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Pumping Test Results for Wells Within Potrero Canyon,
Morongo Band of Mission Indians Reservation, California, 2002

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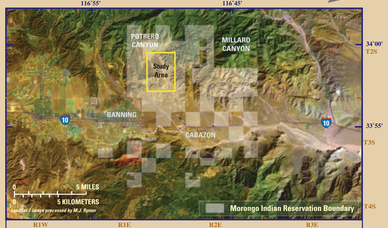
by M. Isabel Pimentel and Allen H. Christensen, 2002

INTRODUCTION

Wells in Potrero Canyon are the main source of water for the Morongo Band of Mission Indians, located near Banning, California. A series of pumping tests were completed on four water-supply wells in the Canyon during February 27 to March 2, 2001. The purpose of the tests was to determine the productivity of each well and the interference (drawdown or water-level decline) each pumped well produced in surrounding wells.

During each pumping test, a well was pumped at a fairly constant rate for several hours and drawdown was measured in the pumping well; nearby production wells (mostly idle) were used as observation wells. Productivity of the pumping well, specific capacity in gallons per minute per foot of drawdown (gal/min/ft), was determined from time-drawdown data in the pumping well. The range of specific capacities from these tests were 29.9 gal/min/ft, measured in well 24P3 (2S/1E-24P3) to 12.8 gal/min/ft in well 25H1. A specific capacity of 34.4 gal/min/ft was reported (Constant Flow Test notes by McCalla Bros.) for well 24N1. The amount of the drawdown in the observation wells during each pumping test was used to determine the interference between wells.



Regional map of study area showing the Morongo Indian Reservation boundary (light shade) and surrounding areas. The location of Potrero Canyon is highlighted (see map below) and is located approximately 90 miles east of Los Angeles, near the towns of Banning and Cabazon.

METHODS

In this report, wells are arranged as clusters A, B, and C based on well proximity and similarity of water-level elevations (see Potrero Canyon map in "Methods"). For tests performed in Potrero Canyon, wells 3, 4, 5 and 6 were used as pumping wells and wells 1, 2, 3, 4, 5 and 25R2 were used as observation wells. Wells 6 (24N1) and 25R1 (location shown only in "Methods") could not be measured due to obstructions in the wells.

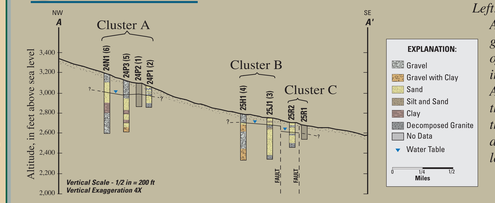
Time-drawdown data were collected using 10 and 50 psig (pounds per square inch, gauged) pressure transducers and dataloggers. Transducers were set at a depth of about 25 feet below static water level in observation wells and approximately 80 ft below static water level in pumping wells. The transducers were calibrated prior to use and had an accuracy of ± 0.03 ft for the 10 psig and ± 0.3 ft for the 50 psig transducers. Approximately 14 hours of background data were collected for wells 1, 2, and 5 prior to start of the first test.

Water-level measurements were made manually using a calibrated electric measuring tape to verify the accuracy of transducer readings. Each well was manually measured before initial testing and approximately every hour throughout the duration of each test. On average, each well was pumped for approximately 8 hours and was allowed to recover overnight for about 15 hours before pumping tests of other wells. No manual water-level measurements were made during the recovery period. During the pumping test at well 3, well 6 was pumped intermittently to meet water supply demands.

Map of Potrero Canyon showing the locations of selected wells within the study area and line of cross section A-A'. Also shown are the locations of known faults within the area (Dibblee, 1982), dashed where approximately located.

LITHOLOGY / WELL CONSTRUCTION

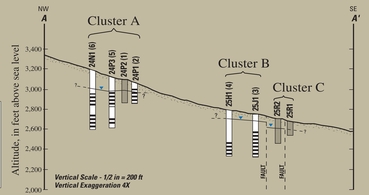
General Lithology



Left: Cross section A - A' showing general lithology of selected wells in the study area. Also shown are the altitudes of the water table and known fault locations.

Note: Wells 24N1, 25H1 and 25J1 were projected to the cross section. Well construction and lithology information is presented as reported in drillers' reports and is generalized for presentation purposes.

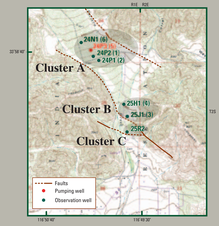
Generalized Well Construction

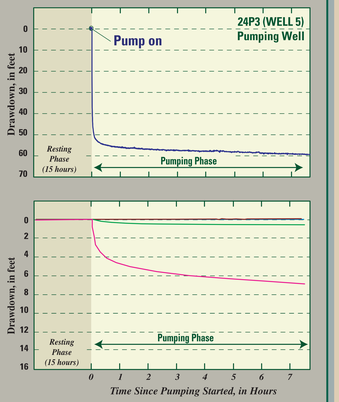


Right: Cross section A - A' showing the perforated intervals of each well used in the study. Also shown are the altitudes of the water table and the locations of known faults.

PUMPING TEST AT WELL 5

Pumping Well: 24P3 (Well 5)





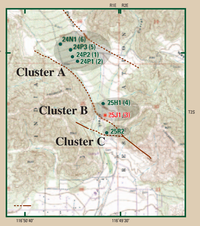
Date of Test - February 28, 2001

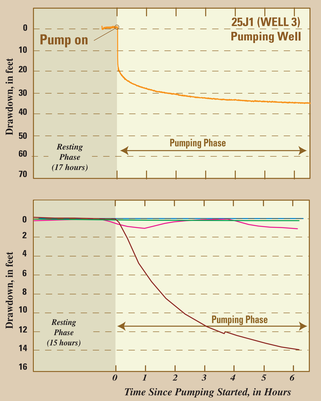
Well	Status	Max Drawdown (in ft)	Specific Capacity (gal/min/ft of drawdown)
1	Observation	6.4	--
2	Observation	0.5	--
3	Observation	NM	--
4	Observation	0.05	--
5	Pumping	60.2	29.9
6	Observation	NM	--
25R2	Observation	0.0	--

Average Pumping Rate (in GPM): 1,800
Duration of pumping (in hours): 7.5

PUMPING TEST AT WELL 3

Pumping Well: 25J1 (Well 3)





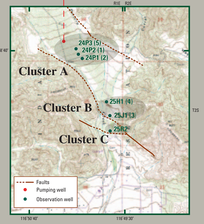
Date of Test - March 1, 2001

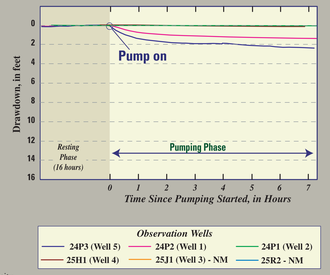
Well	Status	Max Drawdown (in ft)	Specific Capacity (gal/min/ft of drawdown)
1	Observation	1.0*	--
2	Observation	0.28*	--
3	Pumping	36.4	15.1
4	Observation	13.9	--
5	Observation	NM	--
6	Observation	NM	--
25R2	Observation	0.0	--

Average Pumping Rate (in GPM): 550
Duration of pumping (in hours): 6.5
* Response due to intermittent pumping of well 6.

PUMPING TEST AT WELL 6◊

Pumping Well: 24N1 (Well 6)





Date of Test - February 27, 2001

Well	Status	Max Drawdown (in ft)	Specific Capacity (gal/min/ft of drawdown)
1	Observation	1.3	--
2	Observation	0.07	--
3	Observation	NM	--
4	Observation	0.08	--
5	Observation	2.3	--
6	Pumping	NM	34.4h
25R2	Observation	NM	--

Average Pumping Rate (in GPM): 2,400
Duration of pumping (in hours): 7.7

EXPLANATION OF TERMS:

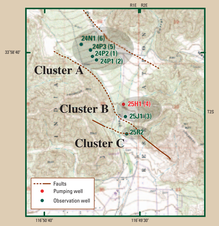
NM Not Measured
GPM Gallons Per Minute
34.4h Historical value. April 1997 Constant Flow Test conducted by McCalla Bros. Pump and Drilling Inc. at a rate of 2,500 GPM.

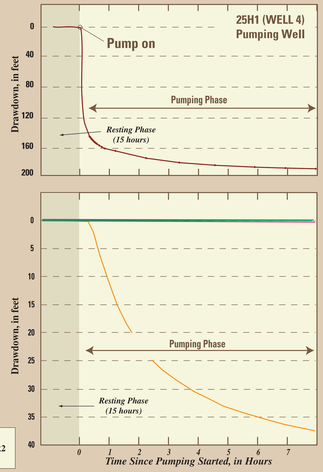
Note: no data collected for Wells 6, 3, and 25R2

◊ Pumping tests shown in order from North to South (6, 5, 4, and 3)

PUMPING TEST AT WELL 4

Pumping Well: 25H1 (Well 4)





Date of Test - March 2, 2001

Well	Status	Max Drawdown (in ft)	Specific Capacity (gal/min/ft of drawdown)
1	Observation	0.1	--
2	Observation	0.2	--
3	Observation	37.3	--
4	Pumping	187.4	12.8
5	Observation	NM	--
6	Observation	NM	--
25R2	Observation	0.0	--

Average Pumping Rate (in GPM): 2,400
Duration of pumping (in hours): 8.2

SUMMARY OF RESULTS

Pumping test results showed that wells 5 and 6 within Cluster A have the highest specific capacities and the lowest interference between wells within the same cluster. Wells in Cluster A had an average specific capacity of 32 gallons per minute per foot [(gal/min)/ft] of drawdown and a maximum interference of 6.4 ft in surrounding wells. Wells within Cluster B, had an average specific capacity of 14 gallons per minute per foot [(gal/min)/ft] of drawdown, about one half of the value for wells in Cluster A, and a maximum interference value of 37.3 ft in nearby wells, more than double the value for wells in Cluster A. Note that the highest interference is observed between wells 3 and 4 in Cluster B, even though they are farther apart (about 75 ft more) than wells 5 and 6 in Cluster A. Therefore, concurrent pumping of wells 5 and 6 within Cluster A would produce a higher yield and less drawdown than pumping wells 3 and 4 within Cluster B. No specific capacity values were calculated for Cluster C wells; well 25R1 was not used for pumping or observation and well 25R2 was used only for observation.

Water levels observed during all pumping tests showed that pumping a well in one cluster resulted in no drawdown in wells in other clusters. These results suggest that the hydraulic interaction between Clusters A, B, and C is limited. Boundaries, such as faults or buried outcrops, could significantly limit ground-water flow and the hydraulic response between wells on opposite sides of such boundaries. Further studies would be needed to determine the type and location of potential boundaries located in Potrero Canyon.

Acknowledgments: *The authors thank the Morongo Band of Mission Indians for their cooperation in this study and Joan Blainey of the U. S. Geological Survey, Sacramento, California for providing additional field help.*

References:

Dibblee, T. W., 1982, Geologic map of the Banning (15-minute) quadrangle, California VTN Consolidated, Inc. 1975, Multiple Purpose Water Resources Investigation, Morongo Indian Reservation, California