285
Coarse sand, streaks of clay	90	375
Silty clay	17	392
Coarse sand and gravel	118	510
Boulders	5	515
Sand and gravel	10	525
Coarse sand	45	570
Coarse sand, streaks of clay	46	616
Coarse sand	19	635
Sand, streaks of clay	15	650
Coarse sand	25	675
Sand, streaks of clay	10	685
Coarse sand and gravel	90	775
Sand and clay	8	783

10S/6E-9N1. S. Fortiner. Drilled by Roscoe Moss. 16-inch casing. Altitude about 709 feet. Perforated: 250-254, 268-272, 408-480, 506-514, and 572-607 feet. Reported yield: 1,500 gpm, drawdown 32 feet.

Sand	170	170
Silt	60	230
Gravel	10	240
Silt	10	250
Gravel	6	256
Silt	12	268
Gravel	4	272
Clay and silt	94	366
Gravel	6	372
Clay and silt	18	390
Sand	18	408
Clay and sand with streaks of gravel	42	450
Boulders	30	480
Silt	26	506
Sand and fine gravel	8	514
Sand	58	572
Sand and few gravel	35	607
Sand	27	634

10S/6E-10M1. J. A. Marovich. Drilled by Pacific Coast Drilling Co. 16- and 12-inch casing. Altitude about 700 feet. Perforated: 272-498 and 504-762 feet. Reported yield: 2,300 gpm, drawdown 18 feet.

Material	Thickness (feet)	Depth (feet)
Medium sand, streaks of clay	194	194
Gravel and boulders	10	204
Coarse sand and gravel, streaks of clay	122	326
Coarse sand	111	437
Gravel and boulders, streaks of clay	45	482
Coarse sand	89	571
Coarse sand and gravel, streaks of clay	41	612
Medium sand	32	644
Coarse sand	66	710
Coarse sand and gravel	46	756
Sandy clay	6	762

10S/6E-15D1. Di Giorgio Fruit Corp. - Borrego Farms. 16-inch casing. Altitude about 685 feet.

Sand	20	20
Sand (clay streaks)	68	88
Sand and boulders	16	104
Sandstone (clay streaks and boulders)	27	131
Rock	5	136
Sand and boulders	20	156
Sandy clay	4	160
Sand (clay streaks)	12	172
Sandstone and sand	27	199
Sand and boulders	44	243
Clay and sandstone	17	260
Sand and boulders	111	371
Sand (clay streaks)	22	393
Packed sand and sandstone	53	446
Sand (some boulders)	41	487
Sand	45	532
Hard sand	9	541
Sand and boulders	5	546
Sand	8	554
Sand (small boulders)	15	569
Sandstone, sand and boulders	20	589
Hard sand and boulders	11	600
Sand and boulders	10	610
Sandy clay	5	615
Sand	7	622
Sandy clay	7	629
Fine sand	10	639
Sandy clay	7	646
Sandy and boulders	22	668
Sticky clay	2	670
Sand and boulders	10	680
Fine sand	5	685
Sand (clay streaks)	5	690
Sand and boulders	18	708
Hard clay and boulders	4	712

10S/6E-16N1. Di Giorgio Fruit Corp. - Borrego Farms. 16-inch casing. Altitude about 676 feet.

Material	Thickness (feet)	Depth (feet)
Surface soil	6	6
Sand and silt	122	128
Sand and boulders	70	198
Sandy clay	10	208
Sand and boulders	55	263
Sandy clay	31	294
Sand	41	335
Sandy clay, clay streaks	208	543
Sand	182	725
Clay	5	730
Sand	29	759
Clay	38	797

10S/6E-17C1. Borrego Cooperative Farms. Drilled by Claude E. Kelley. 14- and 12-inch casing. Altitude about 721 feet. Perforated: 243-411 and 414-558 feet.

Surface sand and silt	228	228
Gravel	14	242
Fine sand	12	254
Gravel	9	263
Silt	7	270
Silt and sand with streaks of clay	35	305
Gravel	12	317
Silty clay with streaks of sand	85	402
Sand	10	412
Clay	6	418
Boulders	21	439
Clay	7	446
Boulders	16	462
Clay and silt	16	478
Gravel	12	490
Clay	8	498
Sand	60	558

Table 3A

10S/6E-20B1. Di Giorgio Fruit Corp. - Borrego Farms. 16-inch casing. Altitude about 657 feet.

Material	Thickness (feet)	Depth (feet)
Top sand and clay streaks	40	40
Tight sand and silt	25	65
Packed sand and silt	24	89
Sandy clay and sandstone streaks	29	118
Packed sand	15	133
Packed sand and boulders	23	156
Hard white sand and boulders	45	201
Packed sand and boulders	20	221
Sandy clay, hard streaks	13	234
Sand, hard streaks	26	260
Sand, clay and silt streaks	30	290
Sand and sandy clay	26	316
Packed sand and boulders	11	327
Sand, hard streaks	7	334
Sticky clay	12	346
Sandy clay, shale streaks	39	385
Sandy clay and boulders	40	425
Sand, small boulders	13	438
Sandy clay	7	445
Packed sand	13	458
Sand, hard streaks	5	463
Sandy clay, hard streaks	20	483
Sand and boulders	10	493
Sandy clay	42	535
Sand and packed sand	26	561
Sandy clay, dry clay	30	591
Sand, clay streaks	19	610
Sand and boulders	8	618
Sandy clay, sand streaks	8	626
Sand streaks, hard clay	6	632
Sandy clay, streaks of boulders	6	638
Hard sandy clay	11	649
Sandy clay and boulders	7	656
Clay	6	662

10S/6E-21B1. Di Giorgio Fruit Corp. - Borrego Farms. 16-inch casing. Altitude about 664 feet.

Material	Thickness (feet)	Depth (feet)
Surface sand	32	32
Coarse sand	46	78
Sand and boulders	32	110
Coarse sand	21	131
Sand and soft sandstone	14	145
Sandy clay	35	180
Coarse sand and boulders	16	196
Sandy clay	10	206
Sand, sandstone and boulders	24	230
Sandy clay	4	234
Sand and boulders	10	244
Sandy clay	5	249
Sand and boulders	10	259
Sand (clay streaks)	10	269
Sandy clay	4	273
Sand and boulders	14	287
Sandy clay	6	293
Sand and boulders	22	315
Sandy clay	4	319
Coarse sand and boulders	24	343
Coarse sand	13	356
Sandy clay	4	360
Coarse sand	20	380
Sandy clay	12	392
Sand, gravel and boulders	17	409
Sand and boulders	12	421
Sandy clay	9	430
Hard clay	11	441
Sand and boulders	11	452
Sand (clay streaks)	8	460
Sand and boulders	5	465
Sandy clay	10	475
Sand and boulders	22	497
Clay	17	514
Sand and boulders	16	530
Clay	9	539
Fine hard sand	7	546
Sandy clay	23	569
Sand	11	580
Sand and clay	15	595
Sand	7	602
Hard clay	15	617
Sandy clay	6	623
Sand and boulders	16	639
Fine sand	12	651
Clay	4	655
Sand and boulders	12	667
Sticky clay	5	672

10S/6E-21E1. Di Giorgio Fruit Corp. - Borrego Farms. 16-inch casing. Altitude about 639 feet.

Material	Thickness (feet)	Depth (feet)
Surface sand	4	4
Sand	76	80
Coarse sand	125	205
Sandy clay	80	285
Coarse sand, streaks of clay	60	345
Coarse sand and gravel	7	352
Sandy clay	83	435
Sand	19	454
Clay	6	460
Coarse sand	26	486
Coarse sand and gravel	64	550
Coarse sand, streaks of clay	30	580
Clay	60	640
Coarse sand	31	671
Coarse sand and gravel	109	780
Clay and gravel	50	830
Coarse sand	70	900

10S/6E-21L1. Di Giorgio Fruit Corp. - Borrego Farms. 16-inch casing. Altitude about 633 feet.

Surface sand and packed sand	47	47
Sand, dry clay streaks	8	55
Coarse sand, clay streaks	11	66
Packed sand and sandstone	39	105
Sandstone, sandy clay streaks	23	128
Hard white sand and small boulders	12	140
Coarse sand and small boulders	16	156
Hard dry clay, sandstone streaks	6	162
Hard white sand	8	170
Coarse sand (hard)	8	178
Hard clay and small boulders	4	182
Hard sand, clay streaks	16	198
Sandy clay, boulders, sandstone streaks	25	223
Sandstone, boulder streaks	38	261
Sandstone, clay streaks	8	269
Sandy clay	3	272
Sandy clay and sandstone	31	303
Hard white sand, sandy clay streaks	9	312
Hard sandy clay	8	320
Sand and sandstone	4	324

10S/6E-21L1.--Continued.

Material	Thickness (feet)	Depth (feet)
Sandy clay and boulders	22	346
Hard sand, rock ledges	4	350
Hard dry clay	11	361
Sandy clay and boulders	19	380
Packed sand, sandy clay, some boulders	33	413
Packed sand and blue clay	7	420
Coarse sand and boulders	4	424
Packed sand and boulders	12	436
Clay, sandy clay and boulders	14	450
Sandstone and hard clay	10	460
Hard sand and sandy clay	11	471
Clay and sand	21	492
Clay and boulders	26	518
Clay, sand streaks	15	533
Free sand and clay	8	541
Sand, clay streaks	7	548
Sand	12	560
Coarse gravel and sand	15	575
Hard dry clay	35	610
Sand and clay	10	620
Sand and boulders	8	628
Clay	3	631
Sand, clay streaks	9	640
Clay	4	644

10S/6E-22A1. J. J. Lynn Farms. Drilled by Claude E. Kelley.
14-, 12-, and 10-inch casing. Altitude about 650 feet.
Perforated: 264-912 feet.

Surface sand with streaks clay and fine gravel	150	150
Sand with boulders, rough, hard	103	253
Clay	14	267
Sand	78	345
Clay	12	357
Sand	103	460
Clay	15	475
Sand, rough and hard	109	584
Clay	18	602
Coarse hard sand	153	755
Clay	13	768
Sand with rough spots	78	846
Clay	13	859
Rough hard sand	53	912

10S/6E-22A2. J. J. Lynn Farms. Drilled by Claude E. Kelley. 14-, 12-, and 10-inch casing. Altitude about 640 feet. Perforated: 260-908 feet.

Material	Thickness (feet)	Depth (feet)
Surface sand with streaks clay and fine gravel ---	212	212
Clay ----------	8	220
Sand ----------	18	238
Clay ----------	18	256
Sand ----------	31	287
Clay ----------	25	312
Sand with streaks clay ----------	148	460
Clay ----------	41	501
Coarse sand ----------	14	515
Clay ----------	13	528
Fine gravel ----------	108	636
Clay ----------	22	658
Coarse sand with streaks clay ----------	172	830
Clay ----------	21	851
Gravel ----------	57	908

10S/6E-22B2. J. J. Lynn Farms. Drilled by Claude E. Kelley. 14-, 12-, and 10-inch casing. Altitude about 655 feet. Perforated: 219-627 and 630-750 feet.

Sand with streaks clay ----------	254	254
Clay ----------	13	267
Fine sand ----------	16	283
Clay ----------	27	310
Sand with streaks clay ----------	161	471
Clay ----------	16	487
Sand ----------	146	633
Clay ----------	22	655
Coarse gravel with streaks sand ----------	36	691
Clay ----------	17	708
Coarse gravel with streaks sand ----------	42	750

10S/6E-22B4. J. J. Lynn Farms. Drilled by Claude E. Kelley. 14-, 12-, and 10-inch casing. Altitude about 650 feet. Perforated: 219-603 and 605-770 feet.

Material	Thickness (feet)	Depth (feet)
Surface sand with streaks clay	191	191
Fine gravel and coarse sand	42	233
Clay	25	258
Fine silty sand	13	271
Sand with streaks of clay	165	436
Sand and fine gravel	26	462
Clay	16	478
Sand and fine gravel	111	589
Clay	19	608
Sand and fine gravel	19	627
Sand with streaks clay	23	650
Sand and fine gravel	59	709
Clay	19	728
Sand and gravel	38	766
Clay	4	770

10S/6E-22D1. Dr. Leon G. Campbell. Drilled by Pacific Coast Drilling Co. 16-inch casing. Altitude about 640 feet. Perforated: 210-735 feet. Reported yield: 2,300 gpm, drawdown 44 feet.

Surface soil	34	34
Coarse sand	56	90
Medium sand	117	207
Coarse sand, streaks of clay	68	275
Coarse sand and gravel	160	435
Coarse sand	15	450
Fine sand	25	475
Sand and gravel	50	525
Clay	25	550
Clay, streaks of coarse sand	85	635
Coarse sand	13	648
Gravel	9	657
Clay	53	710
Clay, streaks of coarse sand	25	735

Table 3A

10S/6E-23B1. J. J. Lynn Farms. Drilled by Claude E. Kelley. 14-, 12-, and 10-inch casing. Altitude about 630 feet. Perforated: 264-672 and 675-908 feet.

Material	Thickness (feet)	Depth (feet)
Surface sand with streaks clay and fine gravel-----	192	192
Coarse sand ----------	18	210
Clay ----------	26	236
Sand with streaks clay ----------	64	300
Clay ----------	17	317
Fine gravel ----------	22	339
Clay ----------	31	370
Sand and fine gravel ----------	28	398
Clay ----------	18	416
Tight sand ----------	31	447
Clay ----------	19	466
Sand and boulders ----------	49	515
Clay ----------	23	538
Tight, hard sand with streaks clay ----------	252	790
Gravel with boulders ----------	24	814
Clay ----------	19	833
Boulders ----------	75	908

10S/6E-23C2. J. J. Lynn Farms. Drilled by Claude E. Kelley. 14-, 12-, and 10-inch casing. Altitude about 640 feet. Perforated: 267-888 feet.

Surface sand with streaks clay and fine gravel ----	216	216
Sand with streaks clay ----------	109	325
Sandy shale ----------	55	380
Coarse sand ----------	16	396
Clay ----------	29	425
Fine gravel ----------	46	471
Clay ----------	18	489
Coarse sand ----------	49	538
Clay ----------	29	567
Sand with streaks clay ----------	104	671
Fine gravel ----------	19	690
Clay with streaks sand ----------	58	748
Coarse sand ----------	34	782
Clay with streaks sand ----------	63	845
Fine rough gravel ----------	43	888

Table 3A

10S/6E-23M1. J. J. Lynn Farms. Drilled by Claude E. Kelley. 14-, 12-, and 10-inch casing. Altitude about 630 feet. Perforated: 264-912 feet.

Material	Thickness (feet)	Depth (feet)
Surface sand with streaks clay	97	97
Sand with streaks fine gravel	68	165
Clay	13	178
Sand	67	245
Clay	20	265
Sand with streaks clay	271	536
Clay	22	558
Sand	138	696
Clay	34	730
Sand, hard and rough	79	809
Clay	22	831
Sand and fine gravel	81	912

10S/6E-23M2. J. J. Lynn Farms. Drilled by Claude E. Kelley. 14-, 12-, and 10-inch casing. Altitude about 625 feet. Perforated: 264-912 feet.

Surface sand and clay	95	95
Sand and gravel	73	168
Clay	12	180
Sand	63	243
Clay	23	266
Sand with small streaks clay	274	540
Clay	20	560
Sand (rough at 670)	145	705
Clay	18	723
Sand and boulders (rough)	82	805
Clay	23	828
Sand and gravel (rough)	84	912

10S/6E-24C1. Mrs. Walter Pallman. Drilled by W. A. Borden. 12-inch casing. Altitude about 650 feet.

Soil and sand	6	6
Dry sand and gravel	34	40
Sand, mud and clay	22	62
Yellow clay and sand	10	72
Hard sand and rocks	8	80
Dry sand	32	112
Conglomerate, hard, water under cong.	2	114
Sand, some rocks	18	132
Quicksand and rocks	8	140
Good gravel, some sand	10	150
Bedrock at bottom		

Table 3A

10S/6E-28B1. Di Giorgio Fruit Corp.- Borrego Farms. 16-inch casing. Altitude about 614 feet.

Material	Thickness (feet)	Depth (feet)
Top soil	12	12
Sand and gravel	15	27
Yellow clay	9	36
Sand	4	40
Sand and gravel	14	54
Yellow clay	6	60
Sand and gravel	5	65
Yellow clay	4	69
Sand (few boulders)	15	84
Clay (sandstone ledges)	6	90
Sand (few boulders)	6	96
Sandy clay (sandstone ledges)	4	100
Coarse sand	12	112
Clay (sand streaks)	6	118
Coarse sand and boulders	16	134
Sandy clay	5	139
Coarse sand and boulders	16	155
Sandy clay	7	162
Sand and boulders	23	185
Clay	4	189
Sand and boulders	76	265
Clay	7	272
Sand and boulders	8	280
Yellow clay	17	297
Sand and boulders	4	301
Yellow clay	13	314
Fine hard sand	29	343
Coarse sand and boulders	13	356
Yellow clay	7	363
Coarse sand and boulders	7	370
Fine sand and boulders	27	397
Sandy clay	8	405
Hard white sand and boulders	23	428
Sandy clay	4	432
Coarse sand and boulders	15	447
Brown clay	10	457
Coarse sand and boulders	17	474
Clay	10	484
Sand and boulders	32	516
Sandy clay	7	523
Sand	8	531
Clay	6	537
Sand and boulders	9	546
Clay	7	553
Sand and boulders	9	562
Clay	6	568
Sand and boulders	26	594
Clay	8	602
Sand	18	620

Table 3

10S/6E-28B1.--Continued.

Material	Thickness (feet)	Depth (feet)
Sandy clay	17	637
Sand and boulders	26	663
Sandy clay	3	666
Sand and boulders	11	677
Sandy clay	3	680
Sand and boulders	20	700
Sandy clay	3	703
Sand and boulders	26	729
Sandy clay	2	731
Sand	20	751
Sand (few boulders)	15	766
Clay	2	768
Sand (few boulders)	6	774
Clay	2	776
Sand and boulders	20	796
Soft sandy clay	4	800
Sand and boulders	23	823
Soft yellow clay	4	827
Sand and boulders	13	840
Soft yellow clay	3	843
Sand and boulders	14	857
Soft yellow clay	3	860
Sand and boulders	17	877
Soft yellow clay	4	881
Sand and boulders	6	887
Sticky clay	6	893
Sand and boulders	7	900
Sandy clay	8	908
Hard brown clay	7	915

10S/6E-28D1. Di Giorgio Fruit Corp.- Borrego Farms. 16-inch casing. Altitude about 607 feet.

Surface sand	15	15
Packed sand	35	50
Sandstone	10	60
Sandstone and clay	16	76
Sandstone, streaks of clay and sand	8	84
Clay	8	92
Packed sand, sandstone streaks	43	135
Sand and boulders	14	149
Sandstone, sand and boulders	15	164
Coarse sand	15	179
Sand and boulders	8	187
Sand	9	196
Sandy clay	14	210
Sand and sandstone	12	222

10S/6E-28D1.--Continued.

Material	Thickness (feet)	Depth (feet)
Sandy clay and sandstone	39	261
Sand, clay streaks	26	287
Sticky clay, sand streaks	8	295
Sticky clay	5	300
Sandy clay, sand streaks	10	310
Sand, clay streaks	4	314
Hard clay	14	328
Sand and boulders	5	333
Sandy clay and sand	6	339
Hard clay	6	345
Sandy clay	10	355
Sand and sandstone	6	361
Sandy clay	19	380
Sandy clay, sand streaks	34	414
Sand	16	430
Sandy clay	15	445
Sand, clay streaks	16	461
Sandy clay	19	480
Sand and boulders	10	490
Sticky clay	24	514
Coarse sand	4	518
Sand, clay streaks	10	528
Clay	7	535
Sand	3	538
Clay	6	544
Sticky clay	6	550
Sand	5	555
Sandy clay	8	563
Sandy clay and boulders	17	580
Sticky clay and boulders	20	600
Hard dry clay and boulders	8	608
Sand and boulders	8	616
Sandy clay	4	620
Sand	4	624
Sticky clay	4	628
Sand	8	636
Sticky clay	8	644

Table 3A

10S/6E-29B1. Di Giorgio Fruit Corp.- Borrego Farms. 16-inch casing. Altitude about 610 feet.

Material	Thickness (feet)	Depth (feet)
Top sand	12	12
Coarse sand	8	20
Sand (few boulders)	5	25
Sandy clay	12	37
Sand	13	50
Coarse sand and boulders	15	65
Sand and clay	10	75
Sandstone	2	77
Sand and boulders	8	85
Coarse sand	25	110
Sand and boulders	28	138
Sandy clay	8	146
Sand, some boulders	34	180
Sandy clay	10	190
Sand	15	205
Sandy clay	7	212
Sand	13	225
Hard clay	5	230
Coarse sand	16	246
Clay (soft)	11	257
Sand	8	265
Clay	5	270
Sand and boulders	6	276
Clay	4	280
Blue clay	10	290
Sand and sandstone	28	318
Hard clay	16	334
Coarse sand	5	339
Sandy clay and sandstone	7	346
Sticky clay	5	351
Hard dry clay	12	363
Sand	15	378
Clay	6	384
Sand and boulders	37	421
Soft clay	5	426
Sand	10	436
Sand and boulders	20	456
Clay	6	462
Sand, boulders and sandstone	39	501
Clay	13	514
Sand and boulders	16	530
Hard sandy clay	12	542
Sand and boulders, sandstone ledges	15	557
Clay	5	562
Sand and boulders	10	572
Clay	15	587
Sand, few boulders	12	599
Sandy clay	6	605
Coarse sand	8	613
Clay	6	619
Sand and boulders	17	636
Sandy clay	6	642

10S/6E-33D1. J. J. Kovacevich. Drilled by Pacific Coast Drilling Co. 16-inch casing. Altitude about 576 feet. Perforated: 100-317, 337-409, and 429-500 feet.

Material	Thickness (feet)	Depth (feet)
Surface soil	8	8
Sand	40	48
Clay	3	51
Sand, streaks of clay	316	367
Sand and boulders	27	394
Sand and clay	37	431
Sand, streaks of clay	49	480
Packed sand	17	497
Clay	3	500

10S/6E-34F1. Joseph V. Costello, Jr. Drilled by Claude E. Kelley. 14-, 12-, and 10-inch casing. Altitude about 570 feet. Perforated: 123-438 feet.

Surface	60	60
Gravel	30	90
Clay	30	120
Fine gravel and coarse sand	3	123
Clay	41	164
Coarse sand	8	172
Clay	8	180
Gravel	6	186
Clay	22	208
Fine gravel	6	214
Clay	29	243
Coarse gravel	16	259
Clay	24	283
Sand	23	306
Sticky clay	12	318
Coarse gravel	16	334
Clay	13	347
Coarse sand	21	368
Clay	19	387
Gravel	15	402
Clay	12	414
Gravel	22	436
Clay	2	438

Table 3A

10S/6E-34H1. N. Jack Benson. Drilled by Claude E. Kelley. 14-, 12-, and 10-inch casing. Altitude about 569 feet. Perforated: 123-462 feet.

Material	Thickness (feet)	Depth (feet)
Surface sand and gravel	121	121
Clay with streaks gravel and sand	93	214
Clay with small streaks of coarse sand and fine gravel	82	296
Gravel	46	342
Clay	25	367
Sandy clay	22	389
Clay	8	397
Gravel	17	414
Clay	20	434
Clay with streaks of gravel	22	456
Clay	9	465

10S/6E-36Q1. Al Jones. Drilled by W. A. Borden. 10-inch casing. Altitude about 535 feet. Reported yield 500-600 gpm.

Surface soil	9	9
Sand and clay	5	14
Clay	6	20
Quicksand	22	42
Sloppy clay and sand, first water at 42 ft	26	68
Hard yellow clay	3	71
Fine sand	18	89
Soft clay	10	99
Yellow clay	5	104
Gray clay	4	108
Blue quicksand	8	116
Yellow clay	2	118
Sloppy blue quicksand	54	172
Gray clay	4	176
Blue quicksand	5	181
Tough blue clay	22	203
Fine blue quicksand	98	301
Broken shale, clay formation	11	312
Brown clay	12	324
Good gravel, $\frac{1}{4}$ inch to $2\frac{1}{2}$ inches in size, very little sand	32	356

Table 3A

10S/7E-30F1. Raymond Pedersen. Drilled by Claude E. Kelley. 14-, 12-, and 10-inch casing. Altitude about 597 feet. Perforated: 146-560 feet.

Material	Thickness (feet)	Depth (feet)
Surface sand and clay	143	143
Gravel	25	168
Clay with streaks soft sand	36	204
Gravel	16	220
Clay	22	242
Gravel and boulders	20	262
Clay	27	289
Gravel	13	302
Clay	15	317
Coarse sand	11	328
Clay with streaks soft sand	34	362
Gravel	11	373
Clay with streaks sand	45	418
Gravel	10	428
Coarse sand	70	498
Gravel	18	516
Sandy clay	12	528
Coarse gravel	32	560

11S/6E-1C1. C. E. Massae. Drilled by Mann Bros. Drilling Co. 14-inch casing. Altitude about 535 feet. Perforated: 123-420 feet.

Surface	56	56
Medium fine and fine sand	46	102
Fine tight and fine sand	18	120
Medium fine sand	18	138
Medium sand	26	164
Medium fine and quicksand	26	190
Clay	28	218
Medium and medium fine sand	12	230
Medium and medium coarse sand	24	254
Fine sand with clay streaks	16	270
Clay and fine sand	20	290
Sticky clay	22	312
Medium and medium coarse sand	38	350
Medium and fine sand	20	370
Medium and medium coarse sand	10	380
Medium coarse sand with rock	45	425

Table 3A

11S/6E-3C1. A. A. Bernand. Drilled by Mann Bros. Drilling Co. 14-inch casing. Altitude about 540 feet. Perforated: 120-420 feet. Estimated yield: 700 gpm.

Material	Thickness (feet)	Depth (feet)
Silt and surface sand with clay	85	85
Medium fine sand	29	114
Clay streak	4	118
Medium and medium fine sand	16	134
Medium sand	19	153
Clay and fine sand	5	158
Medium coarse and medium sand	7	165
Medium and medium fine sand	15	180
Medium sand	13	193
Fine sand and clay streaks	11	204
Medium fine and fine sand	62	266
Medium coarse and medium sand	12	278
Medium sand	12	290
Fine silt	15	305
Fine loose sand	15	320
Medium fine sand, in and out	40	360
Medium and medium coarse sand	20	380
Clay and fine sand	6	386
Medium and medium coarse sand	59	445

11S/6E-3M1. Perry Bernand. Drilled by W. A. Borden. 10-inch casing. Altitude about 540 feet.

Soil and silt	8	8
Sand	4	12
Sand and clay	15	27
Soft yellow clay	1	28
Cemented shale	1	29
Fine gravel and sand, first water, Sample No. 1	12	41
Hard sand	6	47
Yellow clay	5	52
Yellow packed sand	19	71
Clay with sand mixed with cemented shale	7	78
Yellow clay	2	80
Shale and sand with sediment	9	89
Sand and fine gravel, (cut)	8	97
Hard sand and clay	8	105
Hard yellow clay and sand	2	107

Table 3A

11S/6E-3M3. Perry Bernand. Drilled by W. A. Borden. 10-inch casing. Altitude about 542 feet. Reported yield 200 gpm.

Material	Thickness (feet)	Depth (feet)
Soil	7	7
Sand	3	10
Clay	5	15
Sand	14	29
Sloppy sand	2	31
Sand, water, (cut)	7	38
Fine gravel and shale, (cut)	4	42
Yellow clay	27	69
Sand, water, (cut)	6	75
Clay	9	84
Sand	3	87
Very tough gray clay	18	105

11S/6E-3N2. Perry Bernand. Drilled by W. A. Borden. 10-inch casing. Altitude about 536 feet. Reported yield: 200 gpm.

Soil	7	7
Dry sand	13	20
Clay and sand	12	32
Clay and shale	3	35
Clay and sand	2	37
Sand and fine clay	8	45
Sloppy clay	15	60
Clay and sand	15	75
Hard sand	12	87
Clay and sand	23	110
Sand and shale	4	114
Hard yellow clay	6	120

11S/6E-4A1. Yuhas. Drilled by W. A. Borden. 10-inch casing. Altitude about 545 feet. Reported yield: 300 gpm.

Soil	7	7
Sand and clay	21	28
Shale	3	31
Sand	9	40
Clay	6	46
Fine gravel	4	50
Sand and clay	28	78
Sand and fine gravel	19	97
Sloppy mud and sand	13	110
Sand	1	111
Clay	7	118

Table 3A

11S/6E-4D1. Kelsey. Drilled by W. A. Borden. 12-inch casing. Altitude about 575 feet.

Material	Thickness (feet)	Depth (feet)
Surface soil	8	8
Sand	12	20
Dry gravel	3	23
Hard sand	23	46
Hard sand and clay	5	51
Fine sand, surface water level (Not Cut)	2	53
Yellow clay and sand	4	57
Yellow clay	12	69
Fine gravel - (two feet cut)	2	71
Yellow clay and sand	31	102
Fine gravel - (four feet cut)	4	106
Clay	3	109
Dirty sand	26	135
Yellow clay	1	136
Fine sand	11	147
Cement formation some water (two feet cut)	2	149
Hard yellow sand	10	159
Hard clay with sand	5	164
Light yellow clay	3	167
Brown clay	7	174
Yellow sand and clay	7	181
Yellow clay	2	183
Dirty sand fine	8	191
Sand fine three feet	3	194
Sand	6	200
Sand fine	9	209
Clay	2	211
Fine sand	3	214
Clay and sand	5	219
Brown clay	1	220
Blue clay	4	224
Hard blue sand	6	230
Hard dry yellow sand	8	238
Blue clay	4	242
Brown clay	2	244
Light gray clay	10	254
Yellow sandy clay	6	260
Hard yellow sand	3	263
Gravel four feet (cut)	4	267
Yellow clay	1	268
Sand and yellow clay	1	269
Fine gravel, water pressure (one foot cut)	1	270
Fine yellow clay	2	272
Quicksand, yellow	10	282
Hard yellow sand	6	288
Good gravel (cut three feet)	3	291
Fine sand	2	293
Yellow sand	1	294
Quicksand and clay	12	306
Hard yellow sand and clay	15	321
Coarse sand with clay streaks	2	323
Hard brown clay	2	325
Sand with clay, water (cut)	22	347
Sand with clay	10	357
Clay and sand some fine gravel (size $\frac{1}{2}$" diameter)	4	361
Brown clay	17	378
Yellow clay	2	380
Hard clay with sand	4	384

Table 3A

11S/6E-11D2. Dr. Kosky. Drilled by W. A. Borden. 14-inch casing. Altitude about 497 feet. Perforated: 339-346, 354-365, 396-406, 430-446, and 479-489 feet.

Material	Thickness (feet)	Depth (feet)
Soil	8	8
Clay	10	18
Sand and rocks, surface water	6	24
Yellow clay	66	90
Blue clay	6	96
Fine sand, water. sample No. 1	2	98
Blue clay and sand	8	106
Sand, pea gravel, sample No. 2, artesian	20	126
Gray clay	12	138
Sloppy sand, very muddy	4	142
Blue clay	12	154
Hard blue clay, hard like shale	11	165
Sticky blue clay	11	176
Coarse sand, some water, sample No. 3	4	180
Clay mixed with sand	5	185
Gray clay, like talc (two feet thick)	2	187
Clay and sand mixed, blue in color	4	191
Blue clay	11	202
Brown clay tough	28	230
Blue shale, dry	15	245
Blue clay, little sand streaks but dry	13	258
Sticky brown clay	4	262
Hard brown clay	4	266
Yellow sandy clay	10	276
Blue clay	4	280
Light gray clay	4	284
Hard blue clay shale	8	292
Brown clay	13	305
Sandy clay	3	308
Fine gravel and sand, Sample No. 4, artesian water	2	310
Yellow clay	14	324
Gravel and sand, some small rock, walnut size, artesian	11	335
Clay	4	339
Gravel (cut with $\frac{1}{4}$-inch knife)	7	346
Sloppy sandy clay	6	352
Yellow clay	2	354
Gravel and sand. (Cut with $\frac{1}{4}$-inch knife)	11	365
Hard dry clay, sandy silt formation	13	378
Silt, sand, small gravel, no heave	18	396
Sand and small gravel, (cut with $\frac{1}{4}$-inch knife)	10	406
Dirty sand some streaks of clay	24	430
Small gravel $\frac{1}{2}$-inch size (cut with $\frac{1}{4}$-inch knife)	16	446
Streaks of clay, sandy	33	479
Sand and fine gravel $\frac{1}{4}$- to $\frac{1}{2}$-inch size, (cut $\frac{1}{4}$-inch knife)	10	489
Hard dry red clay	7	496
Well was bottomed at this depth and cemented off		

11S/6E-15E1. Paul Grimm. Drilled by James E. Wright. 10-inch casing. Altitude about 565 feet.

Material	Thickness (feet)	Depth (feet)
Surface	15	15
Shale	10	25
Clay	23	48
Sand and gravel	16	64
Fine sand	3	67
Clay	2	69
Clay and gravel	5	74
Sand and gravel	6	80
Sand	4	84
Clay	16	100
Sand and gravel	44	144
Clay	8	152

11S/6E-15F2. Ritz. Drilled by W. A. Borden. 10-inch casing. Altitude about 550 feet. Reported yield: approx. 350 gpm.

Soil	4	4
Hard adobe	2	6
Hard sand, dry formation	12	18
Gray clay, cement formation	30	48
Tough brown clay	4	52
Dry hard sand	5	57
Fine gravel, (cut)	4	61
Hard yellow shale and dirt	10	71
Sand	5	76
Fine gravel, (4 cuts, 8 inch)	8	84
Gray clay	24	108
Good gravel, (5 cuts, 10 inch)	2	110
Hard shale	2	112
Hardpan and sand	2	114
Fine gravel	6	120
Clay	2	122

11S/6E-16H1. Paul Grimm. Drilled by James E. Wright. 12-inch casing. Altitude about 585 feet. Perforated: 135-205, 217-270, and 295-350 feet. Reported yield: 600 gpm.

Material	Thickness (feet)	Depth (feet)
Surface	16	16
Shale	4	20
Hard silt and clay	48	68
Sand and gravel	19	87
Fine sand	3	90
Clay	17	107
Shale and lime	2	109
Fine sand	4	113
Sand and gravel	6	119
Clay	8	127
Fine sand	6	133
Sand, rock and gravel	8	141
Sand and gravel	64	205
Fine sand	12	217
Sand and gravel	12	229
Clay	4	233
Sand and gravel	32	265
Rock and gravel	4	269
Fine sand	24	293
Rock and gravel	4	297
Sand	6	303
Sand and gravel	18	321
Clay	2	323
Sand and gravel	17	340
Rock and gravel	10	350

11S/6E-22A1. Norris Bacco. Drilled by W. A. Borden. 10-inch casing. Altitude about 500 feet. Perforated: 70-79 and 90-103 feet.

Soil	18	18
Dry gravel	9	27
Lime, hard shell dike	1	28
Sand and clay	26	54
Sandy and clay	3	57
Sand and fine gravel - 1st water	7	64
Hard brown clay	6	70
Fine gravel and sand $\frac{1}{4}$ inch to $\frac{1}{2}$ inch	9	79
Sandy clay and mud	3	82
Brown clay	1	83
Adobe and sand, dry	6	89
Fine gravel - good - water	2	91
Coarse gray sand and gravel, $\frac{1}{2}$ inch diameter	13	104
Mixed hardpan and gravel	10	114
Clay and sand	14	128
Clay - bottom	6	134

Table 3A

11S/6E-23D1. Kuhrts. Drilled by W. A. Borden. 12-inch casing. Altitude about 500 feet.

Material	Thickness (feet)	Depth (feet)
Soil and sand	18	18
Cemented sand	6	24
Sandy soil	28	52
Cemented sand, some water	2	54
Gravel	1	55
Cemented sand, some water	1	56
Gray gravel	4	60
Dirty gravel (cut)	4	64
Dirty yellow sand	11	75
Yellow gravel (cut)	16	91
Dirty sand	8	99
Gray gravel, water, (cut)	4	103
Gray gravel and sand, (cut)	16	119
White talc, no grit, smooth	7	126
Red clay	5	131
Lime and red clay	9	140

11S/7E-32Q1. Don Hayden. Drilled by W. A. Borden. 12-inch casing. Altitude about 730 feet. Perforated: 267-270, 300-309, and 406-418 feet. Reported yield: 100 gpm, drawdown 80 feet.

Soil	3	3
Hardpan	3	6
Sand	6	12
Sand and boulders	117	129
Strips of clay and rock	71	200
First water	17	217
Quicksand	43	260
Red shale	7	267
Coarse sand	3	270
Fine sand and clay	27	297
Red shale	3	300
Fine gravel, $\frac{1}{4}$ d, in.	9	309
Fine sand	91	400
Brown shale	6	406
Gravel $\frac{1}{2}$" 1" to 2" size	12	418
Sand and clay	23	441
Sand and fine gravel $\frac{1}{2}$" to $\frac{1}{4}$" size	9	450
Sloppy sand	10	460
Yellow clay	3	463

Part 2.- Ocotillo Area

12S/8E-9H1. John B. Craig. Drilled by Mann Bros. Drilling Co. 6- and 4-inch casing. Altitude about 185 feet. Perforated: 100-174 feet.

Material	Thickness (feet)	Depth (feet)
Coarse sand with boulders	47	47
Coarse sand	41	88
Cemented gravel	14	102
Coarse sand	3	105
Boulders	7	112
Coarse sand	3	115
Coarse sand and boulders	15	130
Boulders	12	142
Coarse sand with thin clay streaks	8	150
Coarse sand and gravel	26	176

12S/9E-22A1. Paul B. Zilk. Drilled by Mann Bros. Drilling Co. 6-inch casing. Altitude about 10 feet. Perforated: 312-412 feet.

Clay with fine sand streaks	25	25
Coarse sand	22	47
Coarse and medium sand	22	69
Gravel with clay	21	90
Coarse sand with clay streaks	21	111
Coarse sand with gravel	22	133
Clay	10	143
Coarse sand	10	153
Clay with coarse sand streaks	13	166
Gravel	8	174
Clay	20	194
Clay with fine sand streaks	23	217
Fine sand with clay streaks	27	244
Clay with coarse sand streaks	26	270
Gravel and rocks	13	283
Gravel, coarse sand with shale	21	304
Clay with large gravel	12	316
Medium and coarse sand	10	326
Medium and coarse sand with clay	17	343
Cemented sand	4	347
Clay with coarse sand streaks	15	362
Coarse sand with clay	17	379
Clay with coarse sand streaks	11	390
Clay	12	402
Clay with coarse sand	43	445

U. S. GEOLOGICAL SURVEY

PLATE 1

54-43

MAP OF BORREGO, OCOTILLO, SAN FELIPE, AND VALLECITO AREAS, CALIFORNIA

SHOWING RECONNAISSANCE GEOLOGY AND LOCATIONS OF WELLS, 1953

EXPLANATION

Qal — Alluvium
Unconsolidated gravel, sand, silt, and clay underlying the central parts of the valley areas of the principal streams; generally moderately to highly water yielding

Qf — Alluvial-fan deposits
Unconsolidated, poorly bedded gravel, sand, and silt underlying the relatively steep fans bordering the mountain fronts, equivalent in age to the alluvium but moderately to poorly water yielding. Water levels commonly are deep

Qof — Older alluvial-fan deposits
Partly consolidated, highly dissected alluvial gravel, sand, and silt; may yield water in moderate amounts; water levels probably are deep

TQc — Continental deposits
Partly consolidated gravel, sand, silt, and clay, largely continental but includes some fossiliferous marine deposits in southeast part of area; continental beds locally are highly water yielding

Bc — Basement complex
Undifferentiated crystalline and metamorphic rocks making up the mountainous part of the area and underlying the sedimentary deposits; includes granite, diorite, gneiss, schist, marble, and some extrusive rocks of possible Tertiary age, essentially non-water-bearing

QUATERNARY

CRETACEOUS(?) and TERTIARY(?)

TERTIARY and QUATERNARY

Boundary of San Felipe Creek drainage system

Boundary between principal areas

Approximate position of fault
U, upthrown side, D, downthrown side

Approximate position of anticlinal axis

Approximate position of synclinal axis

Approximate position of geologic contact

Strike and dip of beds

Approximate direction of dip of beds, strike undetermined

Irrigation well

Domestic, stock, or unused well

Dry or destroyed well

0 1 2 3 MILES

4.5 MILES EAST OF MAP CARRIZO CREEK FLOWS INTO SAN FELIPE CREEK WHICH FLOWS TO SALTON SEA

Base from U.S.G.S. and U.S. Army topographic maps
Land lines are approximate

Geology and field location of wells by W. L. Burnham, 1953