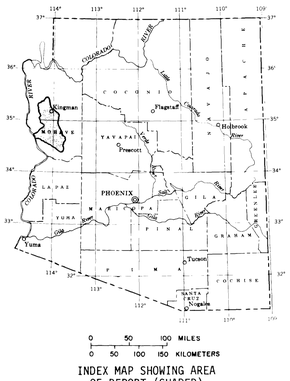


INDEX MAP SHOWING AREA OF REPORT (SHADED)

EXPLANATION

532 / 1649 — WELL IN WHICH DEPTH TO WATER WAS MEASURED IN SPRING, 1990--Upper number, 532, is depth to water, in feet, below land surface. Lower number, 1649, is the altitude of the water level, in feet, above mean sea level

405 / 0.8 — WELL FOR WHICH A WATER SAMPLE WAS COLLECTED IN 1989-1990--Upper number, 405, is specific conductance in microsiemens per centimeter at 25°C. Lower number, 0.8, is the fluoride concentration in milligrams per liter

730 / 0.7 — SPRING FOR WHICH A WATER SAMPLE WAS COLLECTED IN 1989-1990--Upper number, 730, is specific conductance in microsiemens per centimeter at 25°C. Lower number, 0.7, is the fluoride concentration in milligrams per liter

(A) — WELL FOR WHICH A HYDROGRAPH DEPICTING CHANGES IN DEPTH TO WATER IS SHOWN

ALLUVIUM--Consists of semi-consolidated to poorly consolidated sand, silt, clay, gravel and volcanics

BEDROCK (GRANITIC, METAMORPHIC, OR VOLCANIC ROCK)--Water may occur in weathered, fractured or faulted joint systems, or fluvial deposits overlying bedrock

WATER-LEVEL CONTOUR--Shows approximate altitude of the water level. Contour interval 50 and 100 feet. Datum is mean sea level, dashed where inferred

ARBITRARY BOUNDARY OF SACRAMENTO VALLEY BASIN

CHEMICAL QUALITY DIAGRAM--Shows major constituents in milliequivalents per liter. The diagrams are in a variety of shapes and sizes, providing a means of comparing, correlating, and characterizing similar or dissimilar types of water. Year, 1989, indicates year sample collected

MILLIEQUIVALENTS PER LITER

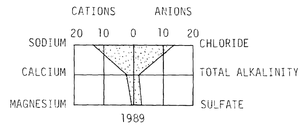
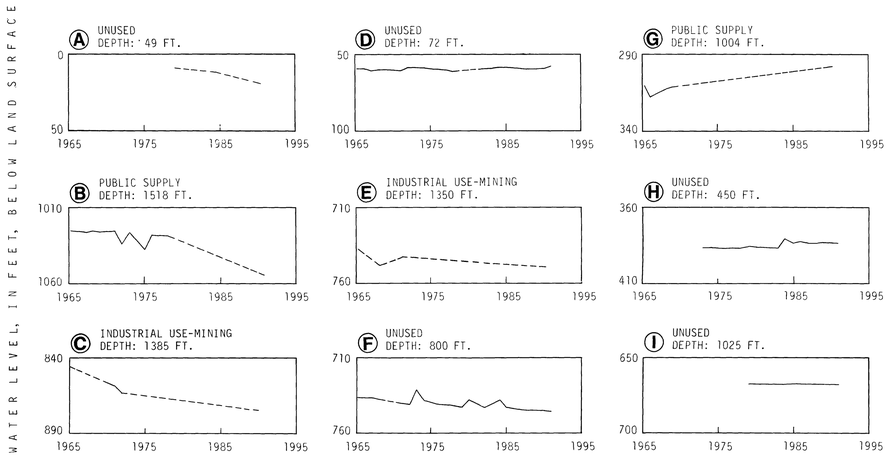


TABLE 2

Conversion factors for the terms used in this report are listed below:

Multiply	By	To obtain
inch	25.4	millimeter
foot	0.3048	meter
mile	1.609	kilometer
square mile	2.590	square kilometer
acre	0.4047	square hectometer
acre-foot	0.001233	cubic hectometer
gallons per minute	0.06309	liters per second
gallons per minute per foot	0.2070	liters per second per meter
microsiemens per centimeter	0.6	approx. dissolved solids in mg/L

HYDROGRAPHS OF THE WATER LEVEL IN SELECTED WELLS
(Dashed lines indicates inferred water level)



5 0 5 MILES
5 0 5 10 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
DATUM IS MEAN SEA LEVEL
SCALE 1:125,000

INTRODUCTION

Sacramento Valley basin is located in Mohave County in northwestern Arizona and encompasses approximately 1,500 square miles. The basin is typical of the northwest-trending alluvial basins of the Basin and Range Province that consist of alluvium-filled basins separated by elongated fault-block mountain ranges. The mountains surrounding the basin are the Cerbat and Hualapai Mountains to the east, the Black Mountains to the west, and the Mohave and McCracken Mountains to the south. Altitudes range from 8,417 feet above mean sea level at Hualapai Peak to approximately 460 feet above mean sea level near the Town of Topock. The basin is bisected by Sacramento Wash, an ephemeral stream, which originates north of Golden Valley, flows south, then west, and eventually discharges to the Colorado River at Topock.

The basin is located in the Mohave Desert, which is a transitional area separating the Great Basin Desert to the north and the Sonoran Desert to the south. Vegetation typical of the Mohave Desert includes the creosote bush (Larrea tridentata), blackbrush (Coleogyne ramosissima), saltbush (Atriplex spp.), and several species of Yucca (Elmore, 1976, p. 37, 60; Lowe, 1964, p. 32).

Average annual precipitation ranges from about 10 inches at the City of Kingman to just over 4 inches at Topock. The Town of Yucca, centrally located in the basin, receives an average annual precipitation of about 7 inches and has an average daily maximum temperature of about 80°F and an average daily minimum of about 53°F (Sellers and Hill, 1974, p. 286, 519, 582; Sellers and others, 1985, p. 113, 115).

GEOLOGY

The mountains surrounding the Sacramento Valley basin consist of igneous and metamorphosed Precambrian granite and related crystalline intrusives, gneiss, schist, and volcanics. The volcanics include basalt flows, basaltic andesite flows, and rhyolite tuff that range in age from Cretaceous to Quaternary (Wilson and Moore, 1959).

Alluvial deposits in the basin have been divided into older, intermediate, and younger units by Gillespie and Bentley (1971, p. 1). The older alluvium is of Tertiary age and consists of semi-consolidated fragments of granite, schist, and gneiss interbedded with volcanics. Intermediate alluvium of Pliocene to Pleistocene age overlies the older alluvium and is also composed of semi-consolidated rock fragments. The younger alluvium is of Holocene age and consists of surficial deposits that have been further divided into piedmont and stream deposits by Gillespie and Bentley (1971, p. 14). Piedmont deposits consist of poorly consolidated rock fragments similar to the older alluvium along with some caliche layers. These deposits overlie terraces, alluvial fans, and pediment slopes as well as the valley floor. Stream deposits are similar to the piedmont deposits, but occur exclusively in stream channels.

GROUNDWATER

The igneous rocks of the Black Mountains contain water in fracture zones and interbedded tuffs, but yield little water to wells (Gillespie and Bentley, 1971, p. 11, 12). The younger volcanics in the Kingman area consist of basalt, rhyolite, and tuff. These rocks are intersected by two large fault zones which provide for the storage of large amounts of water (Gillespie and Bentley, 1971, p. 11, 12), but are not part of the principal aquifer of Sacramento Valley basin. Wells drilled in these fault zones yield up to 240 gallons per minute (gal/min) as reported by Jack Kramer, Utilities Superintendent, City of Kingman, (personal commun., 1990). Water levels measured in 1990 in wells completed in the fault zones of these younger volcanics range from 9 feet to 174 feet below land surface. The City of Kingman operates five wells in this area that collectively pump approximately 450 acre-feet annually (Jack Kramer, Utilities Superintendent, City of Kingman, personal commun., 1990). However, these wells are not the primary sources of water for Kingman. The City's main production wells are located to the northeast in the adjacent Hualapai Valley basin. Southwest of Kingman, pediments consisting of younger volcanic rocks form a separate aquifer that is not hydraulically connected to the fault-zone aquifer or to the principal aquifer of the Sacramento Valley basin. Wells drilled into the younger volcanic deposits that form this aquifer have reported yields of up to 150 gal/min. In 1990, measured water levels in this pediment aquifer ranged from 60 to 300 feet below land surface. Wells drilled on pediments elsewhere in the basin have similar reported yields of up to 150 gal/min, and water levels measured in 1990 ranged from 40 to over 500 feet below land surface.

Static water levels in wells located in recent stream deposits have seasonal variations dependant upon the amount of local runoff. Measured depths to water are as shallow as 7 feet below land surface in these deposits.

The principal aquifer of the Sacramento Valley basin is the older alluvium. Groundwater in this unit is probably semi-confined (U.S. Bureau of Reclamation, 1971, appendix p. 2); however, recent pump-test data from the Golden Valley area, west of Kingman, suggest fully confined conditions exist. Reported yields from wells drilled into the older alluvium range from less than 100 to over 1,000 gal/min. Depths to water measured in 1990 range from less than 100 feet near Topock to over 1,050 feet below land surface in Golden Valley. Since water levels in the basin generally lie below the younger and intermediate alluvium, these units are not part of the principal aquifer (Gillespie and Bentley, 1971, p. 14). The direction of groundwater flow in the principal aquifer parallels the flow of Sacramento Wash. Based on data obtained during this study, groundwater discharge from the basin near Topock was estimated to be 1,000 acre-feet per year.

WATER-LEVEL CHANGES

Water-level changes since 1979 range from a rise of 4 feet south of Kingman (hydrograph D) to a decline of 26 feet in Golden Valley (hydrograph B) north of State Highway 68. The Golden Valley area has had a steady increase in population over the past several years, and plans for substantial development are underway. Valley Pioneer's Water Company currently pumps approximately 330 acre-feet annually from Golden Valley (Valley Pioneer's Water Co., written commun., 1990). Golden Valley Improvement District currently pumps an additional 40 acre-feet annually and plans to double this amount within the near future (Golden Valley Improvement District, written commun., 1990). In 1986, Cyprus Metals Company acquired five wells in the southern part of Golden Valley from the Duval Corporation for use at the Mineral Park Mine. These are large-capacity production wells and are currently reported to yield up to 850 gal/min each; however, only two of the wells are pumped regularly and one is used as a standby (George Veach, Cyprus Mineral Park Mine, personal commun., 1990). Hydrographs of the two operational wells (C and E) depict a steady decline in water levels in this area. Water pumped from wells operated by Cyprus Mineral Park in 1990 totaled approximately 610 acre-feet, and production from these wells is expected to increase to 770 acre-feet in 1991 (George Veach, Cyprus Mineral Park Mine, personal commun., 1990).

Near the Town of Chloride, no complete water-level records exist; however, a shallow well in the area has had a decline of 11 feet since 1979 (hydrograph A). Measurement of wells located in and around Yucca indicate a steady rise in water levels. Although no complete water-level record exists from 1965 to the present, data from several wells indicate a rise of 3 feet since 1973 (hydrograph H) and possibly an overall rise of 12 feet since 1965 (hydrograph G). However, more data are needed to verify the trend. Annual pumpage from the basin is listed in Table 1.

WATER QUALITY

In 1989 and 1990, 48 water-quality samples were collected and analyzed for specific conductance and fluoride. Detailed chemical analyses were performed on 16 of the samples, and results indicate the groundwater of the Sacramento Valley basin is of good chemical quality.

Specific-conductance values ranged from 330 to 2,880 microsiemens per centimeter (uS/cm). Dissolved-solids concentration may be approximated by multiplying specific-conductance values by 0.6, which is the approximate ratio of dissolved solids in milligrams per liter (mg/L) to specific conductance in uS/cm (Table 2). The U.S. Environmental Protection Agency (EPA) has set the secondary maximum contaminant level (SMCL) for total dissolved solids at 500 milligrams per liter (mg/L) which is roughly equivalent to 833 uS/cm. SCML's are guidelines only, and are not enforceable standards (EPA, 1988, p. 9). SCML's are associated with the aesthetic quality of the water, such as taste, odor or color. Water with contaminant levels above the SCML are not necessarily a health risk. Thirty-six of the 48 samples met the SCML for dissolved solids, and of the remaining 12 samples, only three exceeded 1,000 mg/L dissolved solids. These three wells supply water primarily for livestock and are drilled in the older Precambrian rocks that surround the basin. Of the 16 wells sampled for detailed chemical analysis, three exceeded the SMCL for chloride and another two exceeded both the chloride and sulfate SMCL. The Federal SCML for both chloride and sulfate is 250 mg/L (EPA, 1988, p. 14).

The maximum contaminant level (MCL) for fluoride in Arizona has recently been established as 4.0 or 6.0 mg/L by the Arizona Department of Environmental Quality, depending on the number of the year-round residents that a water system serves (ADEQ, 1989, p. 7). The MCL is an enforceable standard set by the U.S. EPA for drinking water. States must comply with this standard, but are free to set levels which are more stringent than the Federal MCL. Fluoride levels in the study area ranged from 0.3 to 5.1 mg/L, none of which exceeded the applicable MCL for Arizona.

Only one of the 16 wells sampled for detailed analysis exceeded an MCL. This well is located in the southeastern part of the valley and had a nitrate level of 20 mg/L, which is twice the allowable limit for drinking water. It supplies water for livestock only.

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ESTIMATED GROUNDWATER PUMPAGE IN THE SACRAMENTO VALLEY BASIN

TABLE 1

YEAR	PUMPAGE, IN THOUSANDS OF ACRE-FEET
1965	6
1966	6
1967	6
1968	6
1969	6
1970	6
1971	6
1972	6
1973	6
1974	6
1975	6
1976	6
1977	6
1978	6
1979	6
1980	6
1981	3
1982	3
1983	3
1984	3
1985	3
1986	1
1987	1
1988	2
1989	2
1990	2
Total	119

BASE FROM U.S. GEOLOGICAL SURVEY
PRESCOTT, ARIZONA, 1954, REV. 1970, 1:250,000
WILLIAMS, ARIZONA, 1954, REV. 1970, 1:250,000
NEEDLES, CALIFORNIA: ARIZONA, 1956, REV. 1969, 1:250,000
KINGMAN, ARIZONA: NEVADA: CALIFORNIA, 1954, REV. 1969, 1:250,000

MAP SHOWING GROUNDWATER CONDITIONS IN THE SACRAMENTO VALLEY BASIN MOHAVE COUNTY, ARIZONA-- 1990

BY

S.J. RASCONA

These hydrologic maps are available upon request from the Department of Water Resources, Basic Data Section, 2810 South 24th Street, Suite 122, Phoenix, Arizona, 85034. The hydrologic data on which these maps are based are available, for the most part, in computer-printout form and may be consulted at the Department of Water Resources and at the U.S. Geological Survey offices located at: 375 S. Euclid, Tucson, Arizona, 85719, and 1545 West University, Tempe, Arizona, 85281.