Hydrologic Data from the Study of Acidic Contamination in the Miami Wash–Pinal Creek Area, Arizona, Water Years 1994–96

By A.D. Konieczki and Cory E. Angeroth

U.S. GEOLOGICAL SURVEY
Open-File Report 97—247

Tucson, Arizona
1997

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FIGURES

CONVERSION FACTORS

Multiply	By	To obtain
centimeter (cm)	0.3937	inch
millimeter (mm)	0.03937	inch
meter (m)	3.281	foot
kilometer (km)	0.6214	mile
square centimeter (cm^2)	0.1550	square inch
square meter (m^2)	10.76	square foot
square kilometer (km^2)	0.3861	square mile
cubic meter (m^3)	35.31	cubic foot
cubic meter (m^3)	0.0008107	acre-foot
liter per minute (L/min)	0.2642	gallon per minute
cubic meter per second (m^3/s)	35.31	cubic foot per second

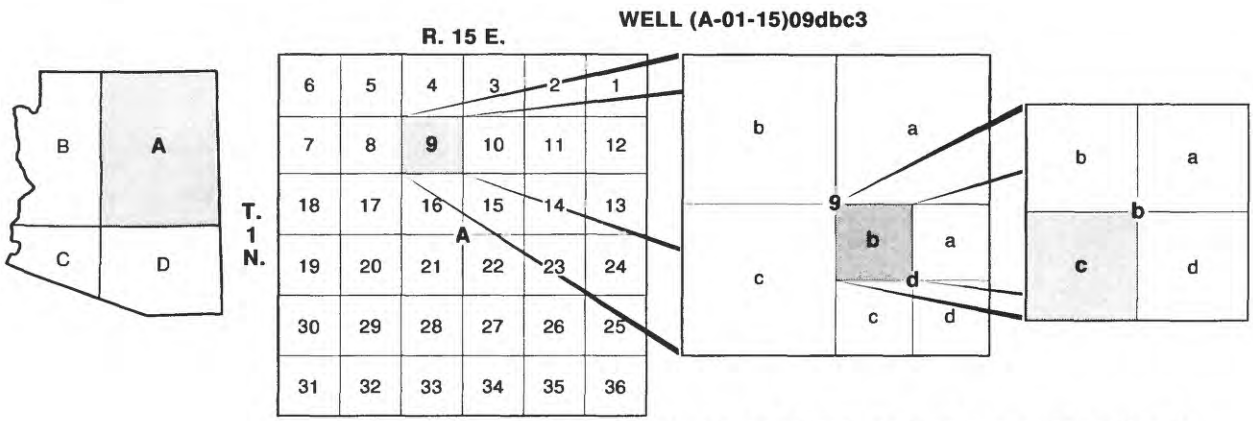
In this report, temperature is reported in degrees Celsius (°C), which can be converted to degrees Fahrenheit (°F) by using the following equation:

$$°F = 1.8(°C) + 32$$

ABBREVIATED WATER-QUALITY UNITS

Chemical concentration and water temperature are given only in metric units. Chemical concentration in water is given in milligrams per liter (mg/L) or micrograms per liter (µg/L). Milligrams per liter is a unit expressing the solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to 1 milligram per liter. For concentrations less than 7,000 milligrams per liter, the numerical value is about the same as for concentrations in parts per million. Specific conductance is given in microsiemens per centimeter (µS/cm) at 25 degrees Celsius. Radioactivity is expressed in picocuries per liter (pCi/L), which is the amount of radioactive decay producing 2.2 disintegrations per minute in a unit (liter) of water.

WELL-NUMBERING AND NAMING SYSTEM



Quadrant A, Township 1 North, Range 15 East, section 9, quarter section d, quarter section b, quarter section c, third well inventoried in 10-acre tract

The well numbers used by the U.S. Geological Survey in Arizona are in accordance with the Bureau of Land Management's system of land subdivision. The land survey in Arizona is based on the Gila and Salt River meridian and base line, which divide the State into four quadrants and are designated by capital letters A, B, C, and D in a counterclockwise direction, beginning in the northeast quarter. The first digit of a well number indicates the township, the second the range, and the third the section in which the well is situated. The lowercase letters a, b, c, and d after the section number indicate the well location within the section. The first letter denotes a particular 160-acre tract, the second the 40-acre tract, and the third the 10-acre tract. These letters also are assigned in a counterclockwise direction, beginning in the northeast quarter. If the location is known within the 10-acre tract, three lowercase letters are shown in the well number. Where more than one well is within a 10-acre tract, consecutive numbers beginning with 1 are added as suffixes. In the example shown, well number (A–01–15)09dbc3 designates the well as being in the SW1/4, NW1/4, SE1/4, section 9, Township 1 North, and Range 15 East.

VERTICAL DATUM

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called "Sea Level Datum of 1929."

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Abstract

Since 1984, hydrologic data have been collected as part of a U.S. Geological Survey study of the occurrence and movement of acidic contamination in the aquifer and streams of the Pinal Creek drainage basin near Globe, Arizona. Ground-water data from that study are presented for water years 1994, 1995, and 1996 and include location, construction information, site plans, water levels, chemical and physical field measurements, and selected chemical analyses of water samples for nine monitoring well groups. Monthly precipitation data and long-term precipitation statistics are presented for two sites.

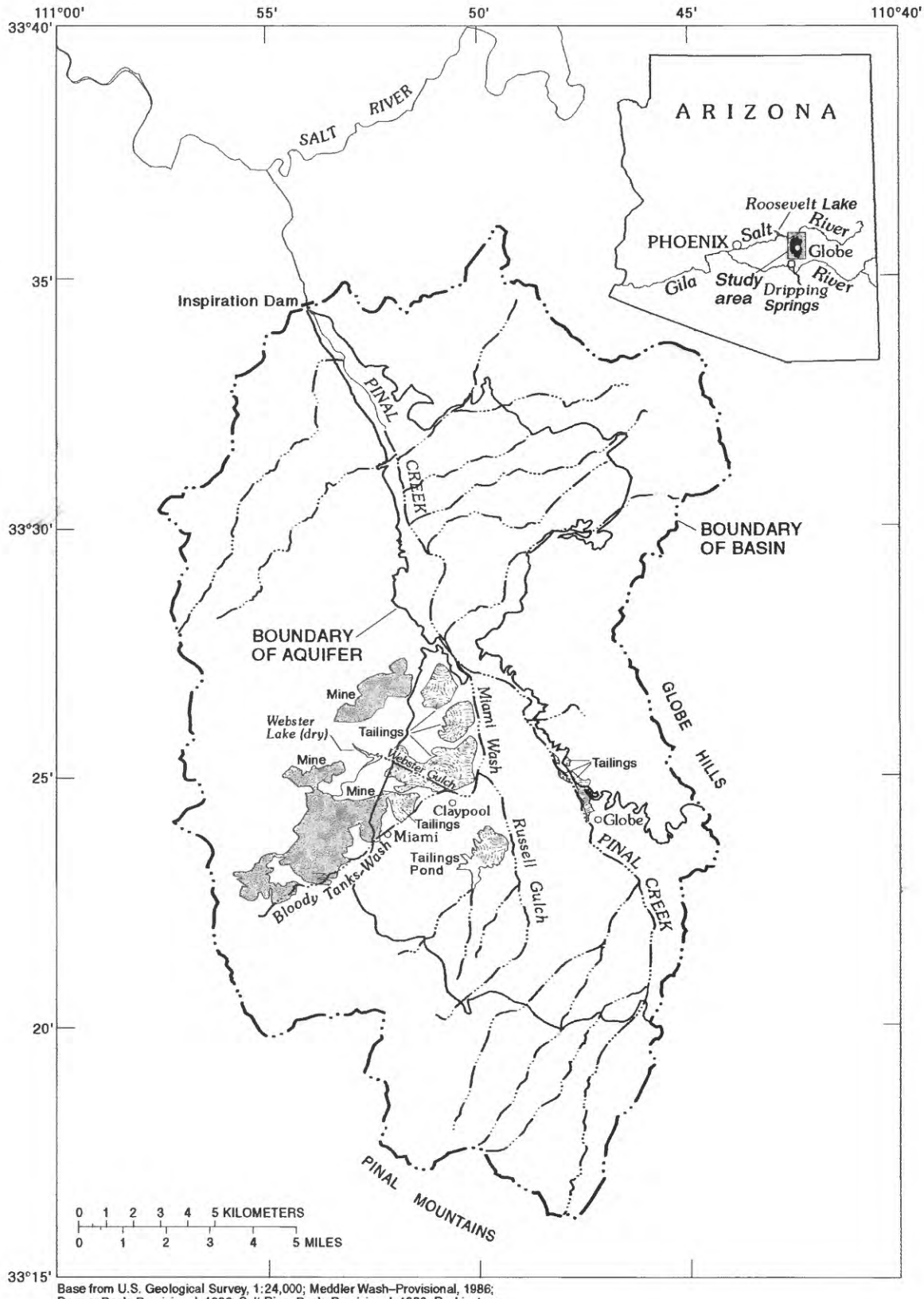
INTRODUCTION

Copper has been mined since 1903 from granite porphyry adjacent to an aquifer in the Pinal Creek drainage basin (fig. 1). Mining, the principal industry in the area, has long been recognized as the cause of some contamination of ground-water resources. These effects were first quantified in 1983 (Rouse, 1983; Envirologic Systems, Inc., 1983); and since 1983, dissolved-metal concentrations have been monitored in the ground water and surface water in Pinal Creek Basin.

The study area is in Gila County, Arizona, and includes the communities of Globe, Miami, and Claypool (fig. 1). The Pinal Creek drainage basin is in the Upper Salt River (USR) ground-water basin (Smith and others, 1996, p. 281) and in Hydrologic Unit 15060103 (Upper Salt River; U.S. Geological Survey, 1975). Miami Wash, a tributary to Pinal Creek, drains the area that contains the most intensive mining activity. Pinal Creek flows into the Salt River about 5 km upstream from the high-water line of Roosevelt Lake.

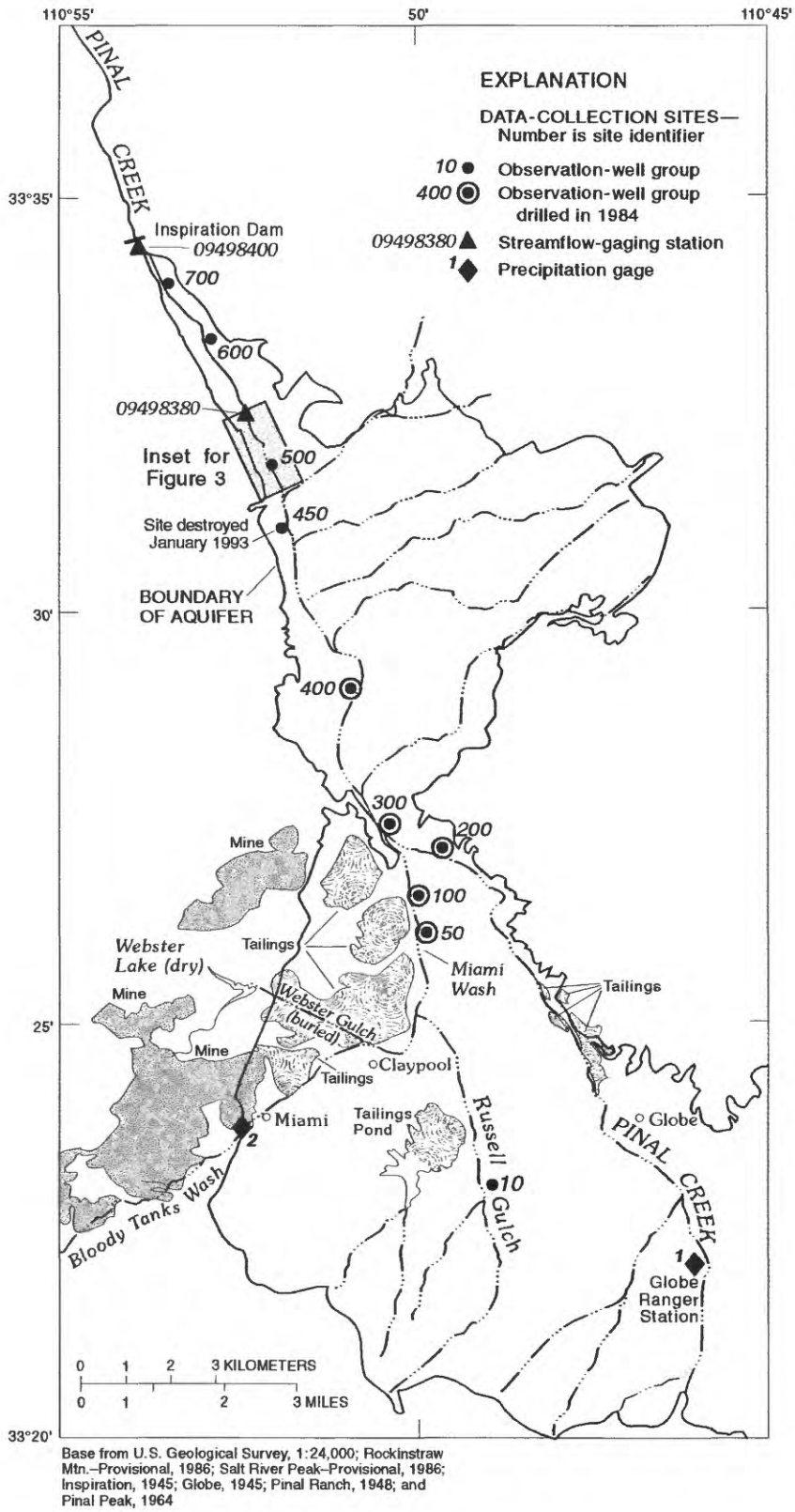
In the spring of 1984, the U.S. Geological Survey (USGS) began a study of contaminant movement in the Pinal Creek drainage basin in cooperation with the Arizona Department of Health Services and the Salt River Project (SRP). Initial observation-well groups were drilled at five sites in October 1984 (fig. 2), and initial samples for chemical analysis were collected in November 1984. The objectives of the study are to identify and describe the processes that control the movement and reactions of inorganic ground-water contaminants, monitor the movement of the contaminants, and model the movement of water and inorganic contaminants in ground water and surface water in the basin. A major concern is how solutes and solids in the system are transformed by each other in a complex environment. The study focuses on the destination or fate of contaminants rather than on sources of ground-water contamination. Since 1985, principal project funding has been provided by the USGS Toxic Substances Hydrology Program.

In well groups 50 and 100 (fig. 2), the measured pH was under 4.0 and specific conductance was greater than 1,590 µS/cm during



Base from U.S. Geological Survey, 1:24,000; Meddler Wash–Provisional, 1986; Dagger Peak–Provisional, 1986; Salt River Peak–Provisional, 1986; Rockinstraw Mtn.–Provisional, 1986; Chrome Butte, 1966; Inspiration, 1945; Globe, 1945; Cammerman Wash, 1966; Pinal Ranch, 1948; and Pinal Peak, 1964

Figure 1. Location of Pinal Creek Basin and study area.



Base from U.S. Geological Survey, 1:24,000; Rockinstraw Mtn.–Provisional, 1986; Salt River Peak–Provisional, 1986; Inspiration, 1945; Globe, 1945; Pinal Ranch, 1948; and Pinal Peak, 1964

Figure 2. Locations of streamflow-gaging stations, observation-well groups, and precipitation gages, Pinal Creek Basin.

the 1994 to 1996 water years. In these wells, dissolved Al ranged from 8,900 to 44,000 µg/L; dissolved Cu ranged from 10,000 to 31,000 µg/L; dissolved Fe ranged from <200 to 360 µg/L; and dissolved Mn ranged from 4,300 to 33,000 µg/L. At streamflow-gaging station Pinal Creek at Setka Ranch (09498380), dissolved Al, Cu, and Mn ranged from 210 to 1,700 µg/L, <30 to 170 µg/L, and 31,600 to 56,400 µg/L, respectively. At the streamflow-gaging station Pinal Creek at Inspiration Dam, dissolved Al, Cu, and Mn ranged from <110 to 370 µg/L, 3 to 13 µg/L, and 31,600 to 56,400 µg/L, respectively.

Annual precipitation in Miami and at the Globe Ranger Station during 1994 and 1995 ranged from 338 to 540 mm. The mean annual precipitation for the period of record in Miami and Globe was 497 and 426 mm, respectively. The yearly mean discharge at the streamflow-gaging station Pinal Creek at Inspiration Dam near Globe (09498400) for water years 1994 through 1996 ranged from 0.19 to 0.30 m^3/s, which was below the average discharge for the period of the record of 0.42 m^3/s.

Purpose and Scope

The purpose of this report is to present hydrologic data for ground water and surface water of Pinal Creek Basin near Globe, Arizona. Included in this report are chemical analyses of ground water and streamflow, records of stream discharge, ground-water levels, and precipitation data. The data have been and are to be used in several interpretive reports in which an exhaustive data summary would be inappropriate. In the interest of completeness, some data that have been published elsewhere are included. This report includes data for water years 1994, 1995, and 1996, which correspond to the period October 1, 1993, through September 30, 1996.

Other Publications Pertinent to the Study Site

A complete list of papers, which includes investigations completed at Pinal Creek, is included in the "Selected References" section of this report. The following summary focuses on some of the publications related to studies completed at the site.

Geology of the Globe–Miami mining district has been described by Ransome (1903) and Peterson (1962). In 1979, the Central Arizona Association of Governments, which is responsible for water-quality management planning in Gila County, established a Mineral Extraction Task Force (METF) to study water-quality problems in the Globe–Miami area. The METF study identified areas where contaminated water was present and probable sources for the contamination (Rouse, 1981, 1983; Envirologic Systems, Inc., 1983).

Lithologic, water-chemistry, water-level, and streamflow data collected as part of the present USGS study for water years 1984–93 were presented by Eychaner and others (1989), Brown (1990), Longsworth and Taylor (1992), and Gellenbeck and Hunter (1994). Neaville and Brown (1994) described the hydrogeology and the hydrologic system of the Pinal Creek Basin.

Eychaner and Stollenwerk (1985) described the distribution of contaminants in the aquifer and the principal geochemical reactions on the basis of the initial data collection.

Brown and Favor (1996) presented the results from research at the site through 1992. Geohydrology of the system, the chemical characteristics and extent of the principal contaminant plume, the physical and chemical processes that alter aqueous and solid phases, and results of geochemical computer-modeled simulations are included in the report.

Numerous papers that discuss work and findings at the site were presented at technical meetings of the Toxic Substances Hydrology Program in 1985 (Massachusetts), 1987 (Florida), 1988 (Arizona), 1991 (California), and 1993 (Colorado), the 1994 American Geophysical Union Fall Meeting (San Francisco), and DOI Hazardous Materials conferences in 1994 and 1995.

Acknowledgments

These data were collected with the cooperation and assistance of landowners and local residents who granted permission to cross over, collect data, and install wells on their properties. Landowners

and local residents that cooperated with the study include: Barbara Caretto; Hollis Crim; Pat Kelley; Eva Setka; Martin Setka; Nellie Setka; Arizona Department of Transportation; Cyprus Miami Mining Corporation; Broken Hills Proprietary Company, Limited (formerly Magma Copper Corporation); and the U.S. Forest Service.

DATA COLLECTION

Ground-water samples from the project wells were obtained using submersible pumps. Most of the samples were collected using a two-pump method. This method involves placing the sampling pump near the screened interval and another pump, operating at a higher flow rate than the sampling pump, near the ground-water surface, which ensured a net upward flow of water from the aquifer to the sampling pump. Water discharged from the sampling pump through Tygon tubing was monitored for pH, specific conductance, temperature, dissolved-oxygen concentration, and oxidation-reduction potential; samples were collected when these field values had stabilized.

Occasionally, pump failures required that sampling be done with a single pump. On those occasions the pump was placed 3 to 4.5 m above the screened interval and a volume of water equivalent to three times the volume of the water between the pump and the bottom of the well was evacuated. The pump was then lowered to the screened interval and samples were collected when the field values had stabilized.

Before November 1993, most samples were collected by installing a 240-volt electric-submersible pump and rigid polyvinylchloride (PVC) discharge pipe. This method stresses the ground-water system more than the methods used after November 1993. In June 1996, selected wells were sampled using the two pump method, and then resampled after being pumped with the large pump, to determine the effects of pumping rates on ground-water chemistry.

Pump-discharge rate and duration are included in the data tables when the data are available. Samples for dissolved constituents were passed through a 0.45-μm polycarbonate filter and collected in polypropylene bottles. Unfiltered samples for total-constituent analyses were collected in polypropylene bottles. Nitric acid (HNO_3) was used as a preservative in samples for metal analyses. Unfiltered water was used for total-inorganic carbon (TIC) analyses for samples collected in November 1993, June 1994, November 1994, and May 1995; filtered water was used for dissolved-inorganic carbon (TDIC) analyses for samples collected in May 1995, November 1995, and June 1996. The water was collected in septum vials and during analysis, the sample was extracted directly through the vial's septum and was not exposed to the atmosphere.

Most ground-water and surface-water samples and field data were collected using methods described by Smith and others (1996, p. 25), including the methods of collecting, examining, and computing records of discharge and water chemistry; definition of terms related to streamflow, water quality, and other hydrologic data; and the description of the downstream order, latitude-longitude, and land-net methods of identifying data-collection sites. Explanations of modified or nonstandard methods used to collect data or samples are included in this report. Well-construction and water-level measurements were made in inch-pound units and converted to metric units.

Data are presented in the "Hydrologic Data" section of this report for 30 project wells that include location, construction details, site plan, water-level measurements, and chemical analyses of water samples. Hydrographs showing water-level data available for selected wells and information for six project exploration boreholes are included. Water levels were measured with a chalked steel tape or a calibrated electric tape.

In August 1996, all of the USGS well groups in the study area were surveyed using a Global Positioning System. Land-surface datums were updated to reflect the new and more accurate data. Water-level measuring points were also surveyed to compare to the land-surface datums. Some measuring points have shifted from their original position. The largest change occurred at well 504 where the measuring point dropped 0.11 m. Most wells had no change.

Discharge, field, and chemical data are included for the site at Pinal Creek at Setka Ranch (09498380) and the site at Pinal Creek at Head of Flow (333156110521000). These data are usually

collected bimonthly. The location of the head of flow is the beginning of perennial flow in Pinal Creek and changes over time (fig. 3). Monthly discharge data and chemical analyses also are presented for Pinal Creek at Inspiration Dam (09498400). Additional observations, estimates, and measurements of stream discharge at various points in the basin during water years 1994–96 are on file in the USGS Arizona District Office. Additional information can also be obtain from the Pinal Creek Toxics Study home page at: http://wwwdaztcn.wr.usgs.gov/pinal.

Three ground-water samples collected in June 1995 as part of a study of chemical interactions between the unsaturated zone and the ground-water plume also are included in this report in the "Miscellaneous Ground-Water Data" table in the "Hydrologic Data" section. Two samples collected near the study area near Dripping Springs (fig. 1) were used to provide flux data from uncontaminated ground water for comparison with similar measurements made in Pinal Creek. The samples were collected from auger holes drilled in stream channels. The holes ranged in depth from 2.2 to 3.6 m.

Monthly precipitation data and long-term precipitation statistics are presented for the two active precipitation-measurement sites closest to Pinal Creek (fig. 2). The data were assembled from published climatological data reports and annual summaries (National Climatic Data Center, issued monthly and annually). Because precipitation data customarily are reported on a calendar-year basis, data for calendar years 1993 through 1996 are included to cover water years 1994–96. Complete data for calendar year 1996 were not available at the time of publication.

Chemical analyses presented in this report were done by the USGS National Water-Quality Laboratory (NWQL), Arvada, Colorado; by C.C. Fuller, a hydrologist in the USGS National Research Program (NRP), Menlo Park, California; by the USGS Project Laboratory, Ocala, Florida; by K.G. Stollenwerk, a geochemist in the NRP, Lakewood, Colorado; and by USGS research laboratory, Reston, Virginia. Where analyses from multiple sources appear in the same table, they are identified by a designated number in the laboratory column.

The ionic balance and ionic strength (Hem, 1985, p. 16 and 164) are reported in data tables in the "Hydrologic Data" section in this report if enough constituents were available in the analysis to accurately represent the water sample.

The balance was computed as:

$$\frac{\Sigma cations - \Sigma anions}{\Sigma cations + \Sigma anions} x 100 = \text{percent ionic balance}$$

where

$\Sigma\, cations$ = the sum of the concentrations of all positively charged ions, in milliequivalents per liter, and

$\Sigma\, anions$ = the sum of the concentrations of all negatively charged ions, in milliequivalents per liter.

The following species were used in the computation of the ionic balance and ionic strength: Ca, Mg, Na, K, SO_4, Cl, F, Ba, Be, Co, Cu, Fe, Mn, Zn, HCO_3, Al, Li, Cd, Ag, Pb, and Sr. Iron was assumed to be Fe^{+2} because field measurements and geochemical modeling showed negligible Fe^{+3} in waters that have dissolved-iron concentrations greater than 200 µg/L (Eychaner and Stollenwerk, 1985).

Stollenwerk, Fuller, and the NWQL analyzed water samples for most metals by inductively coupled plasma-emission spectroscopy (ICP), which simultaneously determines the concentration of as many as 20 elements. An elevated concentration of one element, particularly iron, can interfere with the analytical accuracy and detection limits of other elements that are present in much lower concentrations. Under criteria described by Eychaner and others (1989, p. 5), five cobalt and six fluoride analyses were deleted because of interference.

Dissolved concentrations of Al, B, Cd, Co, Fe, Mn, Ni, or Zn were in some cases greater than total-recoverable concentrations of these elements in laboratory analyses of samples from Head of Flow, Pinal Creek at Setka Ranch, and Pinal Creek at Inspiration Dam. The differences in concentrations from these analyses probably

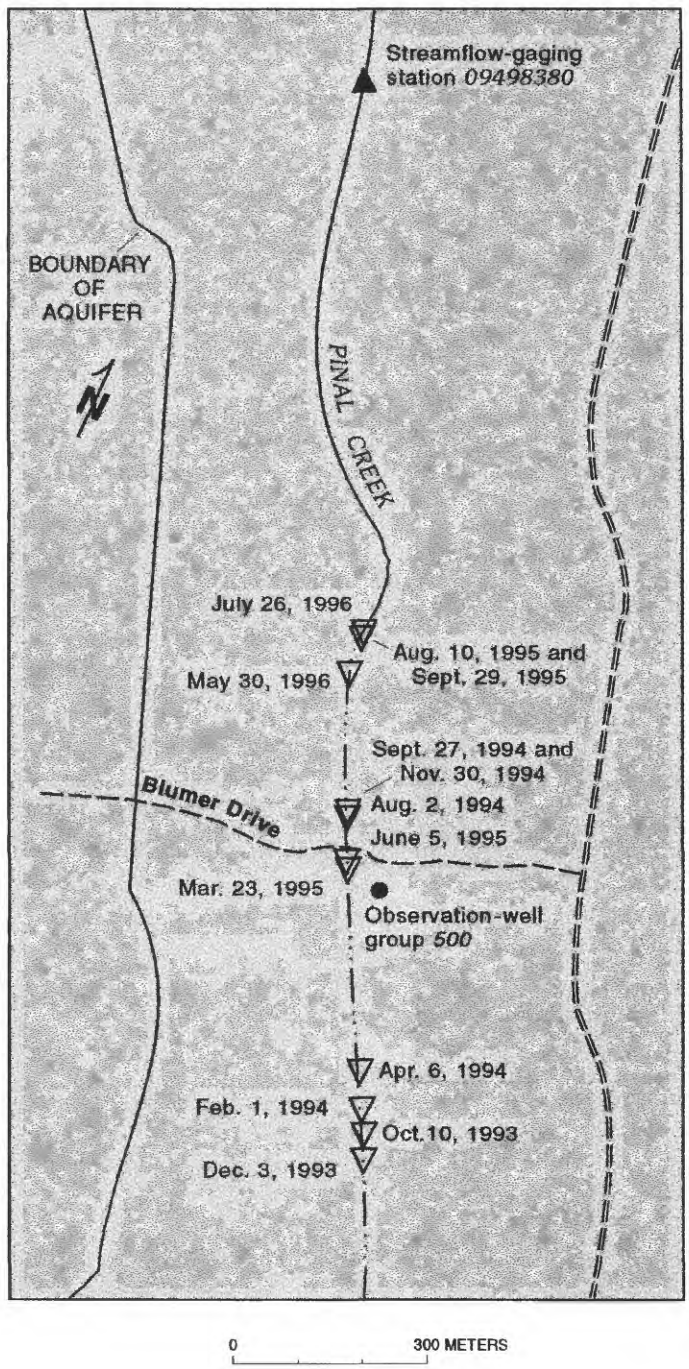


Figure 3. Locations of head of flow (333156110521000) and sampling sites.

resulted from differences in precision between the analytical techniques used. The dissolved fraction was analyzed using ICP; the total-recoverable concentration was analyzed using a graphite furnace-equipped atomic absorption (GFAA) spectrophotometer, which is less precise. Discrepancies also can result from rounding of values. The concentrations, therefore, are considered to be equal.

SELECTED REFERENCES

Brown, J.G., 1990, Chemical, geologic, and hydrologic data from the study of acidic contamination in the Miami Wash–Pinal Creek area, Arizona, water years 1988–89: U.S. Geological Survey Open-File Report 90–395, 75 p.

_____ 1991, Particle tracking analysis of flow in the stream-aquifer system in Pinal Creek basin, Arizona, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 448–453.

_____ 1996, Movement of metal contaminants in ground water in the Pinal Creek basin, Arizona—Model assessment and simulation of reactive transport: Tucson, University of Arizona, M.S. thesis, 236 p.

Brown, J.G., and Eychaner, J.H., 1996a, Research of acidic contamination of ground water and surface water, Pinal Creek Basin, Arizona, *in* Brown, J.G., and Favor, Barbara, eds., 1996, Hydrology and geochemistry of aquifer and stream contamination related to acidic water in Pinal Creek Basin near Globe, Arizona: U.S. Geological Survey Water-Supply Paper 2466, chap. A, p. 1–20.

_____ 1996b, Distribution of chemical constituents in surface water, Pinal Creek Basin, Arizona, *in* Brown, J.G., and Favor, Barbara, eds., 1996, Hydrology and geochemistry of aquifer and stream contamination related to acidic water in Pinal Creek Basin near Globe, Arizona: U.S. Geological Survey Water-Supply Paper 2466, chap. D, p. 61–79.

Brown, J.G., and Favor, Barbara, eds., 1996, Hydrology and geochemistry of aquifer and stream contamination related to acidic water in Pinal Creek Basin near Globe, Arizona: U.S. Geological Survey Water-Supply Paper 2466, 103 p.

Brown, J.G., and Harvey, J.W., 1994, Characterization and simulation of contaminant movement in Pinal Creek basin, Arizona: U.S. Department of Interior Hazardous Materials (HAZMAT) Conference, May 17–19, 1994, Phoenix, Arizona.

_____ 1996, Hydrologic and geochemical factors affecting metal contaminant transport in Pinal Creek basin near Globe, Arizona, *in* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20–24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94–4015, p. 1035–1042.

Brown, J.G., Harvey, J.W., Glynn, P.D., Busenberg, E., and Stollenwerk, K.G., 1995, Hydrologic and geochemical characterization of metal contaminant transport in Pinal Creek basin near Globe, Arizona: Ninth V.E. McKelvey Forum on Mineral Resources, February 22–25, 1994, Tucson, Arizona.

Brown, J.G., Harvey, J.W., Glynn, P.D., Fuller, C.C., Busenberg, E., Wagner, B.J., and Lind, C.J., 1996, Characterization of acidic contaminants in ground water and surface water in Pinal Creek basin, Arizona: U.S. Department of the Interior Hazardous Materials (HAZMAT) Conference, May 25–28, 1995, Colorado Springs, Colorado.

Brown, J.G., Stollenwerk, K.G., and Glynn, P.D., 1993, Geochemical and hydrologic characterization of acidic mine contamination in Pinal Creek basin, Arizona: U.S. Department of the Interior Hazardous Materials (HAZMAT) Management Conference, Denver, Colorado, May 1993, Resource Guide.

Brown, J.G., Bassett, R.L., Glynn, P.D., and Parkhurst, D.L., 1995, Reactive transport of metal contaminants in ground water in Pinal Creek basin, Arizona, *in* Giddies, A.M., ed., Water Use in Arizona—Cooperation or Conflict: Arizona Hydrological Society's 8th Annual Symposium, September 14–16, 1995, Tucson, Arizona, p. 104–105.

Envirologic Systems, Inc., 1983, Mining activities and water-quality report: Florence, Arizona, Central Arizona Association of Governments, Mineral Extraction Task Force Report METF–7, 142 p.

Eychaner, J.H., 1988a, Geohydrologic setting of the Miami Wash–Pinal Creek acidic ground-water study near Globe, Arizona, *in* Ragone, S.E., ed., U.S. Geological Survey's Program on Toxic Waste—Ground-Water Contamination—Fiscal Year 1986 Program Overview and Selected Abstracts from the Second Technical Meeting, Cape Cod, Massachusetts, October 21–25, 1985: U.S. Geological Survey Open-File Report 86–481, p. E–3 to E–5.

_____ 1988b, Evolution of acidic ground-water contamination in a copper-mining area in Arizona, *in* Ouazar, D., Brebbia, C.A., and Stout, G.E., eds., Computer Methods and Water Resources, First International Conference, Morocco, 1988, Proceedings, v. 6 (Water Quality, Planning and Management): Southampton, U.K., Computational Mechanics Publications, p. 291–302.

_____ 1989a, Movement of inorganic contaminants in acidic water near Globe, Arizona, *in* Mallard, G.E., and Ragone, S.E., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Phoenix, Arizona, September 26–30, 1988: U.S. Geological Survey Water-Resources Investigations Report 88–4220, p. 567–575.

_____ 1989b, Research activities related to acidic water near Globe, Arizona, *in* Mallard, G.E., and Ragone, S.E., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Phoenix, Arizona, September 26–30, 1988: U.S. Geological Survey Water-Resources Investigations Report 88–4220, p. 599–601.

_____ 1991a, Inorganic contaminants in acidic water near Globe, Arizona, *in* Rasmussen, T.C., ed., Survival in the Desert: Water Quality and Quantity Issues into the 21st Century: Arizona Hydrological Society, Proceedings of the Third Annual Symposium, Casa Grande, Arizona, September 20–22, 1990, p. 242–252.

_____ 1991b, The Globe, Arizona, research site—Contaminants related to copper mining in a hydrologically integrated environment, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 439–447.

_____ 1991c, Solute transport in perennial streamflow at Pinal Creek, Arizona, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 481–485.

Eychaner, J.H., Rehmann, M.R., and Brown, J.G., 1989, Chemical, geologic, and hydrologic data from the study of acidic contamination in the Miami Wash–Pinal Creek area, Arizona, water years 1984–87: U.S. Geological Survey Open-File Report 89–410, 105 p.

Eychaner, J.H., and Stollenwerk, K.G., 1985, Neutralization of acidic ground water near Globe, Arizona, *in* Schmidt, K.D., ed., Groundwater Contamination and Reclamation, Proceedings of a Symposium, Tucson, Arizona, August 14–15, 1985: Bethesda, Maryland, American Water Resources Association, p. 141–148.

_____1987, Acidic ground-water contamination from copper mining near Globe, Arizona, I. Overview, *in* Franks, B.J., ed., U.S. Geological Survey Program on Toxic Waste—Ground-Water Contamination—Proceedings of the Third Technical Meeting, Pensacola, Florida, March 23–27, 1987: U.S. Geological Survey Open-File Report 87–109, p. D–13 to D–18.

Faires, L.M., and Eychaner, J.H., 1991, Trace-element trends at Pinal Creek, Arizona, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 461–465.

Ficklin, W.H., Love, A.H., and Briggs, P.K., 1991, Analytical results for total and partial metal extractions in aquifer material, Pinal Creek, Globe, Arizona: U.S. Geological Survey Open-File Report 91–111, 33 p.

Ficklin, W.H., Love, A.H., and Papp, C.S.E., 1991, Solid-phase variations in an aquifer as the aqueous solution changes, Globe, Arizona, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 475–480.

Fuller, C.C., 1996, Experimental studies of trace-metal partitioning in perennial reaches of Pinal Creek, Arizona, *in* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program— Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20–24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94–4015, p. 1101–1105.

Fuller, C.C., and Harvey, J.W., 1994, Effect of surface chemical reactions in the hyporheic zone on trace-metal partitioning, Pinal Creek, Arizona: American Geophysical Union, EOS Transactions, v. 75, no. 44, supplement, p. 261.

Gellenbeck, D.J., and Hunter, Y.R., 1994, Hydrologic data from the study of acidic contamination in the Miami Wash–Pinal Creek area, Arizona, water

years 1992–93: U.S. Geological Survey Open-File Report 94–508, 103 p.

Glynn, P.D., 1991, Effect of impurities in gypsum on contaminant transport at Pinal Creek, Arizona, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 466–474.

Glynn, P.D., and Brown, J.G., in press, Reactive-transport modeling of acidic metal-contaminated ground water at a site with sparse spatial information, *in* Lichtner, P.C., Steefel, C.I., and Oelkers, E.H., Mineralogical Society of America Short Course—Reactive Transport in Porous Media: General Principles and Application to Geochemical Processes (in press).

Glynn, P.D., and Busenberg, Eurybiades, 1996a, Dissolved gas and chlorofluorocarbon content of ground waters in the Pinal Creek Basin, Arizona, *in* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20–24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94–4015, p. 1043–1054.

_____ 1996b, Unsaturated zone diffusion of carbon dioxide and oxygen in the Pinal Creek Basin, Arizona, *in* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20–24, 1993: U.S. Geological Survey Water- Resources Investigations Report 94–4015, p. 1055–1064.

Glynn, P.D., Engesgaard, Peter, and Kipp, K.L., 1991, Use and limitations of two computer codes for simulating geochemical mass transport at the Pinal Creek Toxic-Waste Site, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 454–460.

Harvey, J.W., 1995, Solute transport processes in contaminated stream-aquifer systems, *in* Environmental Restoration and ACOWR 1994 Annual Meeting [abs.]: Universities Council on Water Resources, Big Sky, Montana, August 2–5, 1994.

Harvey, J.W., and Fuller, C.C., 1994, Hydrologic controls on manganese transport in a contaminated stream-aquifer system, Pinal Creek basin, Arizona: American Geophysical Union, EOS Transactions, v. 75, no. 44, supplement, p. 259.

_____1995, Role of stream-subsurface water exchange in enhancing manganese precipitation in a contaminated drainage basin: American Geophysical Union, Programs and Abstracts of Fifteenth Annual Hydrology Days, Report 95.2, April 3–7, 1995.

_____1996 Association of selected metals with colloidal and suspended particulate material in shallow ground water and surface water at Pinal Creek, Arizona, *in* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20–24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94–4015, p. 1073–1079.

Harvey, J.W., Bencala, K.E., Wagner, B.J., and Fuller, C.C., 1994, Modeling hydrological exchange within the stream-catchment continuum: Bulletin of the North American Benthological Society, v. 11, no. 1, p. 98.

Harvey, J.W., Fuller, C.C., and Wagner, B.J., 1996, Interactions between shallow ground water and surface water that affect metal transport in Pinal Creek, Arizona, *in* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20–24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94–4015, p. 1065–1072.

Harvey, J.W., Wagner, B.J., and Bencala, K.E., 1996, Evaluating the reliability of the stream tracer approach to characterize stream-subsurface water exchange: Water Resources Research, v. 32, no. 8, p. 2441–2451.

Haschenburger, J.K., 1989a, Manganese in channel sediments of Pinal Creek, Arizona, *in* Mallard, G.E., and Ragone, S.E., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Phoenix, Arizona, September 26–30, 1988: U.S. Geological Survey Water-Resources Investigations Report 88–4220, p. 593–597.

_____1989b, Variation of copper in stream sediment: Tempe, Arizona State University, M.S. thesis, 67 p.

Hem, J.D., 1985, Study and interpretation of the chemical characteristics of natural water, 3d ed.: U.S. Geological Survey Water-Supply Paper 2254, 263 p.

Hem, J.D., and Lind, C.J., 1994, Chemistry of manganese precipitation in Pinal Creek, Arizona, USA—A laboratory study: Geochimica et Cosmochimica Acta, v. 58, no. 6, p. 1601–1614.

_____ 1996, Chemical processes in manganese oxide and carbonate precipitation in Pinal Creek, Arizona, *in* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20–24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94–4015, p. 1095–1099.

Hulseapple, S.M., 1995, A field study of reareation and solute transport at Pinal Creek, Globe, Arizona: Tucson, University of Arizona, M.S. thesis.

Hulseapple, S.M., and Conklin, M., 1995, A field study of volatile solute transport in a stream contaminated with heavy metals: American Geophysical Union, EOS Transactions, v. 76, no. 46, supplement, p. 226.

Hydro Geo Chem, Inc., 1989, Investigation of acid water contamination along Miami Wash and Pinal Creek, Gila County, Arizona: Claypool, Arizona, Cyprus Miami Mining Corporation report, 140 p.

Lind, C.J., 1991, Manganese minerals and associated fine particulates in the Pinal Creek streambed, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 486–491.

Lind, C.J., and Anderson, L.D., 1992, Trace metal scavenging by precipitating Mn and Fe oxides, *in* Kharaka, Y.K., and Maest, A.S., eds., Proceedings of the Seventh International Symposium on Water-Rock Interaction—WRI–7, Park City, Utah, U.S.A., July 13–18, 1992: Rotterdam, A.A. Balkema Publishers, v. 1, p. 397–402.

Lind, C.J., and Hem, J.D., 1993, Manganese minerals and associated fine particulates in the streambed of Pinal Creek, Arizona, U.S.A.—A mining-related acid drainage problem: Applied Geochemistry, v. 8, no. 1, p. 67–80.

_____ 1996, Manganese and iron oxide deposits and trace-metal associations in stream sediments, Pinal Creek Basin, Arizona, *in* Brown, J.G., and Favor, Barbara, eds., 1996, Hydrology and geochemistry of aquifer and stream contamination related to acidic water in Pinal Creek Basin near Globe, Arizona: U.S. Geological Survey Water-Supply Paper 2466, chap. E, p. 81–98.

Lind, C.J., and Oscarson, R.L., 1994, The interaction of acidic, iron-rich drainage from copper mining activities with alluvial and streambed sediments at Pinal Creek, Arizona: Third International Symposium on Environmental Geochemistry, Krakow, Poland, September 12–13, 1994, p. 237.

Lind, C.J., and Stollenwerk, K.G., 1996, Alteration of alluvium by acidic ground water resulting from copper mining at Pinal Creek, Arizona, *in* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20–24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94–4015, p. 1089–1094.

Longsworth, S.A., 1991, Measurement of stream reareation at Pinal Creek, Arizona, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 492–497.

Longsworth, S.A., and Taylor, A.M., 1992, Hydrologic data from the study of acidic contamination in the Miami Wash–Pinal Creek area, Arizona, water years 1990–91: U.S. Geological Survey Open-File Report 92–468, 59 p.

Love, A.H., and Ficklin, W.H., 1990, Sequential-partial extraction of Pinal Creek aquifer material near Globe, Arizona, for SO_4^{-2} and PO_4^{-3}, *in* Rocky Mountain Conference on Analytical Chemistry, 32nd, July 29–August 3, 1990, Proceedings: Society for Applied Spectroscopy, 6 p.

National Climatic Data Center, issued monthly, Climatological data, Arizona: U.S. Department of Commerce, National Climatic Data Center, v. 97–100, no. 1–12.

_____issued annually, Climatological data annual summaries, Arizona: U.S. Department of Commerce, National Climatic Data Center, v. 91–93, no. 13.

Neaville, C.C., 1989, Simulation of ground- and surface-water flow in the Globe area, Arizona, *in* Mallard, G.E., and Ragone, S.E., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Phoenix, Arizona, September 26–30, 1988: U.S. Geological Survey Water-Resources Investigations Report 88–4220, p. 577–579.

_____1991, Hydrogeology and simulation of ground-water and surface-water flow in the Pinal Creek basin, Gila County, Arizona: Tucson, University of Arizona, M.S. thesis, 149 p.

Neaville, C.C., and Brown, J.G., 1994, Hydrogeology and hydrologic system of Pinal Creek basin, Gila

County, Arizona: U.S. Geological Survey Water-Resources Investigations Report 93–4212, 32 p.

Novo-Gradac, K.J., and Smith, C.N., 1991, Application of MINTEQA2 to the speciation of contaminants at Globe, Arizona, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 498–501.

Peterson, N.P., 1962, Geology and ore deposits of the Globe–Miami district, Arizona: U.S. Geological Survey Professional Paper 342, 151 p.

Pool, D.R., and Eychaner, J.H., 1995, Measurements of aquifer-storage change and specific yield using gravity surveys: Ground Water, v. 33, no. 3, May–June 1995, p. 425–432.

Puls, R.W., and Eychaner, J.H., 1990, Sampling of ground water for inorganics—pumping rate, filtration, and oxidation effects, *in* Proceedings of the Fourth National Outdoor Action Conference on Aquifer Restoration, Ground Water Monitoring, and Geophysical Methods, Las Vegas, Nevada, May 14–17, 1990: Dublin, Ohio, Water Well Journal Publishing Company, p. 313–327.

Puls, R.W., Eychaner, J.H., and Powell, R.M., 1990, Colloidal-facilitated transport of inorganic contaminants in ground water: Part I, Sampling considerations: U.S. Environmental Protection Agency Environmental Research Brief, EPA 600/M–90/023, 11 p.

Puls, R.W., and Powell, R.M., 1990, Transport of Fe^{59}-labeled iron oxide colloids in laboratory columns using natural aquifer material: American Geophysical Union, EOS Transactions, v. 71, p. 504.

Puls, R.W., Powell, R.M., and Clark, D.A., 1996, Assessment of colloidal transport in ground water, Pinal Creek Basin, Arizona, *in* Brown, J.G., and Favor, Barbara, eds., 1996, Hydrology and geochemistry of aquifer and stream contamination related to acidic water in Pinal Creek Basin near Globe, Arizona: U.S. Geological Survey Water-Supply Paper 2466, chap. C, p. 51–60.

Puls, R.W., Powell, R.M., and Rees, T.F., 1991, Stability and transport of inorganic colloids through contaminated aquifer material, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 507–510.

Ransome, F.L., 1903, Geology of the Globe copper district, Arizona: U.S. Geological Survey Professional Paper 12, 168 p.

Reese, R.S., 1989, Characterization of organic contamination of ground water in a mining area, Globe, Arizona: Tucson, University of Arizona, M.S. thesis, 138 p.

Reese, R.S., and Bassett, R.L., 1990, Characterization of organic contamination of ground water in a mining area, Globe, Arizona, *in* Lehr, J.H., ed., Ground Water Management No. 1, Proceedings, Ground-Water Geochemistry Conference, Kansas City, Missouri, February 20–22, 1990: National Water Well Association, Association of Ground-Water Scientists and Engineers, p. 221–236.

Rouse, J.V., 1981, Geohydrology of the Globe–Miami, Arizona, area: Florence, Arizona, Central Arizona Association of Governments, Mineral Extraction Task Force Report METF–5, 103 p.

_____1983, Water-quality report for the Globe–Miami area: Florence, Arizona, Central Arizona Association of Governments, Mineral Extraction Task Force Report METF–6, 2 volumes, 448 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, Saeid, 1996, Water Resources Data, Arizona, water year 1995: U.S. Geological Survey Water-Data Report AZ–95–1, 306 p.

Spindler, P.H., 1993, Algal distribution and chemical gradients in Pinal Creek, Gila County, Arizona: Tempe, Arizona State University, M.S. thesis, 73 p.

Spindler, P.H., and Sommerfeld, M.R., 1996, Relations among algal species and chemical gradients in Pinal Creek, near Globe, Arizona, *in* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20–24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94–4015, p. 1107-1113.

Stollenwerk, K.G., 1988, Neutralization of acidic ground water in eastern Arizona, *in* Ragone, S.E., ed., U.S. Geological Survey's Program on Toxic Waste—Ground-Water Contamination—Fiscal Year 1986 Program Overview and Selected Abstracts from the Second Technical Meeting, Cape Cod, Massachusetts, October 21–25, 1985: U.S. Geological Survey Open-File Report 86–481, p. E–7 to E–8.

_____1990, Simulation of the sorption of Co, Cu, Ni, and Zn with a two-site, diffuse layer sorption model:

American Geophysical Union, EOS Transactions, v. 71, no. 17, p. 519.

_____ 1991, Simulation of copper, cobalt, and nickel sorption in an alluvial aquifer near Globe, Arizona, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 502–506.

_____ 1994, Geochemical interactions between constituents in acidic groundwater and alluvium in an aquifer near Globe, Arizona: Applied Geochemistry, v. 9, no. 4, p. 353–369.

_____ 1996, Simulation of reactions affecting transport of constituents in the acidic plume, Pinal Creek Basin, Arizona, *in* Brown, J.G., and Favor, Barbara, eds., 1996, Hydrology and geochemistry of aquifer and stream contamination related to acidic water in Pinal Creek Basin near Globe, Arizona: U.S. Geological Survey Water-Supply Paper 2466, chap. B, p. 21–49.

Stollenwerk, K.G., and Eychaner, J.H., 1987, Acidic ground-water contamination from copper mining near Globe, Arizona, *in* II. Neutralization capacity of alluvium, *in* Franks, B.J., ed., U.S. Geological Survey Program on Toxic Waste—Ground-Water Contamination—Proceedings of the Third Technical Meeting, Pensacola, Florida, March 23–27, 1987: U.S. Geological Survey Open-File Report 87–109, p. D–19 to D–24.

_____ 1989, Solubility of aluminum and iron in ground water near Globe, Arizona, *in* Mallard, G.E., and Ragone, S.E., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Phoenix, Arizona, September 26–30, 1988: U.S. Geological Survey Water-Resources Investigations Report 88–4220, p. 581–591.

Tolle, Shirin, and Arthur, G.V., 1991, Aquifer restoration under the Clean Water Act, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 520–523.

U.S. Geological Survey, 1975, Hydrologic unit map—1974, State of Arizona: U.S. Geological Survey Hydrologic Unit Map series, 1 sheet.

Villinski, J.E., Conklin, M.H., and Liang, L., 1995, Effect of natural organic matter on the Mn/Fe redox couple: American Chemical Society, April 4–5, 1995.

Wagner, B.J., and Harvey, J.W., 1994, Evaluating data worth for designing tracer experiments in stream-aquifer systems: American Geophysical Union, EOS Transactions, v. 75, no. 44, November 1, 1994, p. 259.

Wagner, B.J., and Harvey, J.W., 1996, Solute-transport parameter estimation for an injection experiment at Pinal Creek, Arizona, *in* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20–24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94–4015, p. 1081–1087.

Wallin, R.W., 1991, Ground-water transport of polycyclic aromatic hydrocarbons in association with humic substances in the Pinal Creek basin, Globe, Arizona: Tucson, University of Arizona, M.S. thesis, 80 p.

Wallin, R.W., Bassett, R.L., and Eychaner, J.H., 1991, Ground-water transport of polycyclic aromatic hydrocarbons in association with humic substances in the Pinal Creek basin, Globe, Arizona, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 511–515.

Walter, G.R., and Norris, J.R., 1991, Hydrochemical zoning in the Pinal Creek alluvium, *in* Mallard, G.E., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11–15, 1991: U.S. Geological Survey Water-Resources Investigations Report 91–4034, p. 516–519.

—PAGE 15 FOLLOWS—

HYDROLOGIC DATA

—PAGE 17 FOLLOWS—

GROUND WATER

Well 10

LOCATION.—Lat 33°23'10", long 110°49'05", in SE1/4SE1/4NW1/4, sec. 34, T. 1 N., R. 15 E. (A-01-15)34bdd1, 90 m east of Russell Gulch, and 3 km southwest of Globe.

Landowner: Pinto Valley Division, Broken Hills Proprietary Company, Limited (previously Magma Copper Corporation).

LAND-SURFACE DATUM.—1,056.54 m above National Geodetic Vertical Datum of 1929 (levels by Water Resources Division, U.S. Geological Survey).

REMARKS.—In December 1988, three attempts to drill this well using a hollow-stem auger were abandoned at depths of less than 3 m because of large rocks in the hole.

DRILLING AND WELL CONSTRUCTION

The well was cased and screened with nominal 10-centimeter diameter, schedule 40, polyvinyl chloride (PVC) pipe. The screened interval is a single 9.1-meter length of PVC pipe that has 5,472 factory-cut slots 4.4 cm long by 0.51 mm wide for a total open area of 1,228 cm^2. The borehole annulus around the slotted pipe is filled to approximately 17.0 m below land surface with washed pea gravel from uncontaminated local alluvium. A layer of bentonite pellets was placed in the annulus from approximately 16.4 to 17.0 m below land surface. Native material fills the borehole annulus from approximately 16.4 to 2.4 m below land surface. A concrete seal extends from the land surface to a depth of 2.4 m.

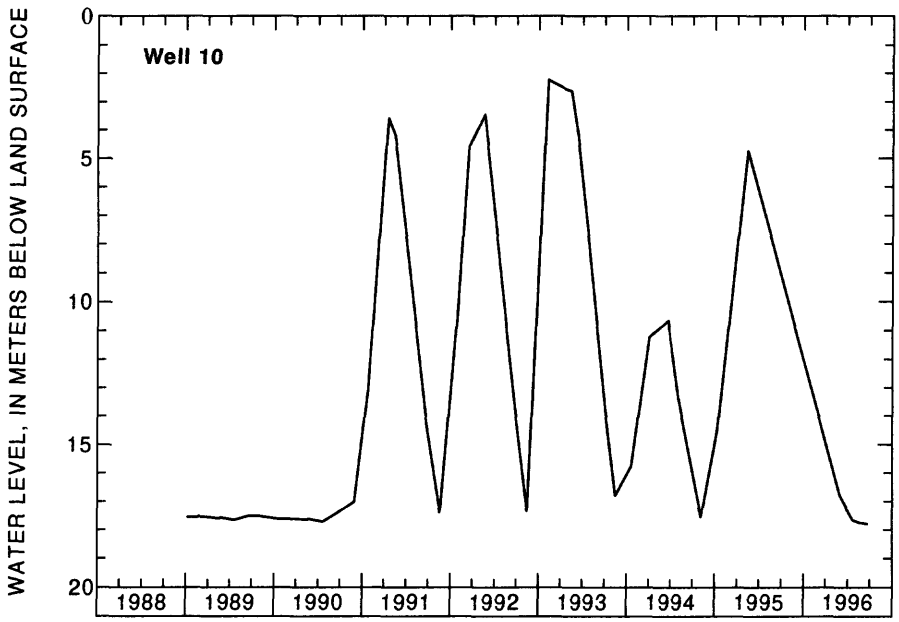
Logs: D, driller's; G, geologist; P, particle size.

Well	Section location	Date completed	Drilling method	Hole depth (meters)	Well depth (meters)	Screened interval (meters)	Geologic Unit	Bottom of seal (meters)	Logs available
10	bdd1	01–06–89	Air hammer	27.9	27.1	18.0–27.1	Basin fill	2.4	DGP

GROUND WATER—Continued

Well 10—Continued

Date	Water level, in meters below land surface	Date	Water level, in meters below land surface	Date	Water level, in meters below land surface
10–05–93	13.83	08–03–94	13.34	06–01–96	16.79
11–16–93	16.79	11–07–94	17.54	07–24–96	17.65
01–21–94	15.76	01–12–95	14.53	08–22–96	17.74
04–06–94	11.22	05–18–95	4.73	09–26–96	17.79
06–22–94	10.64				



Hydrograph of Well 10.

GROUND WATER—Continued

Well 10—Continued

Field Measurements

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; mV, millivolts; °C, degrees Celsius; mg/L, milligrams per liter; IT, incremental titration; L/min, liters per minute; --, no data]

Well	Date	Specific conductance (µS/cm)	pH (standard units)	Oxidation reduction potential (mV)	Temperature, air (°C)	Temperature, water (°C)	Oxygen, dissolved (mg/L)	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)	Average discharge (L/min)	Pumping period (hours)
10	11–07–94	531	6.3	179	17.0	16.0	6.5	186	227	2.4	1.15
	06–01–96	525	6.8	462	--	20.0	7.0	199	243	2.4	.55

Laboratory Measurements

[Laboratory—10, USGS National Water-Quality Laboratory, Arvada, Colorado; 110, USGS research laboratory (K.G. Stollenwerk), Lakewood, Colorado; 140, USGS research laboratory, Menlo Park, California; mol/L, moles per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, no data]

Well	Date	Laboratory	Ionic balance (percent)	Ionic strength (mol/L)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)
10	11–07–94	10	-1.0	0.008	56	17	29	1.8	70	15	0.40
	11–07–94	140	--	--	58	18	29	1.3	--	19	--
	11–07–94	110	.53	.009	57	18	37	--	75	20	--
	06–01–96	10	-.86	.008	56	17	26	2.0	36	26	.30

Well	Date	Laboratory	Silica, dissolved (mg/L as SiO_2)	Aluminum, dissolved (µg/L as Al)	Barium, dissolved (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Boron, dissolved (µg/L as B)	Cadmium, dissolved (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)	Cobalt, dissolved (µg/L as Co)	Copper, dissolved (µg/L as Cu)	Iron, dissolved (µg/L as Fe)
10	11–07–94	10	24	<10	120	<0.5	20	<1.0	<5	<3	<10	<3
	11–07–94	140	26	<110	--	--	--	--	--	<30	<30	<130
	11–07–94	110	29	--	--	--	--	--	--	--	<10	< 20
	06–01–96	10	26	<5.0	170	50	20	<1.0	<5.0	<3	20	<3.0

Well	Date	Laboratory	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Molybdenum, dissolved (µg/L as Mo)	Nickel, dissolved (µg/L as Ni)	Silver, dissolved (µg/L as Ag)	Strontium, dissolved (µg/L as Sr)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Zn)
10	11–07–94	10	30	<4	1	10	<10	<1.0	320	<6	7
	11–07–94	140	--	--	<60	--	<90	--	--	--	<20
	11–07–94	110	--	--	<30	--	<50	--	350	--	<15
	06–01–96	10	<10	4	1.0	<10	<10	<1.0	370	<6	8.0

GROUND WATER—Continued

Well Group 50

LOCATION.—Lat 33°26'11", long 110°49'51", in SE1/4SW1/4SE1/4, sec. 9, T. 1 N., R. 15 E. (A-01-15)09dcd, 170 m east of Miami Wash, and 6 km northwest of Globe.

Landowner: Pinto Valley Division, Broken Hills Proprietary Company, Limited (previously Magma Copper Corporation).

LAND SURFACE DATUM.—988.10 m above National Geodetic Vertical Datum of 1929 (levels by Water Resources Division, U.S. Geological Survey).

REMARKS.—Wells 51, 52, 53, and 54 were originally identified as MP1W1, MP1W2, MP1W3, and MP1W4, respectively.

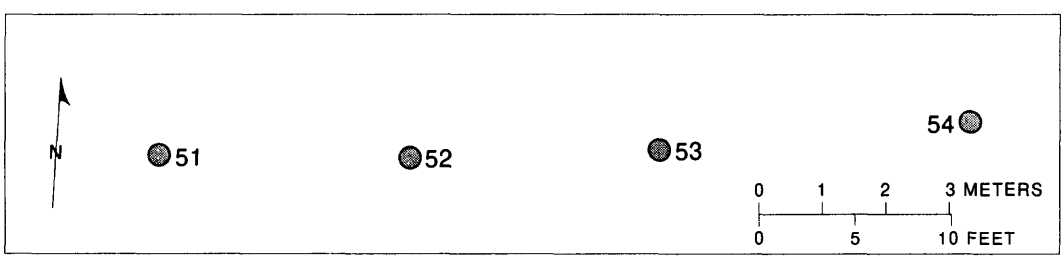
DRILLING AND WELL CONSTRUCTION

All holes listed below were drilled by normal-circulation rotary drilling with bentonite mud. The wells were cased with nominal 10-centimeter diameter, schedule 40, PVC pipe. Each well has a single 0.9-meter length of slotted, 10-centimeter diameter, schedule 80, PVC pipe as the well screen. Each screen has 1,470 factory-cut slots 3.6 cm long by 0.64 mm wide for a total open area of 339 cm^2. The borehole annulus around the screen is filled with washed pea gravel from uncontaminated local alluvium. A layer of bentonite pellets was placed in the annulus from approximately 0.5 to 1.5 m above the screen. A concrete seal extends from the land surface to a depth of 3 m for each well.

Logs: C, caliper; E, electric; G, geologist; P, particle size; --, no data.

Well	Section location	Date completed	Drilling method	Hole depth (meters)	Well depth (meters)	Screened interval (meters)	Geologic Unit	Bottom of seal (meters)	Logs available
51	dcd1	10–11–84	Rotary, bentonite	33.5	33.4	32.4–33.3	Basin fill	3	CEGP
52	dcd2	10–12–84	Rotary, bentonite	20.1	19.8	18.8–19.7	Alluvium	3	--
53	dcd3	10–12–84	Rotary, bentonite	28.0	27.8	26.8–27.7	Basin fill	3	--
54	dcd4	10–12–84	Rotary, bentonite	11.3	11.0	10.0–10.9	Alluvium	3	--

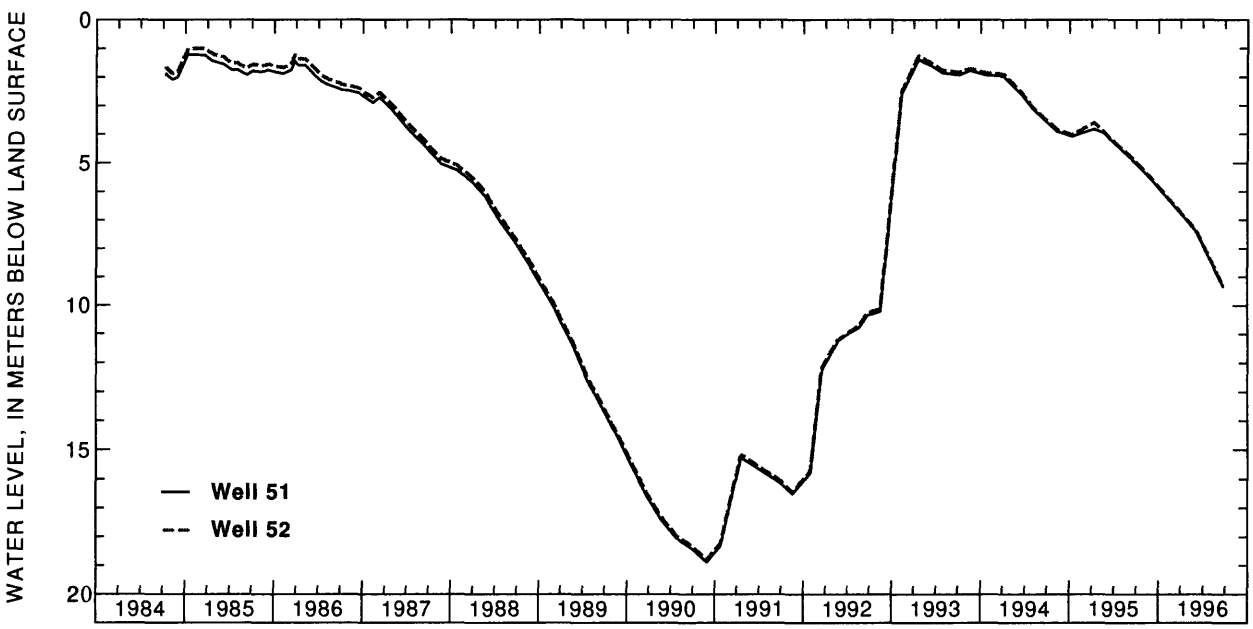
WELL GROUP 50 SITE PLAN



GROUND WATER—Continued

Well Group 50—Continued

	Water level, in meters below land surface			
	Well number			
Date	51	52	53	54
10–06–93	1.93	1.84	1.87	1.88
11–19–93	1.78	1.70	1.72	1.73
01–21–94	1.93	1.86	1.87	1.83
04–06–94	1.98	1.91	1.91	1.89
06–23–94	2.66	2.59	2.58	2.62
08–03–94	3.12	3.06	3.07	3.08
11–10–94	3.90	3.84	3.85	3.87
01–12–95	4.08	4.03	4.04	4.05
04–12–95	3.82	3.59	3.60	3.92
05–19–95	3.95	3.90	3.90	3.93
09–21–95	4.93	4.89	4.89	4.90
12–01–95	5.54	5.50	5.50	5.51
06–05–96	7.39	7.37	7.35	7.35
07–24–96	8.28	8.24	8.24	8.24
08–21–96	8.75	8.71	8.71	8.72
09–26–96	9.35	9.32	9.32	9.32



Hydrographs of Wells 51 and 52.

GROUND WATER—Continued

Well Group 50—Continued

Field Measurements

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; mV, millivolts; °C, degrees Celsius; mg/L, milligrams per liter; L/min, liters per minute; --, no data; <, actual value is known to be less than value shown]

Well	Date	Specific conductance (µS/cm)	pH (standard units)	Oxidation reduction potential (mV)	Temperature, air (°C)	Temperature, water (°C)	Oxygen, dissolved (mg/L)	Average discharge (L/min)	Pumping period (hours)
51	11–19–93	2,160	4.1	--	17.0	17.5	<0.1	4.5	0.58
	06–23–94	2,260	4.0	431	--	19.5	<.1	3.8	.67
	11–10–94	1,950	3.9	--	--	17.0	.4	1.5	.78
	05–19–95	1,950	4.0	--	--	20.0	.3	4.2	.65
	12–01–95	1,810	4.1	449	--	17.0	.7	4.9	.72
	06–05–96	2,620	3.9	464	--	20.5	.2	4.4	.37
	06–07–96*	2,750	3.9	456	--	20.5	.2	3.8	.47
52	11–19–93	1,750	4.0	--	7.0	17.0	.3	4.5	.58
	11–10–94	2,210	3.8	282	--	17.0	.4	1.9	.60
	05–19–95	2,340	3.8	--	--	19.0	.2	4.4	.70
	12–01–95	2,130	3.8	478	--	19.0	.9	4.2	.75
	06–05–96	2,900	3.7	488	--	24.0	.2	3.3	.53
53	06–23–94	2,160	4.0	436	36.5	19.5	<.1	3.8	.72
	11–10–94	1,900	3.9	--	--	16.5	.5	1.5	.88
	05–19–95	1,990	3.9	--	--	19.5	.3	4.9	.50
	12–01–95	1,880	3.9	--	--	18.5	<.1	4.2	.38
	06–05–96	2,810	3.9	472	--	23.5	.3	4.2	.37
54	11–19–93	2,040	4.0	--	--	17.5	.1	4.5	.95
	06–23–94	2,440	3.9	582	33.0	19.0	<.1	2.6	1.30
	11–10–94	2,720	3.9	445	22.0	18.5	.3	1.9	.87
	05–19–95	2,640	3.8	--	--	17.5	.2	4.5	.63
	12–01–95	2,690	3.8	579	--	17.5	.1	3.0	.52
	06–05–96	2,470	3.9	511	33.0	20.5	.1	1.9	1.17

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 50—Continued

Laboratory Measurements

[Laboratory—10, USGS National Water-Quality Laboratory, Arvada, Colorado; 110, USGS research laboratory (K.G. Stollenwerk), Lakewood, Colorado; 140, USGS research laboratory, Menlo Park, California; 20, USGS research laboratory, Ocala, Florida; mg/L, milligrams per liter; µg/L, micrograms per liter; mol/L, moles per liter; --, no data; <, actual value is known to be less than value shown]

Well	Date	Laboratory	Ionic balance (percent)	Ionic strength (mol/L)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)
51	11–19–93	110	1.6	0.064	160	71	75	--	1,500
	06–23–94	10	-.15	.060	190	66	47	5.8	1,400
	06–23–94	110	-.56	.061	160	69	57	--	1,400
	06–23–94	140	-2.3	.059	160	68	59	6.4	1,400
	11–10–94	110	2.3	.055	160	63	76	--	1,300
	11–10–94	140	3.7	.049	160	62	61	11	1,100
	05–19–95	140	1.5	.050	180	63	62	5.7	1,200
	12–01–95	10	--	--	170	57	64	6.4	--
	12–01–95	140	--	--	--	--	--	--	1,200
	06–05–96	10	-3.7	.078	300	97	77	8.2	1,900
	06–07–96*	10	-4.9	.081	310	99	79	8.2	2,000
52	11–19–93	110	1.7	.049	100	66	70	--	1,100
	11–10–94	110	3.6	.065	230	89	91	--	1,500
	11–10–94	140	2.2	.057	200	90	70	9.6	1,300
	11–10–94	10	-12	.055	220	78	67	5.8	1,400
	05–19–95	140	-5.5	.067	280	89	75	7.1	1,700
	12–01–95	140	-11	.058	200	80	70	5.5	1,500
	06–05–96	10	-5.0	.090	380	120	87	7.4	2,200
53	06–23–94	110	1.5	.058	130	71	59	--	1,300
	06–23–94	140	-2.4	.057	140	70	59	6.7	1,400
	11–10–94	110	5.7	.053	150	66	84	--	1,200
	11–10–94	140	.92	.048	150	59	62	6.3	1,100
	05–19–95	140	-2.3	.052	180	69	66	8.2	1,200
	12–01–95	140	-3.3	.049	200	60	60	6.9	1,200
	06–05–96	10	-5.0	.086	350	110	78	8.5	2,100
54	11–19–93	110	2.0	.054	250	91	94	--	1,200
	06–23–94	110	-2.7	.062	310	97	80	--	1,500
	06–23–94	140	-1.0	.062	320	96	81	8.4	1,500
	11–10–94	110	4.5	.079	420	110	130	--	1,800
	11–10–94	140	1.3	.073	400	110	95	10	1,700
	05–19–95	140	-3.8	.075	390	100	93	11	1,900
	12–01–95	140	-4.1	.077	400	110	90	7.4	1,900
	06–05–96	10	-3.7	.066	350	93	87	8.7	1,600

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 50—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Aluminum, dissolved (µg/L as Al)	Barium, dissolved (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Boron, dissolved (µg/L as B)	Cadmium, dissolved (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)
51	11–19–93	110	80	--	100	20,000	--	--	--	<100	--
	06–23–94	10	38	1.3	75	15,000	11	30	150	63	<20
	06–23–94	110	67	--	74	20,000	--	--	--	--	--
	06–23–94	140	38	--	77	17,000	--	--	--	--	--
	11–10–94	110	42	--	95	22,000	--	--	--	--	--
	11–10–94	140	34	--	82	15,000	--	--	--	--	--
	05–19–95	140	20	--	86	15,000	--	--	--	--	--
	12–01–95	10	--	--	86	14,000	15	26	90	47	<20
	12–01–95	140	26	--	--	--	--	--	--	--	--
	06–05–96	10	41	7.6	88	28,100	17	49	44	69	<15
	06–07–96*	10	39	7.8	88	28,800	16	50	52	71	<15
52	11–19–93	110	45	--	120	26,000	--	--	--	<100	--
	11–10–94	110	43	--	120	41,000	--	--	--	--	--
	11–10–94	140	41	--	110	28,000	--	--	--	--	--
	11–10–94	10	59	5.1	91	28,000	6	37	90	33	20
	05–19–95	140	44	--	100	28,000	--	--	--	--	--
	12–01–95	140	36	--	50	25,000	--	--	--	--	--
	06–05–96	10	49	9.2	110	44,000	14	76	59	55	<15
53	06–23–94	110	49	--	76	22,000	--	--	--	--	--
	06–23–94	140	38	--	37	18,000	--	--	--	--	--
	11–10–94	110	36	--	100	24,000	--	--	--	--	--
	11–10–94	140	36	--	83	14,000	--	--	--	--	--
	05–19–95	140	33	--	88	16,000	--	--	--	--	--
	12–01–95	140	31	--	40	15,000	--	--	--	--	--
	06–05–96	10	40	9.8	94	32,600	15	56	52	66	<15
54	11–19–93	110	55	--	120	23,000	--	--	--	<100	--
	11–19–93	150	--	--	--	15,000	--	--	--	22	--
	06–23–94	110	67	--	110	22,000	--	--	--	--	--
	06–23–94	140	65	--	120	18,000	--	--	--	--	--
	11–10–94	110	74	--	120	37,000	--	--	--	--	--
	11–10–94	140	75	--	110	23,000	--	--	--	--	--
	05–19–95	140	25	--	100	25,000	--	--	--	--	--
	12–01–95	140	43	--	50	25,000	--	--	--	--	--
	06–05–96	10	61	1.9	96	18,000	20	44	50	24	20

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 50—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Cobalt, dissolved (µg/L as Co)	Copper, dissolved (µg/L as Cu)	Iron, dissolved (µg/L as Fe)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Molybdenum, dissolved (µg/L as Mo)	Nickel, dissolved (µg/L as Ni)	Silver, dissolved (µg/L as Ag)
51	11–19–93	110	3,900	13,000	360,000	--	--	12,000	--	350	--
	06–23–94	10	2,100	18,000	290,000	<30	170	10,000	<30	430	<3.0
	06–23–94	110	--	19,000	320,000	--	--	8,800	--	660	--
	06–23–94	140	--	19,000	280,000	--	--	9,500	--	390	--
	11–10–94	110	--	18,000	240,000	--	--	7,400	--	280	--
	11–10–94	140	280	17,000	210,000	--	--	8,100	--	230	--
	05–19–95	140	240	15,000	180,000	--	--	8,000	--	310	--
	12–01–95	10	180	13,000	130,000	70	200	7,200	<30	270	<3.0
	06–05–96	10	--	24,000	200,000	70	250	13,000	<30	450	<3.0
	06–07–96*	10	--	25,000	200,000	<30	250	14,000	<30	490	<3.0
52	11–19–93	110	2,800	22,000	210,000	--	--	12,000	--	280	--
	11–10–94	110	--	23,000	150,000	--	--	9,600	--	460	--
	11–10–94	140	--	20,000	130,000	--	--	10,000	--	440	--
	11–10–94	10	680	18,000	<20,000	<30	230	9,900	<30	410	6.0
	05–19–95	140	270	18,000	84,000	--	--	11,000	--	380	--
	12–01–95	140	230	16,000	71,000	--	--	10,000	--	340	--
	06–05–96	10	--	31,000	100,000	80	290	19,000	<30	590	<3.0
53	06–23–94	110	--	20,000	320,000	--	--	4,300	--	630	--
	06–23–94	140	370	20,000	270,000	--	--	10,000	--	420	--
	11–10–94	110	--	20,000	230,000	--	--	7,600	--	270	--
	11–10–94	140	220	16,000	190,000	--	--	7,900	--	330	--
	05–19–95	140	250	16,000	150,000	--	--	7,800	--	<90	--
	12–01–95	140	190	13,000	110,000	--	--	7,600	--	290	--
	06–05–96	10	--	26,000	160,000	<30	260	15,000	<30	520	<3.0
54	11–19–93	110	450	17,000	660	--	--	22,000	--	440	--
	11–19–93	150	360	18,000	--	--	--	33,000	--	520	--
	06–23–94	110	--	20,000	<200	--	--	23,000	--	810	--
	06–23–94	140	480	20,000	--	--	--	26,000	--	590	--
	11–10–94	110	--	25,000	<200	--	--	29,000	--	650	--
	11–10–94	140	510	22,000	1,100	--	--	29,000	--	690	--
	05–19–95	140	480	19,000	790	--	--	27,000	--	660	--
	12–01–95	140	460	19,000	1,700	--	--	25,000	--	630	--
	06–05–96	10	350	17,000	110	60	280	20,000	<30	560	<3.0

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 50—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Strontium, dissolved (µg/L as Sr)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Zn)	Carbon, inorganic, total (mg/L as C)	Carbon, inorganic, dissolved (mg/L as C)
51	11–19–93	110	910	--	3,300	--	--
	11–19–93	20	--	--	--	34	--
	06–23–94	10	700	60	3,000	--	--
	06–23–94	110	710	--	2,700	--	--
	06–23–94	140	700	--	2,800	--	--
	06–23–94	20	--	--	--	49	--
	11–10–94	110	680	--	2,300	--	--
	11–10–94	140	--	--	2,300	--	--
	11–10–94	20	--	--	--	54	--
	05–19–95	140	700	--	2,000	--	--
	05–19–95	20	--	--	--	23	33
	12–01–95	10	700	<18	1,600	--	--
	12–01–95	20	--	--	--	--	8.7
	06–05–96	10	1,300	23	2,900	--	--
	06–07–96*	10	1,300	21	2,800	--	--
	06–05–96	20	--	--	--	--	20
	06–07–96*	20	--	--	--	--	16
52	11–19–93	110	510	--	2,600		--
	11–19–93	20	--	--	--	33	--
	11–10–94	110	650	--	2,600	--	--
	11–10–94	140	630	--	2,700	--	--
	11–10–94	10	590	31	2,500	--	--
	11–10–94	20	--	--	--	54	--
	05–19–95	140	800	--	2,200	--	--
	05–19–95	20	--	--	--	21	23
	12–01–95	140	700	--	2,000	--	--
	12–01–95	20	--	--	--	--	18
	06–05–96	10	1,300	<18	3,200	--	--
	06–05–96	20	--	--	--	--	16
53	06–23–94	110	560	--	2,900		--
	06–23–94	140	500	--	3,100		--
	06–23–94	20	--	--	--	49	--

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 50—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Strontium, dissolved (µg/L as Sr)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Zn)	Carbon, inorganic, total (mg/L as C)	Carbon, inorganic, dissolved (mg/L as C)
53	11–10–94	110	540	--	2,300	--	--
	11–10–94	140	--	--	2,400	--	--
	11–10–94	20	--	--	--	59	--
	05–19–95	140	600	--	2,000	--	--
	05–19–95	20	--	--	--	26	29
	12–01–95	20	--	--	--	--	17.5
	12–01–95	140	590	--	1,700	--	--
	06–05–96	10	1,200	<18	3,000	--	--
	06–05–96	20	--	--	--	--	17
54	11–19–93	110	1,600	--	2,900	--	--
	11–19–93	150	2,000	--	2,300	--	--
	11–19–93	20	--	--	--	21	--
	06–23–94	110	1,300	--	2,800	--	--
	06–23–94	140	1,300	--	2,900	--	--
	06–23–94	20	--	--	--	31	--
	11–10–94	110	1,700	--	3,300	--	--
	11–10–94	140	--	--	3,100	--	--
	11–10–94	20	--	--	--	45	--
	05–19–95	20	--	--	--	21	25
	05–19–95	140	1,500	--	3,000	--	--
	12–01–95	20	--	--	--	--	16
	12–01–95	140	1,500	--	2,900	--	--
	06–05–96	10	1,400	<18	2,400	--	--
	06–05–96	20	--	--	--	--	9.4

GROUND WATER—Continued

Well Group 100

LOCATION.—Lat 33°26'29", long 110°49'58", in SW1/4NW1/4SE1/4, sec. 9, T. 1 N., R. 15 E. (A-01-15)09dbc, in the right-of-way of State Highway 88, 150 m east of Miami Wash, and 7 km northwest of Globe.

Landowner: Arizona Department of Transportation.

LAND-SURFACE DATUM.—986.01 m above National Geodetic Vertical Datum of 1929 (levels by Water Resources Division, U.S. Geological Survey).

REMARKS.—Wells 101, 102, 103, 104, 105, and 106 were originally identified as X1W1, X1W2, X1W3, X1W4, X1W5, and X1W6, respectively.

DRILLING AND WELL CONSTRUCTION

Wells 101–105 were cased with nominal 10-centimeter diameter, schedule 40, PVC pipe. Each well has a single 0.9-meter length of slotted, 10-centimeter diameter, schedule 80, PVC pipe as the well screen. Each screen has 1,470 factory-cut slots 3.6 cm long by 0.64 mm wide for a total open area of 339 cm^2. The borehole annulus around the screen is filled with washed pea gravel from uncontaminated local alluvium. A layer of bentonite pellets was placed in the annulus from approximately 0.5 to 1.5 m above the screen. A concrete seal extends from the land surface to the depth listed.

Well 1EX was drilled for exploration purposes. After water samples and cuttings were collected, the hole was sealed with concrete to its total depth.

The casing of well 106 was accidentally crushed at about 46 m depth during pressure grouting. The borehole annulus probably is grouted from 0 to 15 m and from 46 to 55 m. Air jetting during attempted development removed most water from the upper casing. The water level rose from 37 to 29 m below land surface during the next 54 days, which represents an average inflow of 1.2 L/d. The casing then was filled with concrete.

Well 107 was cased with nominal 10-centimeter diameter, schedule 80 PVC pipe. The well has a single 4.4-meter length of slotted, 10-centimeter diameter, schedule 80, PVC pipe as the well screen. The screen has 3,168 factory cut slots 3.4 cm long by 0.64 mm wide for a total open area of 689 cm^2. The borehole around the screen is filled with washed pea gravel from uncontaminated local alluvium. A layer of bentonite pellets was placed in the annulus from approximately 1 to 2 m above the screen. A concrete seal extends from the land surface to a depth of 1.5 m.

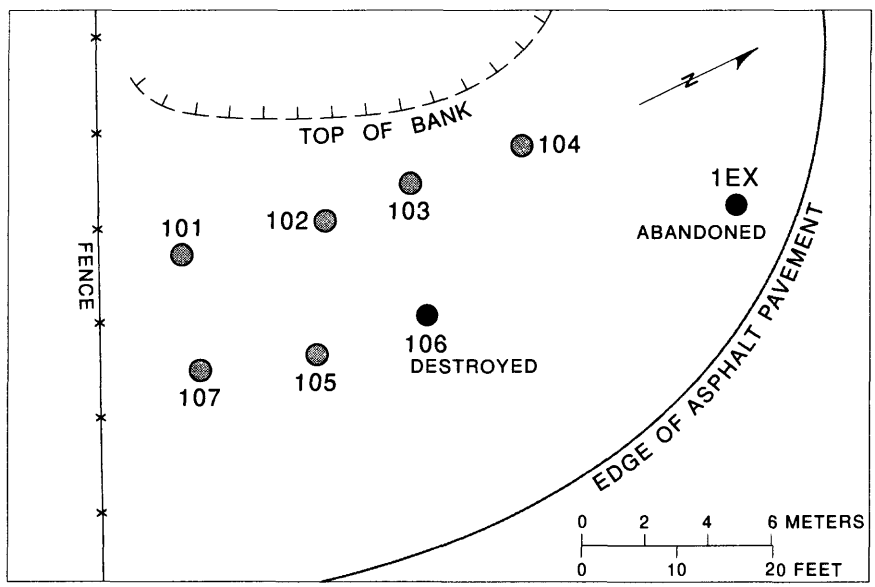
GROUND WATER—Continued

Well Group 100—Continued

Logs: C, caliper; D, driller's; E, electric; G, geologist; P, particle size; U, gamma-gamma; --, no data.

Well	Section location	Date completed	Drilling method	Hole depth (meters)	Well depth (meters)	Screened interval (meters)	Geologic Unit	Bottom of seal (meters)	Logs available
101	dbc1	10–10–84	Rotary, bentonite	36.3	36.1	35.1–36.0	Basin fill	3	CEGPU
102	dbc2	10–11–84	Rotary, bentonite	25.3	25.2	24.2–25.1	Alluvium	3	--
103	dbc3	10–11–84	Rotary, bentonite	19.2	19.1	18.1–19.0	Alluvium	3	--
104	dbc4	10–11–84	Rotary, bentonite	11.3	11.2	10.1–11.1	Alluvium	3	--
1EX	--	12–11–85	Dual-wall air rotary	77.7	--	--	--	--	DGP
105	dbc5	05–22–86	Rotary, bentonite	49.1	48.8	47.2–48.1	Basin fill	38.1	D
106	dbc6	05–20–86	Rotary, bentonite	62.5	--	--	--	--	--
107	dbc7	12–14–88	Hollow stem auger	22.6	19.3	14.9–19.2	Alluvium	1.5	DGP

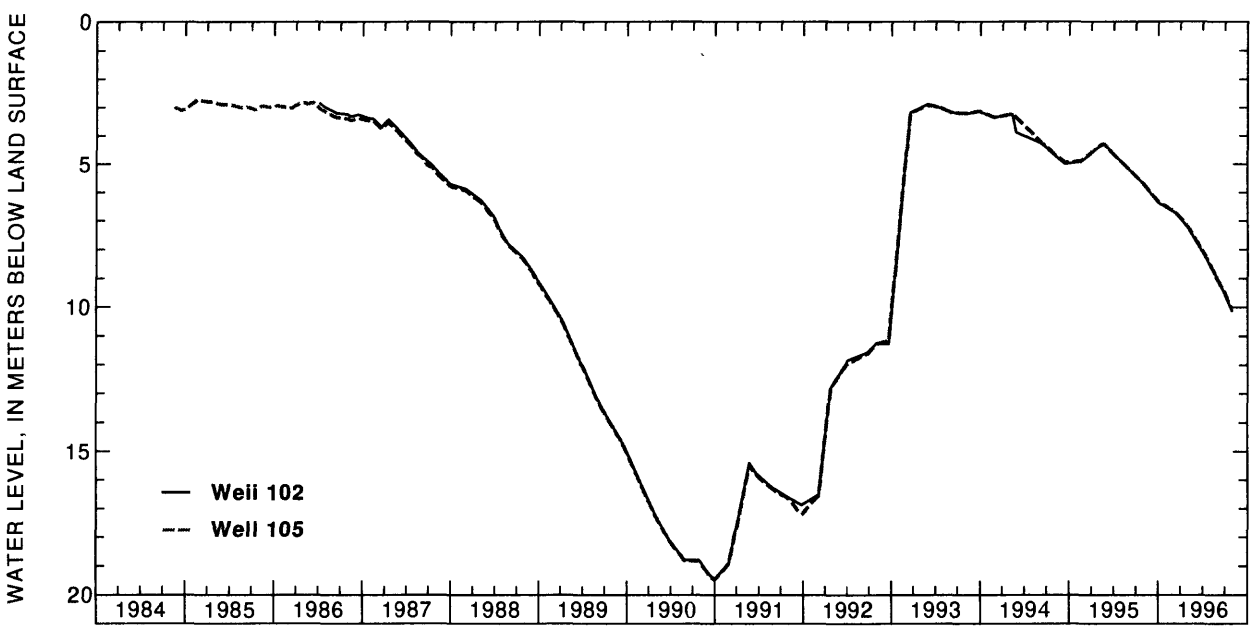
WELL GROUP 100 SITE PLAN



GROUND WATER—Continued

Well Group 100—Continued

	Water level, in meters below land surface					
	Well number					
Date	101	102	103	104	105	107
10–06–93	3.16	3.15	3.13	3.16	3.15	3.06
11–19–93	3.06	3.06	3.04	3.06	3.07	2.96
01–21–94	3.29	3.29	3.28	3.31	3.29	3.20
04–06–94	3.17	3.17	3.16	3.20	3.18	3.09
06–22–94	3.80	3.81	3.80	3.83	3.82	3.73
08–03–94	4.17	4.18	4.17	4.20	4.20	4.11
11–09–94	4.87	4.87	4.87	4.91	4.92	4.60
01–12–95	4.82	4.82	4.82	4.86	4.85	4.77
04–12–95	4.19	4.19	4.20	4.24	4.21	4.15
05–17–95	4.48	4.48	4.48	4.52	4.48	4.43
09–21–95	5.56	5.56	5.56	5.60	5.57	5.51
11–29–95	6.31	6.27	6.28	6.32	6.30	6.21
02–07–96	6.62	6.63	6.64	6.58	6.65	6.58
03–28–96	7.14	7.14	7.16	7.19	7.17	7.09
06–01–96	8.06	8.05	8.07	8.10	8.10	8.00
07–24–96	8.91	8.91	9.01	9.06	8.90	8.28
08–22–96	9.35	9.35	9.35	9.39	9.39	9.31
09–26–96	10.01	10.02	10.01	10.05	10.07	9.98



Hydrographs of Wells 102 and 105.

GROUND WATER—Continued

Well Group 100—Continued

Field Measurements

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; mV, millivolts; °C, degrees Celsius; mg/L, milligrams per liter; IT, incremental titration; L/min, liters per minute; --, no data; <, actual value is known to be less than value shown]

Well	Date	Specific conductance (µS/cm)	pH (standard units)	Oxidation reduction potential (mV)	Temperature, air (°C)	Temperature, water (°C)	Oxygen, dissolved (mg/L)	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)	Average discharge (L/min)	Pumping period (hours)
101	11–19–93	2,630	4.0	--	20.0	18.0	0.3	--	--	4.5	0.47
	06–22–94	1,790	3.9	431	37.0	21.0	<.1	--	--	3.4	.97
	11–09–94	1,740	4.0	--	--	17.5	.3	--	--	1.9	.62
	05–18–95	1,350	4.0	--	--	21.0	.1	--	--	4.9	.88
	11–29–95	1,260	4.0	476	--	18.5	.2	--	--	4.5	.72
	06–03–96	1,400	4.1	436	20.0	18.5	.3	--	--	4.5	1.42
102	11–19–93	3,150	3.8	--	--	18.0	.2	--	--	4.5	.45
	06–22–94	2,960	3.9	434	36.5	21.5	<.1	--	--	2.6	.85
	05–18–95	1,790	3.8	--	--	19.0	.1	--	--	4.5	.77
	11–30–95	1,620	3.9	448	--	19.0	.2	--	--	3.8	1.03
	06–05–96	1,800	4.0	436	--	20.0	.2	--	--	3.8	.67
103	11–19–93	2,170	4.0	--	19.5	18.0	.1	--	--	4.5	.53
	11–09–94	1,850	3.7	--	--	18.0	.4	--	--	1.5	.70
	05–18–95	1,590	4.0	--	--	17.5	.1	--	--	4.9	.65
	11–30–95	1,620	3.9	484	--	19.0	.3	--	--	4.9	.78
	06–01–96	1,780	3.9	450	--	21.5	.9	--	--	2.3	.48
104	11–19–93	1,970	3.9	--	--	18.0	.6	--	--	4.5	.58
	11–09–94	2,560	3.5	--	--	19.0	.4	--	--	1.9	.75
	05–17–95	2,830	3.8	--	--	17.0	.1	--	--	4.9	.68
	11–29–95	2,340	3.7	--	--	19.0	.4	--	--	4.5	.65
	06–01–96	2,090	3.8	579	--	21.5	.9	--	--	3.4	.75
105	06–22–94	4,040	6.3	308	--	21.0	.1	573	699	3.4	.60
	11–09–94	4,090	6.0	--	--	19.5	.7	--	--	1.1	1.27
	05–17–95	3,470	6.5	--	--	19.0	.2	637	777	4.5	.87
	06–07–96	3,900	6.3	252	--	20.0	.5	555	677	4.5	1.8
	06–07–96*	3,450	6.4	382	--	23.3	1.0	521	636	3.8	2.5
107	06–22–94	2,030	3.8	459	35.5	22.0	<.1	--	--	3.4	.58
	05–18–95	1,820	3.8	--	--	19.5	.2	--	--	4.9	.42

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 100—Continued

Laboratory Measurements

[Laboratory—10, USGS National Water-Quality Laboratory, Arvada, Colorado; 20, USGS research laboratory, Ocala, Florida; 110, USGS research laboratory (K.G. Stollenwerk), Lakewood, Colorado; 140, USGS research laboratory, Menlo Park, California; 150, USGS research laboratory, Reston, Virginia; mol/L, moles per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data; <, actual value is known to be less than value shown]

Well	Date	Laboratory	Ionic balance (percent)	Ionic strength (mol/L)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)
101	11–19–93	110	2.09	0.079	340	72	85	--	1,800
	06–22–94	10	-15.52	.037	170	39	43	5.0	1,000
	06–22–94	110	-.14	.046	160	42	53	--	1,100
	06–22–94	140	-.67	.050	150	40	51	5.2	1,200
	11–09–94	110	.58	.045	150	39	63	--	1,000
	11–09–94	140	8.21	.044	200	40	60	5.4	950
	05–18–95	140	-.77	.037	120	38	56	6.1	890
	11–29–95	140	-5.14	.032	100	30	50	4.4	810
	06–03–96	10	-8.7	.033	100	33	49	4.9	850
102	11–19–93	110	-.44	.114	580	71	90	--	2,700
	06–22–94	110	2.15	.086	520	43	62	--	2,000
	06–22–94	140	-.56	.086	510	41	54	3.9	2,000
	05–18–95	140	-3.16	.054	200	50	70	5.1	1,300
	11–30–95	140	-4.69	.040	100	50	60	4.4	1,000
	06–05–96	10	-4.6	.045	140	52	60	5.3	1,100
103	11–19–93	110	-1.85	.067	310	49	84	--	1,600
	11–09–94	110	2.64	.046	150	46	65	--	1,000
	11–09–94	140	2.03	.045	160	47	57	3.2	1,000
	11–09–94	10	--	.039	150	45	57	4.2	1,100
	05–18–95	140	-1.36	.043	140	48	60	4.9	1,000
	11–30–95	140	-5.99	.040	100	50	60	2.7	1,000
	06–01–96	10	-5.4	.045	150	53	63	4.7	1,100
104	11–19–93	110	1.99	.055	320	80	87	--	1,200
	11–09–94	110	-.51	.069	350	94	100	--	1,600
	11–09–94	140	1.37	.068	370	100	87	8.9	1,600
	05–17–95	140	--	--	370	87	72	7.0	1,700
	11–29–95	20	--	--	310	82	82	7.4	--
	11–29–95	140	-4.58	.064	300	90	90	6.6	1,600
	06–01–96	10	-5.0	.053	280	69	75	7.1	1,300
105	06–22–94	110	-2.25	.093	560	180	200	--	1,800
	06–22–94	140	.55	.098	610	180	230	28	1,800
	11–09–94	110	16.82	.092	620	180	280	--	1,700
	11–09–94	140	15.36	.094	630	190	230	28	1,800
	05–17–95	140	-3.47	.066	360	110	240	31	1,200
	06–07–96	10	-3.90	.071	400	110	240	30	1,400
	06–07–96*	10	-4.7	.086	520	140	190	28	1,700
107	06–22–94	110	2.78	.055	170	56	68	--	1,200
	06–22–94	140	2.86	.055	170	56	59	4.8	1,300
	05–18–95	140	-3.41	.048	140	56	65	5.9	1,200

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 100—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Aluminum, dissolved (µg/L as Al)	Barium, dissolved (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Boron, dissolved (µg/L as B)	Cadmium, dissolved (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)
101	11–19–93	110	50	--	100	27,000	--	--	--	<100	--
	06–22–94	10	24	1.3	76	12,000	13	18	120	41	<20
	06–22–94	110	33	--	79	14,000	--	--	--	--	--
	06–22–94	140	14	--	79	11,000	--	--	--	--	--
	11–09–94	110	23	--	87	16,000	--	--	--	--	--
	11–09–94	140	26	--	86	12,000	--	--	--	--	--
	05–18–95	140	13	--	79	9,500	--	--	--	--	--
	11–29–95	140	10	--	40	7,500	--	--	--	--	--
	06–03–96	10	30	2.8	74	7,860	15	15	66	35	<10
102	11–19–93	110	65	--	110	42,000	--	--	--	<100	--
	06–22–94	110	43	--	86	29,000	--	--	--	--	--
	06–22–94	140	34	--	83	22,000	--	--	--	--	--
	05–18–95	140	22	--	86	11,000	--	--	--	--	--
	11–30–95	140	23	--	40	8,900	--	--	--	--	--
	06–05–96	10	35	4.6	83	10,100	16	20	40	55	<15
103	11–19–93	110	48	--	100	18,000	--	--	--	<100	--
	11–19–93	150	--	--	--	13,000	--	--	--	23	--
	11–09–94	110	34	--	98	20,000	--	--	--	--	--
	11–09–94	140	34	--	88	14,000	--	--	--	--	--
	11–09–94	10	34	4.1	87	15,000	11	22	130	36	<20
	05–18–95	140	23	--	90	12,000	--	--	--	--	--
	11–30–95	140	24	--	40	12,000	--	--	--	--	--
	06–01–96	10	37	4.8	94	13,500	15	21	51	39	<15
104	11–19–93	110	73	--	120	13,000	--	--	--	<100	--
	11–09–94	110	46	--	120	27,000	--	--	--	--	--
	11–09–94	140	59	--	110	20,000	--	--	--	--	--
	05–17–95	140	30	--	68	11,000	--	--	--	--	--
	11–29–95	10	--	--	110	19,000	19	45	40	28	<20
	11–29–95	140	31	--	50	20,000	--	--	--	--	--
	06–01–96	10	47	5.4	92	13,900	18	38	59	20	<15
105	06–22–94	110	210	--	46	<5,000	--	--	--	--	--
	06–22–94	140	230	--	53	<110	--	--	--	--	--
	11–09–94	110	210	--	55	<5,000	--	--	--	--	--
	11–09–94	140	150	--	51	<110	--	--	--	--	--
	05–17–95	140	140	--	47	<110	--	--	--	--	--
	06–07–96	10	180	--	43	25	21	<1.5	114	<3.0	<15
	06–07–96*	10	150	--	47	22	16	<1.5	126	<3.0	<15
107	06–22–94	110	44	--	100	26,000	--	--	--	--	--
	06–22–94	140	36	--	100	19,000	--	--	--	--	--
	05–18–95	140	34	--	94	16,000	--	--	--	--	--

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 100—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Cobalt, dissolved (µg/L as Co)	Copper, dissolved (µg/L as Cu)	Iron, dissolved (µg/L as Fe)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Molybdenum, dissolved (µg/L as Mo)	Nickel, dissolved (µg/L as Ni)	Silver, dissolved (µg/L as Ag)
101	11–19–93	110	3,500	25,000	280,000	--	--	6,400	--	220	--
	06–22–94	10	1,200	11,000	--	<30	140	7,200	<30	240	<3.0
	06–22–94	110	--	12,000	210,000	--	--	6,400	--	360	--
	06–22–94	140	230	12,000	280,000	--	--	6,700	--	250	--
	11–09–94	110	--	12,000	190,000	--	--	5,900	--	360	--
	11–09–94	140	220	11,000	170,000	--	--	6,600	--	<240	--
	05–18–95	140	150	10,000	150,000	--	--	6,400	--	<90	--
	11–29–95	140	140	8,500	120,000	--	--	5,400	--	190	--
	06–03–96	10	--	9,000	120,000	<20	130	5,600	<20	180	3.0
102	11–19–93	110	3,500	26,000	350,000	--	--	12,000	--	<100	--
	06–22–94	110	--	12,000	230,000	--	--	6,600	--	330	--
	06–22–94	140	240	12,000	240,000	--	--	6,800	--	290	--
	05–18–95	140	250	14,000	210,000	--	--	8,300	--	310	--
	11–30–95	140	190	12,000	170,000	--	--	6,700	--	270	--
	06–05–96	10	--	14,000	170,000	60	180	6,900	<30	330	<3.0
103	11–19–93	110	2,100	15,000	220,000	--	--	8,300	--	<100	--
	11–19–93	150	--	15,000	--	--	--	11,000	--	260	--
	11–09–94	110	--	14,000	200,000	--	--	7,300	--	490	--
	11–09–94	140	--	14,000	180,000	--	--	8,100	--	120	--
	11–09–94	10	1,100	13,000	--	<30	190	8,500	<30	300	<3.0
	05–18–95	140	240	13,000	170,000	--	--	8,200	--	<90	--
	11–30–95	140	200	13,000	150,000	--	--	7,200	--	310	--
	06–01–96	10	--	14,000	130,000	60	200	8,400	<30	310	<3.0
104	11–19–93	110	350	15,000	--	--	--	27,000	--	420	--
	11–09–94	110	--	20,000	20,000	--	--	23,000	--	830	--
	11–09–94	140	470	20,000	19,000	--	--	27,000	--	610	--
	05–17–95	140	340	10,000	42,000	--	--	24,000	--	560	--
	11–29–95	10	330	18,000	27,000	60	260	20,000	<30	520	<3.0
	11–29–95	140	370	19,000	29,000	--	--	20,000	--	540	--
	06–01–96	10	270	14,000	3,500	50	220	17,000	<30	430	<3.0

GROUND WATER—Continued

Well Group 100—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Cobalt, dissolved (µg/L as Co)	Copper, dissolved (µg/L as Cu)	Iron, dissolved (µg/L as Fe)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Molybdenum, dissolved (µg/L as Mo)	Nickel, dissolved (µg/L as Ni)	Silver, dissolved (µg/L as Ag)
105	06–22–94	110	--	<100	<200	--	--	11,000	--	550	--
	06–22–94	140	<50	<30	<130	--	--	12,000	--	<90	--
	11–09–94	110	--	<100	<200	--	--	12,000	--	200	--
	11–09–94	140	20	<30	190	--	--	13,000	--	<90	--
	05–17–95	140	<20	<30	<130	--	--	6,100	--	<90	--
	06–07–96	10	<9	<30	99	<30	190	7,200	<30	<30	<3.0
	06–07–96*	10	11	<30	430	<30	210	11,000	<30	<30	<3.0
107	06–22–94	110	--	17,000	250,000	--	--	9,100	--	320	--
	06–22–94	140	310	16,000	280,000	--	--	9,900	--	350	--
	05–18–95	140	<20	15,000	180,000	--	--	9,000	--	350	--

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 100—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Strontium, dissolved (µg/L as Sr)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Zn)	Carbon, inorganic, total (mg/L as C)	Carbon, inorganic, dissolved (mg/L as C)
101	11–19–93	20	--	--	--	42	--
	11–19–93	110	1,000	--	2,700	--	--
	06–22–94	10	690	33	1,800	--	--
	06–22–94	20	--	--	--	50	--
	06–22–94	110	730	--	1,600	--	--
	06–22–94	140	700	--	1,800	--	--
	11–09–94	110	790	--	1,600	--	--
	11–09–94	140	790	--	1,700	--	--
	11–09–94	20	--	--	--	61	--
	05–18–95	20	--	--	--	12	26
	05–18–95	140	800	--	1,400	--	--
	11–29–95	20	--	--	--	--	22
	11–29–95	140	690	--	1,200	--	--
	06–03–96	20	--	--	--	--	19
	06–03–96	10	760	<12	1,200	--	--
102	11–19–93	20	--	--	--	31	--
	11–19–93	110	1,100	--	3,300	--	--
	06–22–94	110	860	--	1,900	--	--
	06–22–94	20	--	--	--	47	--
	06–22–94	140	800	--	1,900	--	--
	05–18–95	140	680	--	2,200	--	--
	05–18–95	20	--	--	--	26	32
	11–30–95	20	--	--	--	--	21
	11–30–95	140	610	--	1,800	--	--
	06–05–96	10	740	<18	1,900	--	--
	06–05–96	20	--	--	--	--	--
103	11–19–93	20	--	--	--	25	--
	11–19–93	110	650	--	1,700	--	--
	11–19–93	150	870	--	2,100	--	--
	11–09–94	110	610	--	2,100	--	--
	11–09–94	140	--	--	2,200	--	--
	11–09–94	10	630	27	2,100	--	--
	11–09–94	20	--	--	--	57	--

GROUND WATER—Continued

Well Group 100—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Strontium, dissolved (µg/L as Sr)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Zn)	Carbon, inorganic, total (mg/L as C)	Carbon, inorganic, dissolved (mg/L as C)
103	05–18–95	140	600	--	2,000	--	--
	05–18–95	20	--	--	--	44	31
	11–30–95	140	670	--	1,900	--	--
	11–30–95	20	--	--	--	--	.4
	06–01–96	10	760	<18	1,900	--	--
	06–01–96	20	--	--	--	--	26
104	11–19–93	20	--	--	--	23	--
	11–19–93	110	1,500	--	1,600	--	--
	11–19–93	150	--	--	--	--	--
	11–09–94	110	1,500	--	2,800	--	--
	11–09–94	140	--	--	2,800	--	--
	11–09–94	20	--	--	--	46	--
	05–17–95	140	1,100	--	1,700	--	--
	05–17–95	20	--	--	--	24	26
	11–29–95	10	1,300	<18	2,400	--	--
	11–29–95	140	1,300	--	2,700	--	--
	11–29–95	20	--	--	--	--	15
	06–01–96	20	--	--	--	--	20
	06–01–96	10	1,200	<18	1,900	--	--
105	06–22–94	110	1,600	--	<150		--
	06–22–94	140	1,600	--	40	--	--
	11–09–94	110	1,700	--	230	--	--
	11–09–94	140	--	--	20	--	--
	05–17–95	140	1,000	--	59	--	--
	06–07–96	10	1,400	<18	<9.0	--	--
	06–07–96*	10	1,100	<18	16	--	--
107	06–22–94	110	720	--	2,300	--	--
	06–22–94	20	--	--	--	44	--
	06–22–94	140	700	--	2,600	--	--
	05–18–95	140	700	--	2,300	--	--
	05–18–95	20	--	--	--	--	32

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 200

LOCATION.—Lat 33°27'07", long 110°49'55", in SW1/4SW1/4SE1/4, sec. 4, T. 1 N., R. 15 E. (A-01-15)04dcc, 7 m northeast of Bixby Road, 50 m north of Pinal Creek, and 8 km northwest of Globe.

Landowner: F.R. Kelly, Claypool, Arizona.

LAND-SURFACE DATUM.—979.24 m above National Geodetic Vertical Datum of 1929 (levels by Water Resources Division, U.S. Geological Survey).

REMARKS.—Wells 201 and 202 were originally identified as X2W1 and X2W2, respectively.

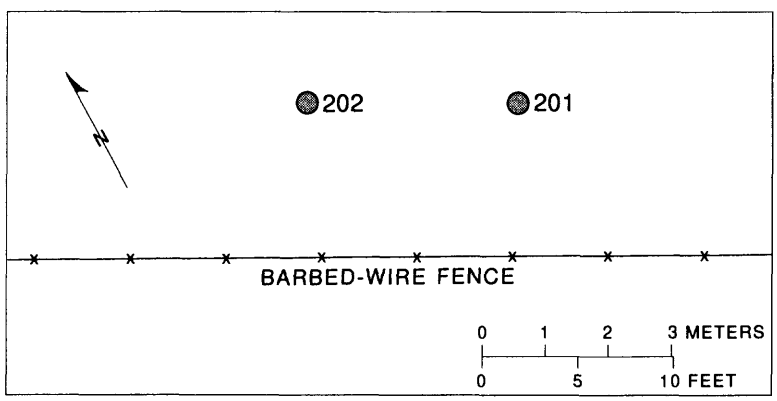
DRILLING AND WELL CONSTRUCTION

Both holes listed below were drilled by normal-circulation rotary drilling with bentonite mud. The wells were cased with nominal 10-centimeter diameter, schedule 40, PVC pipe. Each well has a single 0.9-meter length of slotted, 10-centimeter diameter, schedule 80, PVC pipe as the well screen. Each screen has 1,470 factory-cut slots 3.6 cm long by 0.64 mm wide for a total open area of 339 cm^2. The borehole annulus around the screen is filled with washed pea gravel from uncontaminated local alluvium. A layer of bentonite pellets was placed in the annulus from approximately 0.5 to 1.5 m above the screen. A concrete seal extends from the land surface to the depth listed.

Logs: C, caliper; E, electric; G, geologist; J, gamma; P, particle size; U, gamma-gamma; --, no data.

Well	Section location	Date completed	Drilling method	Hole depth (meters)	Well depth (meters)	Screened interval (meters)	Geologic Unit	Bottom of seal (meters)	Logs available
201	dcc1	10–05–84	Rotary, bentonite	18.6	18.6	17.6–18.5	Basin fill	3	CEGJPU
202	dcc2	10–06–84	Rotary, bentonite	12.5	12.3	11.3–12.2	Alluvium	3	--

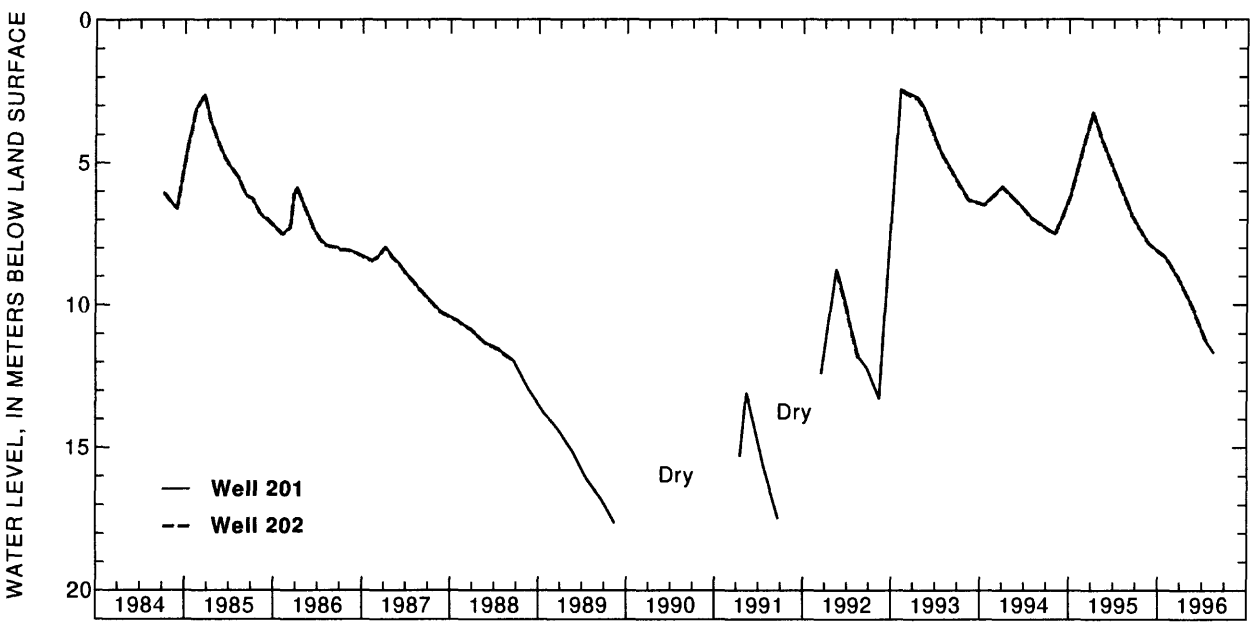
WELL GROUP 200 SITE PLAN



GROUND WATER—Continued

Well Group 200—Continued

Date	Water level, in meters below land surface, Well number 201	Well number 202	Date	Water level, in meters below land surface, Well number 201	Well number 202
10–06–93	5.68	5.71	05–18–95	4.12	4.15
11–17–93	6.30	6.31	09–21–95	6.87	6.89
01–21–94	6.47	6.48	11–27–95	7.82	7.83
04–06–94	5.83	5.85	02–07–96	8.35	8.35
06–20–94	6.49	6.50	03–28–96	9.04	9.04
08–03–94	6.93	6.95	05–31–96	10.17	10.18
11–10–94	7.52	7.53	07–24–96	11.31	11.32
01–12–95	6.13	6.15	08–21–96	11.67	Dry
04–12–95	3.23	3.26	09–26–96	12.03	Dry



Hydrographs of Wells 201 and 202.

GROUND WATER—Continued

Well Group 200—Continued

Field Measurements

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; mV, millivolts; °C, degrees Celsius; mg/L, milligrams per liter; IT, incremental titration; L/min, liters per minute; --, no data]

Well	Date	Specific conductance (µS/cm)	pH (standard units)	Oxidation reduction potential (mV)	Temperature, air (°C)	Temperature, water (°C)	Oxygen, dissolved (mg/L)	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)	Average discharge (L/min)	Pumping period (hours)
201	06–20–94	665	7.1	400	23.0	16.0	5.4	146	178	6.1	1.02
	11–27–95	594	7.0	621	--	15.5	3.9	159	194	4.2	.60
	05–31–96	690	7.1	432	--	21.0	3.6	168	205	1.9	.87
202	06–20–94	696	7.1	413	--	16.0	4.0	152	186	6.1	.67
	11–27–95	580	7.0	564	11.0	15.0	3.1	157	192	4.2	.32
	05–31–96	680	7.0	447	--	20.0	3.3	169	206	1.5	.75

Laboratory Measurements

[Laboratory—10, USGS National Water-Quality Laboratory, Arvada, Colorado; 110, USGS research laboratory (K.G. Stollenwerk), Lakewood, Colorado; 140, USGS research laboratory, Menlo Park, California; mol/L, moles per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, no data]

Well	Date	Laboratory	Ionic balance (percent)	Ionic strength (mol/L)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)
201	06–20–94	110	0.74	0.010	79	17	26	--	120
	06–20–94	140	-15	.013	85	17	26	<.05	250
	11–27–95	140	10	.010	80	20	30	2.9	90
	05–31–96	10	2.0	.011	86	16	30	1.7	120
202	06–20–94	110	-2.9	.011	80	18	23	--	140
	06–20–94	140	-16	.015	93	19	26	3.2	290
	11–27–95	140	1.7	.009	70	10	30	4.0	80
	05–31–96	10	1.4	.011	82	17	32	2.6	120

Well	Date	Laboratory	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as Fe)	Silica, dissolved (mg/L as SiO_2)	Aluminum, dissolved (µg/L as Al)	Barium, dissolved (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Boron, dissolved (µg/L as B)
201	06–20–94	110	30	--	24	<500	--	--	--
	06–20–94	140	38	--	26	<110	--	--	--
	11–27–95	140	26	--	10	170	--	--	--
	05–31–96	10	29	0.30	24	5.9	29	<0.50	65
202	06–20–94	110	31	--	23	<500	--	--	--
	06–20–94	140	38	--	26	<110	--	--	--
	11–27–95	140	27	--	10	<110	--	--	--
	05–31–96	10	31	.30	25	5.2	55	<.50	66

GROUND WATER—Continued

Well Group 200—Continued

Laboratory Measurements

Well	Date	Laboratory	Cadmium, dissolved (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)	Cobalt, dissolved (µg/L as Co)	Copper, dissolved (µg/L as Cu)	Iron, dissolved (µg/L as Fe)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)
201	06–20–94	110	--	--	--	<10	<20	--	--
	06–20–94	140	--	--	30	<30	<130	--	--
	11–27–95	140	--	--	<20	210	--	--	--
	05–31–96	10	<1.0	<5.0	<3.0	<10	4.0	<10	9
202	06–20–94	110	--	--	--	<10	<20	--	--
	06–20–94	140	--	--	40	<30	<130	--	--
	11–27–95	140	--	--	<20	110	980	--	--
	05–31–96	10	<1.0	<5.0	<3.0	<10	<3.0	<10	7

Well	Date	Laboratory	Manganese, dissolved (µg/L as Mn)	Molybdenum, dissolved (µg/L as Mo)	Nickel, dissolved (µg/L as Ni)	Silver, dissolved (µg/L as Ag)	Strontium, dissolved (µg/L as Sr)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Zn)
201	06–20–94	110	<30	--	<50	--	270	--	<15
	06–20–94	140	<60	--	<90	--	300	--	<20
	11–27–95	140	230	--	<90	--	280	--	50
	05–31–96	10	<1.0	30	<10	<1.0	280	<6	6.0
202	06–20–94	110	<30	--	<50	--	290	--	<15
	06–20–94	140	<60	--	<90	--	300	--	<20
	11–27–95	140	100	--	<90	--	240	--	<20
	05–31–96	10	<1.0	<10	<10	<1.0	300	<6	<3.0

GROUND WATER—Continued

Well Group 300

LOCATION.—Lat 33°27'17", long 110°50'19", in SE1/4NW1/4SW1/4, sec. 4, T. 1 N., R. 15 E. (A-01-15)04cbd, 100 m northeast of Pinal Creek, and 8 km northwest of Globe.

Landowner: H and E Ranch, Inc., Globe, Arizona.

LAND-SURFACE DATUM.—972.40 m above National Geodetic Vertical Datum of 1929 (levels by Water Resources Division, U.S. Geological Survey).

REMARKS.—Wells 301, 302, 303, and 304 were originally identified as X3W1, X3W2, X3W3, and X3W4, respectively.

DRILLING AND WELL CONSTRUCTION

All holes for which well depth is listed below were cased with nominal 10-centimeter diameter, schedule 40, PVC pipe. Each well has a single 0.9-meter length of slotted, 10-centimeter diameter, schedule 80, PVC pipe as the well screen. Each screen has 1,470 factory-cut slots 3.6 cm long by 0.64 mm wide for a total open area of 339 cm^2. The borehole annulus around the screen is filled with washed pea gravel from uncontaminated local alluvium. A layer of bentonite pellets was placed in the annulus from approximately 0.5 to 1.5 m above the screen. A concrete seal extends from the land surface to the depth listed. Caving of subsurface and surface materials interfered with completing several holes to their planned depths.

Wells 3EX, 3EX2, and 3EX3 were drilled for exploration purposes. After water samples and cuttings were collected, the total depth of each hole was sealed with concrete.

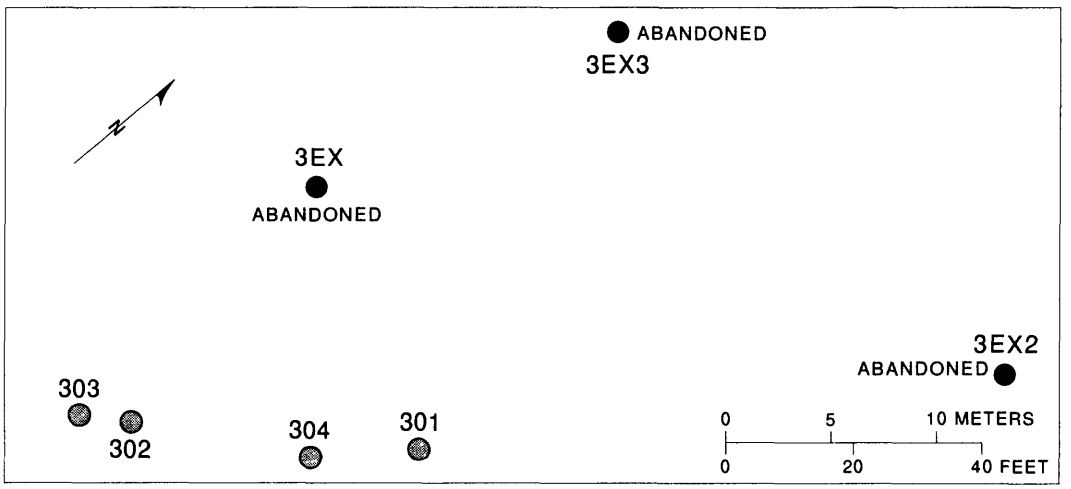
GROUND WATER—Continued

Well Group 300—Continued

Logs: C, caliper; D, driller's; E, electric; G, geologist; J, gamma; P, particle size; U, gamma-gamma; --, no data.

Well	Section location	Date completed	Drilling method	Hole depth (meters)	Well depth (meters)	Screened interval (meters)	Geologic Unit	Bottom of seal (meters)	Logs available
301	cbd1	10–07–84	Rotary, bentonite	59.4	59.1	58.1–59.0	Basin fill	3	CEJGPU
302	cbd2	10–08–84	Rotary, bentonite	36.0	35.8	34.8–35.7	Alluvium	3	--
303	cbd3	10–08–84	Rotary, bentonite	14.6	14.4	13.4–14.3	Alluvium	3	D
3EX	--	12–17–85	Dual-wall air rotary	54.9	--	--	--	--	DGP
3EX2	--	12–19–85	Dual-wall air rotary	36.6	--	--	--	--	--
3EX3	--	01–09–86	Dual-wall air rotary	102.1	--	--	--	--	GP
304	cbd4	05–24–86	Rotary, bentonite	48.8	30.3	28.7–29.6	Alluvium	27	D

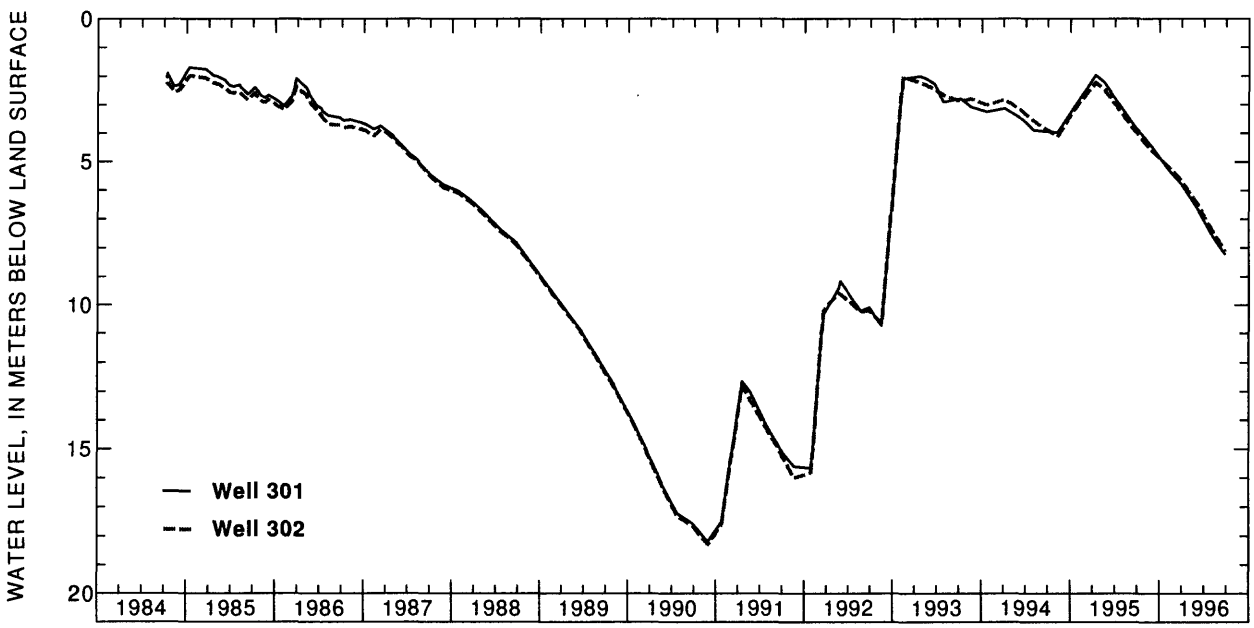
WELL GROUP 300 SITE PLAN



GROUND WATER—Continued

Well Group 300—Continued

Date	Water level, in meters below land surface			
	Well number			
	301	302	303	304
10–06–93	2.78	2.88	2.68	2.84
11–18–93	3.08	2.79	2.60	2.74
01–21–94	3.25	3.01	2.83	3.00
04–06–94	3.14	2.82	2.64	2.82
06–02–94	3.54	3.26	3.09	3.26
08–03–94	3.90	3.58	3.43	3.59
11–09–94	3.98	4.12	3.97	4.13
01–12–95	3.13	3.23	3.07	3.23
04–12–95	1.97	2.23	2.07	2.23
05–17–95	2.21	2.44	2.28	2.44
09–21–95	3.77	3.93	3.77	3.93
11–29–95	4.45	4.60	4.43	4.60
02–07–96	5.28	5.16	5.01	5.18
03–28–96	5.76	5.64	5.50	5.61
06–06–96	6.66	6.50	6.36	6.50
07–24–96	7.41	7.23	7.10	7.25
08–21–96	7.80	7.62	7.49	7.63
09–26–96	8.22	8.12	7.99	8.12



Hydrographs of Wells 301 and 302.

GROUND WATER—Continued

Well Group 300—Continued

Field Measurements

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; mV, millivolts; °C, degrees Celsius; mg/L, milligrams per liter; IT, incremental titration; L/min, liters per minute; --, no data; <, actual value is known to be less than value shown]

Well	Date	Specific conductance (µS/cm)	pH (standard units)	Oxidation reduction potential (mV)	Temperature, air (°C)	Temperature, water (°C)	Oxygen, dissolved (mg/L)	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)	Average discharge (L/min)	Pumping period (hours)
301	06–22–94	1,730	6.5	228	--	20.0	2.3	135	165	4.2	1.15
	05–17–95	2,690	6.6	--	--	18.0	.7	167	204	4.5	.80
	11–30–95	2,430	6.4	--	--	19.5	1.9	165	201	4.2	1.12
	06–06–96	2,380	6.3	192	--	22.0	.4	162	198	3.8	3.65
302	11–18–93	3,040	3.9	--	--	18.0	.2	--	--	4.5	.43
	06–22–94	2,570	3.9	457	--	21.0	.1	--	--	3.8	.65
	11–09–94	2,520	3.9	--	--	17.5	.4	--	--	1.9	.57
	05–17–95	2,670	4.0	--	--	18.5	<.1	--	--	5.3	.63
	11–30–95	2,110	4.0	474	24.0	18.5	.2	--	--	4.5	.63
	06–06–96	2,000	4.0	433	--	18.0	.1	--	--	4.9	.90
303	11–18–93	1,350	4.4	--	--	18.0	.2	--	--	4.5	.45
	06–22–94	2,350	4.3	497	26.0	18.5	.2	--	--	4.2	.55
	11–09–94	2,480	4.3	--	--	18.0	.5	--	--	1.9	.92
	05–17–95	2,810	4.4	--	--	18.5	.1	--	--	6.0	.55
	11–30–95	1,630	4.4	569	25.0	18.5	.5	--	--	4.5	.78
	06–06–96	2,280	4.4	448	--	22.5	.4	--	--	1.9	.72
304	11–18–93	3,230	3.9	--	22.0	18.0	.5	--	--	4.5	.47
	11–09–94	3,050	3.8	--	--	18.5	.4	--	--	1.5	.83
	05–17–95	3,250	3.9	--	--	19.0	.1	--	--	5.3	.57
	11–30–95	2,560	3.9	490	--	19.0	<.1	--	--	4.5	.70
	06–06–96	2,550	4.0	436	--	20.0	.2	--	--	4.2	.48

GROUND WATER—Continued

Well Group 300—Continued

Laboratory Measurements

[Laboratory—10, USGS National Water-Quality Laboratory, Arvada, Colorado; 20, USGS research laboratory, Ocala, Florida; 110, USGS research laboratory (K.G. Stollenwerk), Lakewood, Colorado; 140, USGS research laboratory, Menlo Park, California; mg/L, milligrams per liter; mol/L, moles per liter; µg/L, micrograms per liter; --, no data; <, actual value is known to be less than value shown; >, actual value is known to be greater than value shown]

Well	Date	Laboratory	Ionic balance (percent)	Ionic strength (mol/L)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)
301	06–22–94	110	-6.0	0.038	230	52	55	--	870
	06–22–94	140	-3.6	.040	240	53	56	10	890
	05–17–95	140	-2.0	.064	370	86	71	8.1	1,400
	11–30–95	140	-1.7	.063	400	90	60	9.2	1,400
	06–06–96	10	-.22	.074	450	110	65	7.6	1,600
302	11–18–93	110	2.9	.109	380	94	81	--	2,500
	06–22–94	10	-12.2	.064	320	57	49	5.1	1,700
	06–22–94	110	-4.3	.076	290	60	61	--	1,900
	06–22–94	140	-.96	.071	300	59	58	5.6	1,700
	11–09–94	110	2.5	.073	310	58	70	--	1,700
	11–09–94	140	5.3	.068	340	74	68	8.7	1,500
	05–17–95	140	-4.2	.070	310	55	66	5.6	1,700
	11–30–95	140	-3.4	.057	200	40	70	4.4	1,400
	06–06–96	10	-3.4	.050	210	38	66	4.4	1,200
303	11–18–93	110	-3.0	.035	190	51	58	--	850
	06–22–94	110	-.59	.060	340	95	72	--	1,400
	06–22–94	140	--	--	350	94	69	8.1	--
	11–09–94	110	-.33	.065	370	100	83	--	1,500
	11–09–94	140	--	.069	400	100	80	7.4	1,400
	05–17–95	140	-3.8	.059	320	88	73	8.1	1,500
	11–30–95	140	-8.1	.037	200	50	50	5.5	920
	06–06–96	10	1.5	.061	350	91	78	7.0	1,400
304	11–18–93	110	3.8	.095	430	110	85	--	2,100
	11–09–94	110	1.3	.090	410	90	83	--	2,100
	11–09–94	140	-.31	.086	410	85	74	11	2,000
	11–09–94	10	-15.8	.085	420	83	75	5.5	2,300
	05–17–95	140	-4.0	.086	400	81	80	5.0	2,100
	11–30–95	140	-11.0	.069	300	70	70	3.7	1,800
	06–06–96	10	-2.8	.067	320	64	66	5.2	1,600

GROUND WATER—Continued

Well Group 300—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Aluminum, dissolved (µg/L as Al)	Barium, dissolved (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Boron, dissolved (µg/L as B)	Cadmium, dissolved (µg/L as Cd)
301	06–22–94	110	44	--	27	<5,000	--	--	--	--
	06–22–94	140	38	--	28	500	--	--	--	--
	05–17–95	140	59	--	66	20,000	--	--	--	--
	11–30–95	140	64	--	10	470	--	--	--	--
	06–06–96	10	76	4.7	26	740	24	64	86	38
302	11–18–93	110	75	--	120	50,000	--	--	--	<100
	06–22–94	10	40	--	80	20,000	14	36	160	59
	06–22–94	110	48	--	82	29,000	--	--	--	--
	06–22–94	140	39	--	86	23,000	--	--	--	--
	11–09–94	110	46	--	89	31,000	--	--	--	--
	11–09–94	140	45	--	58	22,000	--	--	--	--
	05–17–95	140	38	--	81	21,000	--	--	--	--
	11–30–95	140	40	--	40	16,000	--	--	--	--
	06–06–96	10	45	3.4	75	13,700	<22	<22	<33	<49
303	11–18–93	110	35	--	100	6,000	--	--	--	<100
	06–22–94	110	69	--	90	13,000	--	--	--	--
	06–22–94	140	--	--	94	10,000	--	--	--	--
	11–09–94	110	74	--	93	15,000	--	--	--	--
	11–09–94	140	78	--	86	12,000	--	--	--	--
	05–17–95	140	23	--	75	9,100	--	--	--	--
	11–30–95	140	62	--	30	4,900	--	--	--	--
	06–06–96	10	55	2.2	70	6,900	19	26	33	30
304	11–18–93	110	120	--	120	44,000	--	--	--	<100
	11–09–94	110	68	--	93	38,000	--	--	--	--
	11–09–94	140	60	--	92	29,000	--	--	--	--
	11–09–94	10	63	--	87	30,000	11	45	140	36
	05–17–95	140	67	--	86	27,000	--	--	--	--
	11–30–95	140	57	--	30	20,000	--	--	--	--
	06–06–96	10	57	5.5	78	16,000	15	27	60	47

GROUND WATER—Continued

Well Group 300—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Chromium, dissolved (µg/L as Cr)	Cobalt, dissolved (µg/L as Co)	Copper, dissolved (µg/L as Cu)	Iron, dissolved (µg/L as Fe)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)
301	06–22–94	110	--	--	<100	22,000	--	--	23,000
	06–22–94	140	--	260	<30	20,000	--	--	26,000
	05–17–95	140	--	280	<30	28,000	--	--	24,000
	11–30–95	140	--	310	90	46,000	--	--	32,000
	06–06–96	10	<25	--	<50	58,000	<50	120	29,000
302	11–18–93	110	--	5,300	43,000	500,000	--	--	22,000
	06–22–94	10	<20	1,700	18,000	>65,000	<30	160	11,000
	06–22–94	110	--	--	19,000	300,000	--	--	1,000
	06–22–94	140	--	320	19,000	260,000	--	--	10,000
	11–09–94	110	--	--	19,000	290,000	--	--	9,400
	11–09–94	140	--	410	18,000	170,000	--	--	17,000
	05–17–95	140	--	260	16,000	220,000	--	--	10,000
	11–30–95	140	--	200	12,000	180,000	--	--	8,800
	06–06–96	10	<25	--	11,000	140,000	<50	180	<7,100
303	11–18–93	110	--	180	10,000	160	--	--	15,000
	06–22–94	110	--	--	15,000	<200	--	--	24,000
	06–22–94	140	--	480	15,000	<130	--	--	26,000
	11–09–94	110	--	--	16,000	<200	--	--	25,000
	11–09–94	140	--	460	17,000	--	--	--	27,000
	05–17–95	140	--	400	12,000	300	--	--	23,000
	11–30–95	140	--	250	6,500	1,800	--	--	13,000
	06–06–96	10	<25	350	11,000	60	<50	160	23,000
304	11–18–93	110	--	3,500	23,000	250,000	--	--	32,000
	11–09–94	110	--	--	20,000	230,000	--	--	22,000
	11–09–94	140	--	--	19,000	210,000	--	--	22,000
	11–09–94	10	<20	1,400	18,000	<97,000	<30	230	24,000
	05–17–95	140	--	380	17,000	200,000	--	--	22,000
	11–30–95	140	--	340	12,000	110,000	--	--	21,000
	06–06–96	10	<25	--	<11,000	<110,000	<50	190	19,000

GROUND WATER—Continued

Well Group 300—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Molybdenum, dissolved (µg/L as Mo)	Nickel, dissolved (µg/L as Ni)	Silver, dissolved (µg/L as Ag)	Strontium, dissolved (µg/L as Sr)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Zn)	Carbon, inorganic, total (mg/L as C)	Carbon, inorganic, dissolved (mg/L as C)
301	06–22–94	110	--	630	--	470	--	610	--	--
	06–22–94	140	--	190	--	500	--	500	--	--
	05–17–95	140	--	320	--	1,000	--	1,700	--	--
	11–30–95	140	--	270	--	750	--	840	--	--
	06–06–96	10	<50	320	<5.0	<900	<30	940	--	--
302	11–18–93	110	--	510	--	1,400	--	4,400	--	--
	11–18–93	20	--	--	--	--	--	--	37	--
	06–22–94	10	40	410	<3.0	780	57	2,700		--
	06–22–94	20	--	--	--	--	--	--	43	--
	06–22–94	110	--	590	--	790	--	2,400	--	--
	06–22–94	140	--	390	--	800	--	2,700	--	--
	11–09–94	110	--	470	--	830	--	2,500	--	--
	11–09–94	140	--	350	--	--	--	2,600	--	--
	11–09–94	20	--	--	--	--	--	--	59	--
	05–17–95	140	--	<90	--	800	--	2,200	--	--
	05–17–95	20	--	--	--	--	--	--	32	28
	11–30–95	20	--	--	--	--	--	--	--	17
	11–30–95	140	--	230	--	810	--	1,600	--	--
	06–06–96	10	<50	240	<5.0	810	<30	1,500	--	--
	06–06–96	20	--	--	--	--	--	--	--	20
303	11–18–93	20	--	--	--	--	--	--	31	--
	11–18–93	110	--	<100	--	750	--	1,300	--	--
	06–22–94	110	--	920	--	1,200	--	2,300	--	--
	06–22–94	20	--	--	--	--	--	--	45	--
	06–22–94	140	--	700	--	1,200	--	2,500	--	--
	11–09–94	110	--	910	--	1,300	--	2,500	--	--
	11–09–94	140	--	730	--	1,300	--	2,600	--	--
	11–09–94	20	--	--	--	--	--	--	50	--
	05–17–95	140	--	620	--	1,100	--	2,200		--
	05–17–95	20	--	--	--	--	--	--	18	--
	11–30–95	20	--	--	--	--	--	--		20
	11–30–95	140	--	330	--	660	--	1,200		--
	06–06–96	10	<50	600	<5.0	1,300	<30	1,900	--	--
	06–06–96	20	--	--	--	--	--	--	--	15
304	11–18–93	20	--	--	--	--	--	--	42	--
	11–18–93	110	--	800	--	2,000	--	4,000	--	--
	11–09–94	110	--	780	--	1,200	--	2,500	--	--
	11–09–94	140	--	520	--	--	--	2,800	--	--
	11–09–94	10	30	560	<3.0	1,200	43	2,600	--	--
	11–09–94	20	--	--	--	--	--	--	--	--
	05–17–95	140	--	500	--	1,100	--	2,400	--	--
	05–17–95	20	--	--	--	--	--	--	44	38
	11–30–95	20	--	--	--	--	--	--	--	14
	11–30–95	140	--	410	--	1,000	--	1,800	--	--
	06–06–96	10	<50	430	<5.0	1,000	<30	1,600	--	--
	06–06–96	20	--	--	--	--	--	--	--	18

GROUND WATER—Continued

Well Group 400

LOCATION.—Lat 33°29'04", long 110°50'48", in SE1/4NW1/4SE1/4, sec. 29, T. 2 N., R. 15 E. (A-02-15)29dbd, 10 m west of Pinal Creek, and 11 km northwest of Globe.

Landowner: Tonto National Forest.

LAND-SURFACE DATUM.—943.31 m above National Geodetic Vertical Datum of 1929 (levels by Water Resources Division, U.S. Geological Survey).

REMARKS.—Wells 401, 402, 403, and 404 were originally identified as X4W1, X4W2, X4W3, and X4W4, respectively.

DRILLING AND WELL CONSTRUCTION

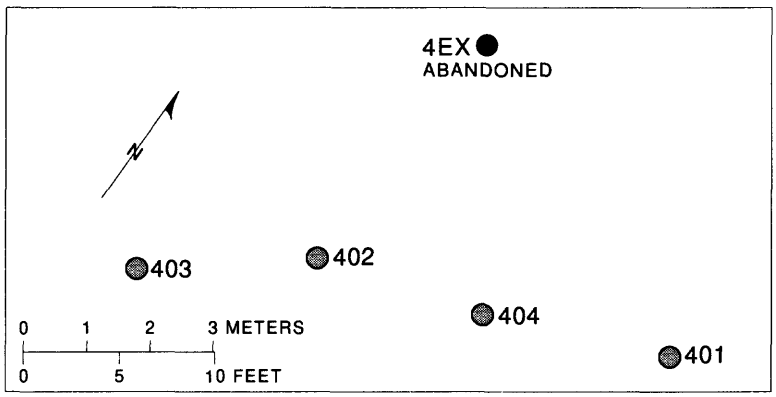
All holes for which well depth is listed below were cased with nominal 10-centimeter diameter, schedule 40, PVC pipe. Each well has a single 0.9-meter length of slotted, 10-centimeter diameter, schedule 80, PVC pipe as the well screen. Each screen has 1,470 factory-cut slots 3.6 cm long by 0.64 mm wide for a total open area of 339 cm^2. The borehole annulus around the screen is filled with washed pea gravel from uncontaminated local alluvium. A layer of bentonite pellets was placed in the annulus from approximately 0.5 to 1.5 m above the screen. A concrete seal extends from the land surface to the depth listed.

Well 4EX was drilled for exploration purposes. After water samples and cuttings were collected, the total depth of the hole was sealed with concrete.

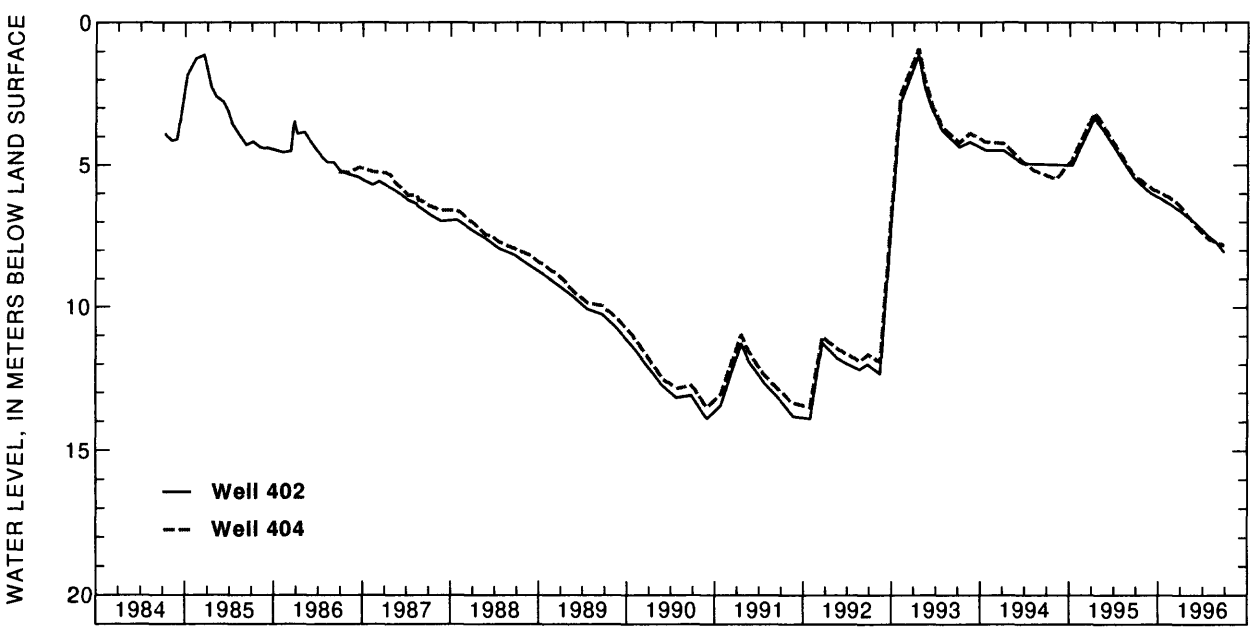
Logs: C, caliper; D, driller's; E, electric; G, geologist; P, particle size; --, no data.

Well	Section location	Date completed	Drilling method	Hole depth (meters)	Well depth (meters)	Screened interval (meters)	Geologic Unit	Bottom of seal (meters)	Logs available
401	dbd1	10–09–84	Rotary, bentonite	34.4	34.2	33.2–34.1	Basin fill	3	CEGP
402	dbd2	10–10–84	Rotary, bentonite	21.0	20.8	19.8–20.7	Alluvium	3	--
403	dbd3	10–10–84	Rotary, bentonite	13.1	13.0	12.0–12.9	Alluvium	3	--
4EX	--	01–07–86	Dual-wall air rotary	73.2	--	--	--	--	DGP
404	dbd4	09–04–86	Cable tool	55.5	55.3	53.7–54.6	Basin fill	48.5	D

WELL GROUP 400 SITE PLAN



Date	Water level, in meters below land surface			
	Well number			
	401	402	403	404
10–06–93	4.37	4.37	4.34	4.22
11–18–93	4.18	4.19	4.17	3.89
01–21–94	4.47	4.48	4.46	4.19
04–06–94	4.46	4.49	4.47	4.24
06–21–94	4.92	4.94	4.92	4.85
08–03–94	5.29	5.29	5.24	5.17
11–07–94	5.76	5.76	5.75	5.50
01–12–95	4.99	5.01	4.99	4.81
04–12–95	3.35	3.37	3.34	3.19
05–16–95	3.68	3.71	3.69	3.56
09–21–95	5.47	5.45	5.42	5.37
11–29–95	6.00	5.98	5.95	5.77
02–23–96	6.42	6.40	6.37	6.19
03–28–96	6.61	6.58	6.56	6.40
06–02–96	7.07	7.04	7.02	7.13
07–24–96	7.51	7.49	7.46	7.60
08–21–96	7.71	7.68	7.66	7.69
09–26–96	8.07	8.06	8.05	7.82



Hydrographs of Wells 402 and 404.

GROUND WATER—Continued

Well Group 400—Continued

Field Measurements

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; mV, millivolts; °C, degrees Celsius; mg/L, milligrams per liter; IT, incremental titration; L/min, liters per minute; --, no data; <, actual value is known to be less than value shown]

Well	Date	Specific conductance (µS/cm)	pH (standard units)	Oxidation reduction potential (mV)	Temperature, air (°C)	Temperature, water (°C)	Oxygen, dissolved (mg/L)	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)	Average discharge (L/min)	Pumping period (hours)
401	11–18–93	2,820	5.2	--	--	17.0	0.8	16	20	4.5	0.88
	06–21–94	3,300	4.9	359	32.0	20.0	.2	14	18	6.4	.77
	11–08–94	3,000	4.9	--	--	16.5	.7	16	20	1.5	.68
	05–16–95	3,140	4.5	--	--	19.0	.2	--	--	3.4	.72
	11–29–95	2,600	4.4	--	--	18.0	.3	--	--	5.3	.80
	06–02–96	2,790	4.2	416	--	19.5	.2	--	--	4.5	.95
402	11–18–93	2,170	4.2	--	--	17.0	.7	--	--	4.5	.47
	06–21–94	2,490	3.9	416	--	18.0	<.1	--	--	7.2	.82
	11–08–94	2,470	4.1	--	--	17.5	.5	16	20	1.5	.60
	05–16–95	2,150	4.1	--	--	17.5	.1	--	--	4.5	.52
	11–29–95	2,060	4.0	--	--	18.0	.2	--	--	4.9	.65
	06–02–96	2,250	4.2	431	--	20.5	.4	--	--	3.0	.47
	06–08–96*	2,260	4.2	429	--	21.5	.3	--	--	--	--
403	11–18–93	1,120	5.4	--	--	17.5	.4	18	22	3.8	1.82
	06–21–94	1,220	5.9	465	--	17.5	.1	31	38	7.2	.93
	11–08–94	1,570	5.6	--	--	17.0	.5	38	47	1.5	.87
	05–16–95	631	5.9	--	--	17.0	2.5	24	30	4.9	.62
	11–29–95	1,040	5.7	--	--	17.0	.1	34	42	4.5	.67
	06–02–96	1,410	5.6	475	39.0	22.0	.5	26	32	3.0	.45
404	11–07–94	407	7.3	--	--	18.0	6.8	190	232	2.3	1.02
	06–02–96	383	7.6	373	25.0	19.0	8.5	182	223	4.5	2.83

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 400—Continued

Laboratory Measurements

[Laboratory—10, USGS National Water-Quality Laboratory, Arvada, Colorado; 110, USGS research laboratory (K.G. Stollenwerk), Lakewood, Colorado; 140, USGS research laboratory, Menlo Park, California; 20, USGS research laboratory, Ocala, Florida; mg/L, milligrams per liter; mol/L, moles per liter; µg/L, micrograms per liter; --, no data; <, actual value is known to be less than value shown]

Well	Date	Laboratory	Ionic balance (percent)	Ionic strength (mol/L)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)
401	11–18–93	110	1.7	0.092	460	100	69	--	2,100
	06–21–94	110	2.0	.100	470	110	79	--	2,300
	06–21–94	140	-5.4	.106	490	110	68	7.6	2,600
	11–08–94	140	.27	.089	450	94	64	13	2,100
	11–08–94	110	1.7	.087	420	92	71	--	2,000
	11–08–94	10	-14	.082	430	87	63	6.4	2,200
	05–16–95	140	-3.8	.102	510	90	70	6.3	2,500
	11–29–95	140	-5.3	.080	400	70	60	5.1	2,000
	06–02–96	10	-6.5	.076	360	72	63	5.4	1,900
402	11–18–93	110	-4.1	.071	310	91	64	--	1,700
	06–21–94	10	-3.0	.066	300	78	49	5.7	1,600
	06–21–94	110	-1.1	.071	300	83	64	--	1,700
	06–21–94	140	-1.3	.068	300	81	58	<.05	1,600
	11–08–94	110	.72	.070	290	77	75	--	1,600
	11–08–94	140	-5.6	.061	250	67	54	7.1	1,500
	05–16–95	140	-7.2	.066	260	71	62	6.7	1,700
	11–29–95	10	--	--	240	64	58	5.0	--
	11–29–95	140	-12	.056	200	60	60	5.8	1,500
	06–02–96	10	-.70	.060	250	73	58	5.3	1,400
	06–08–96*	10	-4.4	.062	260	71	59	4.9	1,500
403	11–18–93	110	-3.5	.024	150	35	44	--	580
	06–21–94	110	-12	.029	170	39	35	--	730
	06–21–94	140	--	--	180	41	37	4.8	--
	11–08–94	110	3.9	.036	250	55	56	--	800
	11–08–94	140	2.2	.033	230	52	44	5.2	740
	05–16–95	140	-7.7	.015	90	20	30	3.4	380
	11–29–95	140	-12	.022	100	40	40	5.6	580
	06–02–96	10	-.44	.031	210	45	40	4.8	710
404	11–07–94	110	2.7	.006	41	15	27	--	10
	11–07–94	140	--	--	41	14	24	3.7	--
	06–02–96	10	.12	.006	39	14	22	2.8	11

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 400—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Aluminum, dissolved (µg/L as Al)	Barium, dissolved (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Boron, dissolved (µg/L as B)	Cadmium, dissolved (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)
401	11–18–93	110	68	--	61	12,000	--	--	--	<100	--
	06–21–94	110	77	--	70	18,000	--	--	--	--	--
	06–21–94	140	60	--	71	14,000	--	--	--	--	--
	11–08–94	140	56	--	66	11,000	--	--	--	--	--
	11–08–94	110	52	--	66	15,000	--	--	--	--	--
	11–08–94	10	57	--	60	9,700	14	30	150	42	<15
	05–16–95	140	41	--	73	16,000	--	--	--	--	--
	11–29–95	140	48	--	30	13,000	--	--	--	--	--
	06–02–96	10	63	4.7	69	11,400	20	27	46	55	<15
402	11–18–93	110	55	--	85	13,000	--	--	--	<100	--
	06–21–94	10	49	--	74	10,000	10	30	120	34	<15
	06–21–94	110	64	--	80	16,000	--	--	--	--	--
	06–21–94	140	52	--	79	12,000	--	--	--	--	--
	11–08–94	110	59	--	88	18,000	--	--	--	--	--
	11–08–94	140	49	--	64	10,000	--	--	--	--	--
	05–16–95	140	31	--	79	11,000	--	--	--	--	--
	11–29–95	10	--	--	77	9,600	16	22	100	55	<15
	11–29–95	140	38	--	30	9,700	--	--	--	--	--
	06–02–96	10	54	4.9	73	11,000	11	23	20	11	<15
	06–08–96*	10	60	4.5	78	9,640	10	25	18	<3.0	<15
403	11–18–93	110	35	--	16	<1,000	--	--	--	<100	--
	06–21–94	110	44	--	21	<5,000	--	--	--	--	--
	06–21–94	140	--	--	24	<110	--	--	--	--	--
	11–08–94	110	25	--	32	<5,000	--	--	--	--	--
	11–08–94	140	36	--	26	<110	--	--	--	--	--
	05–16–95	140	19	--	21	<290	--	--	--	--	--
	11–29–95	140	23	--	20	360	--	--	--	--	--
	06–02–96	10	41	1.3	48	335	19	560	62	4.0	<5.0
404	11–07–94	110	8.3	--	28	<500	--	--	--	--	--
	11–07–94	140	20	--	24	<110	--	--	--	--	--
	06–02–96	10	7.6	.50	26	<5	13	<.5	27	<1.0	<5

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 400—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Cobalt, dissolved (µg/L as Co)	Copper, dissolved (µg/L as Cu)	Iron, dissolved (µg/L as Fe)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Molybdenum, dissolved (µg/L as Mo)	Nickel, dissolved (µg/L as Ni)	Silver, dissolved (µg/L as Ag)
401	11–18–93	110	3,000	15,000	280,000	--	--	31,000	--	500	--
	06–21–94	110	--	18,000	340,000	--	--	31,000	--	600	--
	06–21–94	140	570	17,000	300,000	--	--	34,000	--	620	--
	11–08–94	140	590	15,000	270,000	--	--	27,000	--	590	--
	11–08–94	110	--	15,000	280,000	--	--	25,000	--	760	--
	11–08–94	10	1,500	14,000	--	<30	150	27,000	30	530	<3.0
	05–16–95	140	450	17,000	290,000	--	--	27,000	--	540	--
	11–29–95	140	380	13,000	210,000	--	--	22,000	--	440	--
	06–02–96	10	--	13,000	200,000	80	160	22,000	<30	450	5.0
402	11–18–93	110	1,900	18,000	160,000	--	--	35,000	--	570	--
	06–21–94	10	750	14,000	180,000	<30	150	25,000	<30	550	6.0
	06–21–94	110	--	15,000	230,000	--	--	25,000	--	540	--
	06–21–94	140	650	14,000	200,000	--	--	27,000	--	<90	--
	11–08–94	110	--	16,000	240,000	--	--	22,000	--	560	--
	11–08–94	140	420	13,000	180,000	--	--	20,000	--	400	--
	05–16–95	140	370	12,000	190,000	--	--	21,000	--	420	--
	11–29–95	10	450	11,000	170,000	70	150	21,000	<30	430	<3.0
	11–29–95	140	320	11,000	160,000	--	--	19,000	--	380	--
	06–02–96	10	410	12,000	190,000	60	140	24,000	<30	420	<3.0
	06–08–96*	10	--	12,000	180,000	<30	150	23,000	<30	460	3.0
403	11–18–93	110	<40	220	120	--	--	3,200	--	940	--
	06–21–94	110	--	<100	<200	--	--	3,600	--	460	--
	06–21–94	140	70	120	<130	--	--	4,100	--	<90	--
	11–08–94	110	--	<100	3,700	--	--	4,200	--	<500	--
	11–08–94	140	60	120	<130	--	--	4,300	--	<90	--
	05–16–95	140	<20	<210	1,600	--	--	1,900	--	<90	--
	11–29–95	140	<20	330	3,500	--	--	2,200	--	<90	--
	06–02–96	10	15	150	6.0	<10	56	3,700	<10	110	<1.0
404	11–07–94	110	--	<10	<20	--	--	<30	--	<50	--
	11–07–94	140	20	<30	<130	--	--	<60	--	<90	--
	06–02–96	10	<3.0	<10	5.0	<10	10	<1.0	<10	<10	<1.0

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 400—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Strontium, dissolved (µg/L as Sr)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Zn)	Carbon, inorganic, total (mg/L as C)	Carbon, inorganic, dissolved (mg/L as C)
401	11–18–93	20	--	--	--	42	--
	11–18–93	110	1,500	--	2,500	--	--
	06–21–94	110	1,500	--	2,800	--	--
	06–21–94	20	--	--	--	53	--
	06–21–94	140	1,400	--	3,100	--	--
	11–08–94	140	--	--	2,800	--	--
	11–08–94	110	1,200	--	2,500	--	--
	11–08–94	10	1,200	34	2,500	--	--
	11–08–94	20	--	--	--	60	--
	05–16–95	140	1,200	--	3,400	--	--
	05–16–95	20	--	--	--	14	--
	11–29–95	20	--	--	--	--	18
	11–29–95	140	990	--	2,300	--	--
	06–02–96	10	980	<18	2,100	--	--
	06–02–96	20	--	--	--	--	17
402	11–18–93	110	1,700	--	2,700	--	--
	11–18–93	20	--	--	--	31	--
	06–21–94	10	1,200	32	2,500	--	--
	06–21–94	20	--	--	--	39	--
	06–21–94	110	1,200	--	2,400	--	--
	06–21–94	140	1,200	--	2,700	--	--
	11–08–94	110	1,100	--	2,700	--	--
	11–08–94	140	--	--	2,400	--	--
	11–08–94	20	--	--	--	45	--
	05–16–95	140	900	--	2,200	--	--
	05–16–95	20	--	--	--	12	--
	11–29–95	20	--	--	--	--	12
	11–29–95	10	880	<18	2,000	--	--
	11–29–95	140	860	--	2,000	--	--
	06–02–96	10	1,000	<18	2,100	--	--
	06–02–96	20	--	--	--	--	24
	06–08–96*	10	980	21	2,200	--	--
	06–08–96*	20	--	--	--	--	19
403	11–18–93	110	610	--	1,500	--	--
	11–18–93	20	--	--	--	26	--
	06–21–94	110	660	--	300	--	--
	06–21–94	20	--	--	--	36	--
	06–21–94	140	700	--	100	--	--
	11–08–94	110	960	--	<150	--	--
	11–08–94	140	--	--	<140	--	--
	11–08–94	20	--	--	--	45	--
	05–16–95	140	370	--	90	--	--
	05–16–95	20	--	--	--	19	--
	11–29–95	140	620	--	140	--	--
	06–02–96	10	790	<6	250	--	--
404	11–07–94	110	2,600	--	<15	--	--
	11–07–94	140	--	--	<20	--	--
	06–02–96	10	260	<6	<3	--	--

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 500

LOCATION.—Lat 33°31'51", long 110°52'05", in SE1/4SE1/4NW1/4, sec. 7, T. 2 N., R. 15 E. (A-02-15)07bdd, 60 m east of Pinal Creek, and 16 km northwest of Globe.

Landowner: Tonto National Forest.

LAND-SURFACE DATUM.—897.77 m above National Geodetic Vertical Datum of 1929 (levels by Water Resources Division, U.S. Geological Survey).

REMARKS.—Wells 501, 502, 503, and 504 were originally identified as X5W1, X5W2, X5W3, and X5W4, respectively. In Brown (1990) and Longsworth and Taylor (1992), the location of wells 505 and 506 in the site plan were incorrect and have been corrected in this report.

DRILLING AND WELL CONSTRUCTION

Well 5EX was drilled for exploration purposes. After water samples and cuttings were collected, the entire depth of the hole was sealed with concrete.

Wells 501–504 were cased with nominal 10-centimeter diameter, schedule 40, PVC pipe. Each well has a single 0.9-meter length of slotted, 10-centimeter diameter, schedule 80, PVC pipe as the well screen. Each screen has 1,470 factory-cut slots 3.6 cm long by 0.64 mm wide for a total open area of 339 cm^2. The borehole annulus around the screen is filled with washed pea gravel from uncontaminated local alluvium. A layer of bentonite pellets was placed in the annulus from approximately 0.5 to 1.5 m above the screen. A concrete seal extends from the land surface to the depth listed. Hole 503 caved during installation of casing.

Well 505 was cased with nominal 10-centimeter diameter, schedule 40, PVC pipe. The well has a a single 1.5-meter length of slotted, 10-centimeter diameter, schedule 40, PVC pipe as the well screen. The screen has 3,648 factory-cut slots 4.4 cm long by 0.51 mm wide for a total open area of 819 cm^2. The borehole annulus around the screen is filled with washed pea gravel from uncontaminated alluvium. A layer of bentonite pellets was placed in the annulus from approximately 0.9 to 1.2 m above the screen. A concrete seal extends from the land surface to the depth listed.

Well 506 was cased with nominal 10-centimeter diameter, schedule 80, PVC pipe. The well has a single 1.5-meter length of slotted, 10-centimeter diameter, schedule 80, PVC pipe as the well screen. The screen in well 506 has 1,056 factory-cut slots 3.4 cm long by 0.64 mm wide for a total open area of 230 cm^2. The borehole annulus around the screen is filled with washed pea gravel from uncontaminated alluvium. Formation material collapsed around the casing from 0.8 to 3.4 m above the screen, or to within about 1.8 m of land surface. A layer of bentonite pellets 0.3 m thick was placed in the annulus on the collapsed material. A concrete seal extends from the land surface to a depth of 1.5 m.

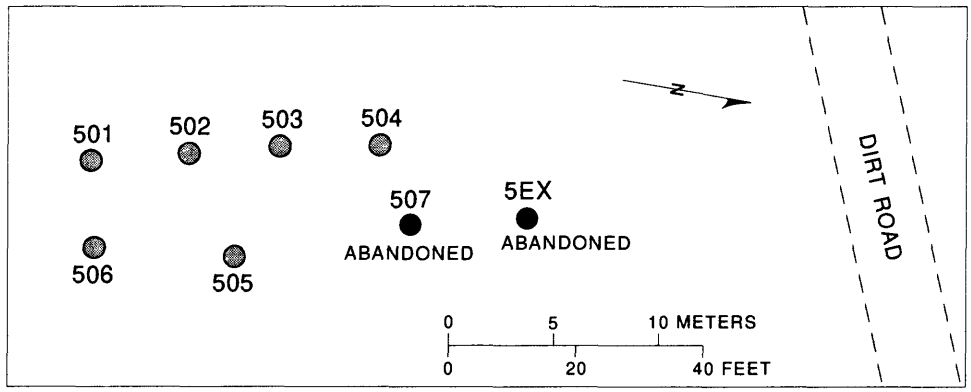
GROUND WATER—Continued

Well Group 500—Continued

Logs: D, driller's; G, geologist; P, particle size; --, no data.

Well	Section location	Date completed	Drilling method	Hole depth (meters)	Well depth (meters)	Screened interval (meters)	Geologic Unit	Bottom of seal (meters)	Logs available
5EX	--	12–13–85	Dual-wall air rotary	89.9	--	--	--	--	DGP
501	bdd1	05–22–86	Rotary, bentonite	17.1	17.0	15.4–16.3	Alluvium	15.2	D
502	bdd2	05–22–86	Rotary, bentonite	38.1	38.0	36.5–37.4	Basin fill	35.1	D
503	bdd3	05–22–86	Rotary, bentonite	73.2	25.0	23.4–24.3	Alluvium	19.8	D
504	bdd4	07–24–86	Cable tool	69.5	69.2	67.6–68.6	Basin fill	64.0	D
505	bdd5	12–17–88	Hollow-stem auger	22.2	21.6	15.5–21.6	Alluvium	1.5	DGP
506	bdd6	12–15–88	Hollow-stem auger	7.3	6.7	5.2–6.7	Alluvium	1.5	DGP

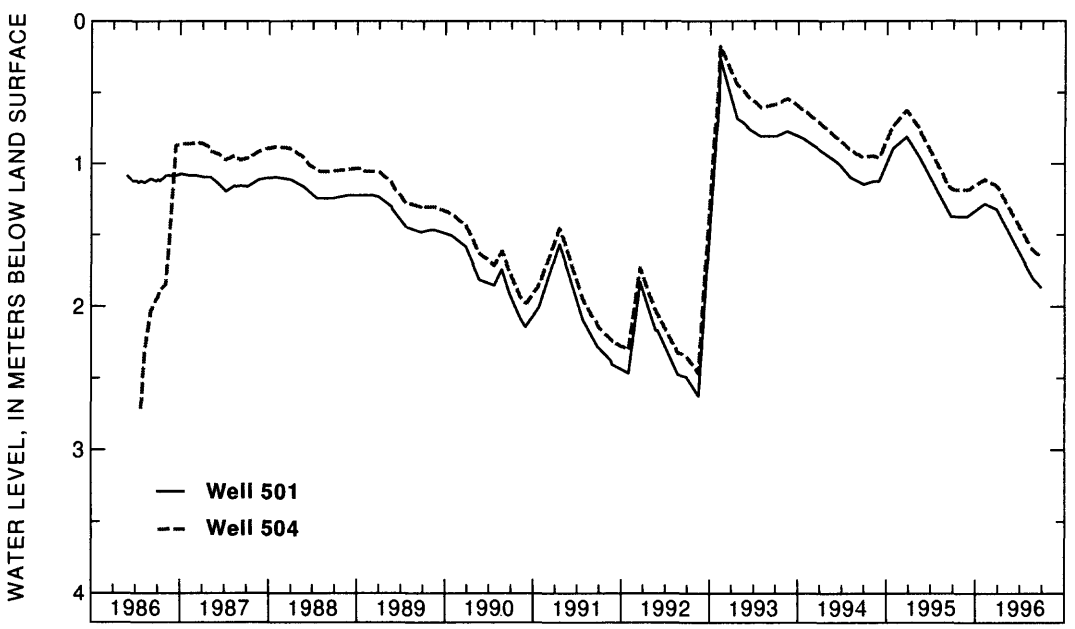
WELL GROUP 500 SITE PLAN



GROUND WATER—Continued

Well Group 500—Continued

Date	Water level, in meters below land surface					
	Well number					
	501	502	503	504	505	506
10–04–93	0.80	0.79	0.88	0.58	0.85	0.81
11–17–93	.77	.75	.85	.54	.82	.78
01–21–94	.82	.82	.90	.62	.87	.83
04–06–94	.91	.91	.99	.72	.96	.91
06–05–94	.98	.98	1.06	.80	1.04	.99
06–20–94	1.00	1.00	1.08	.83	1.06	1.00
08–03–94	1.09	1.09	1.17	.90	1.14	1.10
09–27–94	1.14	1.14	1.23	.95	1.19	1.15
11–08–94	1.12	1.12	1.20	.94	1.18	1.13
11–30–94	1.12	1.13	1.21	.96	1.18	1.12
01–25–95	.89	.90	.98	.73	.94	.89
03–23–95	.81	.81	.90	.62	.88	.81
05–15–95	.95	.95	1.03	.76	1.00	.94
09–21–95	1.37	1.38	1.46	1.18	1.43	1.37
11–28–95	1.37	1.37	1.44	1.18	1.41	1.34
02-06–96	1.28	1.29	1.37	1.11	1.33	.96
03–26–96	1.32	1.34	1.40	1.15	1.40	1.26
05–29–96	1.53	1.54	1.61	1.35	1.58	1.52
07–26–96	1.72	1.73	1.79	1.53	1.76	1.69
08–21–96	1.80	1.81	1.87	1.60	1.83	1.78
09–26–96	1.87	1.89	1.95	1.66	1.90	1.86



Hydrographs of Wells 501 and 504.

GROUND WATER—Continued

Well Group 500—Continued

Field Measurements

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; mV, millivolts; °C, degrees Celsius; mg/L, milligrams per liter; IT, incremental titration; L/min, liters per minute; --, no data; <, actual value is known to be less than value shown]

Well	Date	Specific conductance (µS/cm)	pH (standard units)	Oxidation reduction potential (mV)	Temperature, air (°C)	Temperature, water (°C)	Oxygen, dissolved (mg/L)	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)	Average discharge (L/min)	Pumping period (hours)
501	11–17–93	3,030	5.7	--	--	17.5	0.2	40	49	4.5	0.82
	11–08–94	3,160	5.6	--	--	18.0	.6	49	60	1.9	.90
	05–15–95	2,990	5.6	--	--	19.0	.1	48	58	4.5	.53
	11–28–95	2,740	5.5	614	--	17.5	.2	48	--	4.2	.63
	05–30–96	2,830	5.6	485	25.5	18.0	.3	49	60	6.1	.67
502	06–20–94	1,780	7.3	415	--	21.0	3.5	151	185	7.6	.97
	11–08–94	1,830	6.5	--	--	18.5	3.6	148	181	2.3	.87
	05–15–95	1,630	7.3	--	28.0	21.0	2.9	155	189	4.5	1.12
	11–28–95	1,740	7.2	--	--	18.5	3.2	148	181	5.3	.60
	05–29–96	1,710	7.1	498	--	19.0	5.0	145	177	5.7	1.12
503	11–17–93	2,950	5.7	--	15.5	17.5	.4	38	46	4.5	.55
	06–20–94	3,080	5.5	466	--	20.0	.1	34	42	8.0	.85
	11–08–94	3,110	5.3	--	--	18.0	.5	32	39	1.5	.88
	05–18–95	2,910	5.4	--	--	20.0	.2	43	52	4.9	.77
	11–28–95	2,660	5.4	--	--	17.5	.2	92	112	4.9	.63
	06–08–96	2,720	5.3	422	--	18.0	.3	27	32	4.5	.43
	06–08–96*	2,720	5.3	425	--	19.5	.3	25	31	--	--
504	06–20–94	408	7.6	424	28.5	21.5	6.0	178	217	7.6	.70
	05–29–96	420	7.6	483	30.5	20.5	4.5	185	226	5.3	2.9
505	11–17–93	2,980	5.8	--	--	17.5	.5	70	85	4.5	1.02
	11–28–95	2,810	5.8	--	15.0	18.0	.2	63	77	5.3	.88
506	11–17–93	2,740	6.4	--	--	18.0	.2	155	189	4.2	1.2
	06–20–94	3,100	6.2	444	--	21.0	<.1	109	133	--	.93
	11–08–94	3,120	6.0	--	--	19.0	.5	127	154	2.3	.57
	05–15–95	2,950	6.1	--	28.0	19.0	.2	99	122	4.2	.62
	11–28–95	2,670	6.0	--	--	18.5	.2	84	102	4.5	.83
	05–30–96	2,910	5.9	448	--	20.5	.2	86	104	6.8	.55

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 500—Continued

Laboratory Measurements

[Laboratory—10, USGS National Water-Quality Laboratory, Arvada, Colorado; 110, USGS research laboratory (K.G. Stollenwerk), Lakewood, Colorado; 140, USGS research laboratory, Menlo Park, California; 20, USGS research laboratory, Ocala, Florida; mol/L, moles per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data; <, actual value is known to be less than value shown]

Well	Date	Laboratory	Ionic balance (percent)	Ionic strength (mol/L)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)
501	11–17–93	110	0.0	0.089	540	140	92	--	2,100
	11–08–94	110	-1.1	.085	560	140	88	--	2,000
	11–08–94	140	.51	.088	550	140	82	6.3	2,000
	11–08–94	10	-1.4	.084	540	120	77	6.1	2,000
	05–15–95	140	-2.8	.086	500	140	90	7.8	2,100
	11–28–95	140	-1.7	.079	500	110	70	5.0	1,900
	05–30–96	10	-2.1	.076	480	110	62	5.1	1,800
502	06–20–94	110	-8.6	.044	310	55	33	--	1,000
	06–20–94	140	--	--	340	58	36	4.3	--
	11–08–94	110	3.4	.044	350	61	40	--	920
	11–08–94	140	3.8	.043	340	60	40	3.8	880
	05–15–95	140	.78	.046	350	61	40	3.4	970
	11–28–95	140	-2.5	.042	300	60	40	3.7	930
	05–29–96	10	3.5	.043	350	55	34	3.1	880
503	11–17–93	110	.22	.091	580	140	83	--	2,100
	06–20–94	10	.49	.086	550	130	65	5.7	2,000
	06–20–94	110	-2.3	.087	530	130	81	--	2,100
	06–20–94	140	.30	.085	530	130	76	6.9	2,000
	11–08–94	110	1.3	.086	550	130	82	--	2,000
	11–08–94	140	.89	.087	550	130	77	8.0	2,000
	05–18–95	140	1.9	.085	540	130	77	7.0	2,000
	11–28–95	140	.68	.079	500	120	70	7.6	1,800
	06–08–96	10	-1.94	.075	460	110	62	5.3	1,800
	06–08–96*	10	-.52	.076	460	120	64	5.4	1,800
504	06–20–94	110	--	--	41	15	19	--	14
	06–20–94	140	-6.0	.007	45	16	20	2.8	60
	05–29–96	10	.46	.006	43	15	19	2.3	13
505	11–17–93	110	-4.3	.091	550	140	91	--	2,200
	11–28–95	140	2.6	.088	600	130	80	5.3	2,000
506	11–17–93	110	2.3	.079	510	160	78	--	1,700
	06–20–94	110	--	--	550	130	79	--	2,000
	06–20–94	140	-.17	.086	570	130	77	4.7	2,000
	11–08–94	110	1.6	.084	580	130	82	--	1,900
	11–08–94	140	.61	.082	570	120	77	5.3	1,800
	11–08–94	10	-2.6	.083	570	110	76	4.6	1,900
	05–15–95	140	-1.9	.079	510	120	79	4.4	1,800
	11–28–95	140	-.95	.077	500	120	70	5.1	1,800
	05–30–96	10	-12.	.070	540	<120	69	3.9	1,800

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 500—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Aluminum, dissolved (µg/L as Al)	Barium, dissolved (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Boron, dissolved (µg/L as B)	Cadmium, dissolved (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)
501	11–17–93	110	75	--	60	2,300	--	--	--	<100	--
	11–08–94	110	41	--	72	<5,000	--	--	--	--	--
	11–08–94	140	59	--	66	740	--	--	--	--	--
	11–08–94	10	58	2.7	63	720	25	4.0	70	11	<20
	05–15–95	140	49	--	64	760	--	--	--	--	--
	11–28–95	140	55	--	30	940	--	--	--	--	--
	05–30–96	10	52	2.8	64	943	24	4.6	90	15	33
502	06–20–94	110	33	--	27	<5,000	--	--	--	--	--
	06–20–94	140	29	--	32	<110	--	--	--	--	--
	11–08–94	110	20	--	31	<5,000	--	--	--	--	--
	11–08–94	140	25	--	30	<110	--	--	--	--	--
	05–15–95	140	25	--	30	<110	--	--	--	--	--
	11–28–95	140	24	--	10	<110	--	--	--	--	--
	05–29–96	10	26	.30	29	6.9	27	<.50	29	<1.0	<5.0
503	11–17–93	110	64	--	64	3,500	--	--	--	<100	--
	06–20–94	10	57	2.9	66	1,800	27	7.7	70	20	<20
	06–20–94	110	56	--	70	<5,000	--	--	--	--	--
	06–20–94	140	57	--	71	1,900	--	--	--	--	--
	11–08–94	110	40	--	74	<5,000	--	--	--	--	--
	11–08–94	140	58	--	71	2,200	--	--	--	--	--
	05–18–95	140	54	--	73	2,500	--	--	--	--	--
	11–28–95	140	51	--	30	2,300	--	--	--	--	--
	06–08–96	10	49	2.9	67	2,610	24	8.6	62	22	18
	06–08–96*	10	52	2.7	66	2,500	27	8.1	77	14	<15
504	06–20–94	110	--	--	27	<500	--	--	--	--	--
	06–20–94	140	10	--	30	<110	--	--	--	--	--
	05–29–96	10	8.7	.30	27	<5.0	14	<.50	32	1.0	<5.0
505	11–17–93	110	82	--	59	<1,000	--	--	--	<100	--
	11–28–95	140	56	--	30	<110	--	--	--	--	--
	11–17–93	110	55	--	53	<1,000	--	--	--	<100	--
	06–20–94	110	74	--	59	<5,000	--	--	--	--	--
	06–20–94	140	65	--	62	<110	--	--	--	--	--
	11–08–94	110	70	--	62	<5,000	--	--	--	--	--
	11–08–94	140	62	--	60	<110	--	--	--	--	--
506	11–08–94	10	95	.40	56	<10	17	<1.5	90	12	<20
	05–15–95	140	57	--	62	<110	--	--	--	--	--
	11–28–95	140	54	--	30	<110	20	<1.5	70	8.0	20
	05–30–96	10	54	.40	68	<5.0	22	<1.5	26	13	29

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 500—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Cobalt, dissolved (µg/L as Co)	Copper, dissolved (µg/L as Cu)	Iron, dissolved (µg/L as Fe)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Molybdenum, dissolved (µg/L as Mo)	Nickel, dissolved (µg/L as Ni)	Silver, dissolved (µg/L as Ag)
501	11–17–93	110	450	<20	56	--	--	86,000	--	1,100	--
	11–08–94	110	--	<100	<200	--	--	7,100	--	770	--
	11–08–94	140	470	<30	<130	--	--	76,000	--	710	--
	11–08–94	10	420	<30	45	40	200	73,000	<30	690	15
	05–15–95	140	440	<30	<130	--	--	77,000	--	730	--
	11–28–95	140	410	150	1,800	--	--	63,000	--	600	--
	05–30–96	10	430	<30	36	<30	160	66,000	<30	680	15
502	06–20–94	110	--	<100	<200	--	--	<300	--	440	--
	06–20–94	140	50	<30	<130	--	--	<60	--	<90	--
	11–08–94	110	--	<100	<200	--	--	<300	--	290	--
	11–08–94	140	<30	<30	<130	--	--	<60	--	<90	--
	05–15–95	140	<20	60	150	--	--	530	--	<90	--
	11–28–95	140	<20	60	1,100	--	--	1,600	--	<90	--
	05–29–96	10	<3.0	<10	6.0	<10	8	<1.0	10	<10	<1.0
503	11–17–93	110	1,100	140	<40	--	--	85,000	--	680	--
	06–20–94	10	940	230	25	<30	210	83,000	<30	880	12
	06–20–94	110	--	<100	<200	--	--	76,000	--	900	--
	06–20–94	140	1,000	240	<130	--	--	83,000	--	860	--
	11–08–94	110	--	<100	<200	--	--	78,000	--	1,000	--
	11–08–94	140	990	390	<130	--	--	84,000	--	890	--
	05–18–95	140	970	610	200	--	--	83,000	--	870	--
	11–28–95	140	960	710	<130	--	--	78,000	--	800	--
	06–08–96	10	870	670	26	<30	180	75,000	<30	800	8.0
	06–08–96*	10	830	720	60	<30	180	82,000	<30	860	11
504	06–20–94	110	--	<10	<20	--	--	<30	--	<50	--
	06–20–94	140	20	<30	<130	--	--	<60	--	<90	--
	05–29–96	10	<3.0	<10	<3.0	<10	14	2.0	<10	<10	1.0
505	11–17–93	110	130	<20	56	--	--	72,000	--	<100	--
	11–28–95	140	210	<30	3,200	--	--	66,000	--	570	--
506	11–17–93	110	<40	<20	<40	--	--	19,000	--	<100	--
	06–20–94	110	--	<100	<200	--	--	51,000	--	530	--
	06–20–94	140	70	<30	<130	--	--	55,000	--	290	--
	11–08–94	110	--	<100	<200	--	--	40,000	--	430	--
	11–08–94	140	50	<30	<130	--	--	41,000	--	200	--
	11–08–94	10	<9	<30	55	60	130	41,000	50	230	<3.0
	05–15–95	140	<20	50	<130	--	--	44,000	--	320	--
	11–28–95	140	60	<30	1,500	<30	160	49,000	<30	330	8.0
	05–30–96	10	30	<30	31	100	150	50,000	60	360	18

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well Group 500—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Strontium, dissolved (µg/L as Sr)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Zn)	Carbon, inorganic, dissolved (mg/L as C)
501	11–17–93	110	1,800	--	310	--
	11–08–94	110	1,900	--	840	--
	11–08–94	140	--	--	800	--
	11–08–94	10	1,800	<18	780	--
	05–15–95	140	1,900	--	830	--
	11–28–95	140	1,700	--	730	--
	05–30–96	10	1,700	<18	760	--
502	06–20–94	110	1,300	--	<150	--
	06–20–94	140	1,400	--	<20	--
	11–08–94	110	1,500	--	<150	--
	11–08–94	140	--	--	<20	--
	05–15–95	140	1,500	--	40	--
	11–28–95	140	1,500	--	30	--
	05–29–96	10	1,400	<6	<3.0	--
	05–29–96	20	--	--	--	--
503	11–17–93	110	1,900	--	2,100	--
	06–20–94	10	1,800	<18	2,300	--
	06–20–94	110	1,800	--	2,200	--
	06–20–94	140	700	--	2,300	--
	11–08–94	110	1,800	--	2,300	--
	11–08–94	140	--	--	2,300	--
	05–18–95	140	1,800	--	2,100	--
	11–28–95	20	--	--	--	20
	11–28–95	140	1,600	--	2,000	--
	06–08–96	10	1,500	<18	1,900	--
	06–08–96	20	--	--	--	24
	06–08–96*	10	1,600	<18	1,800	--
	06–08–96*	20	--	--	--	23
504	06–20–94	110	300	--	<15	--
	06–20–94	140	300	--	<20	--
	05–29–96	10	310	10	6.0	--
505	11–17–93	110	2,100	--	<30	--
	11–28–95	140	1,800	--	250	--
506	11–17–93	110	2,000	--	<30	--
	06–20–94	110	1,900	--	--	--
	06–20–94	140	1,900	--	<20	--
	11–08–94	110	2,000	--	<150	--
	11–08–94	140	--	--	<20	--
	11–08–94	10	1,800	<18	35	--
	05–15–95	140	1,700	--	<20	--
	11–28–95	140	1,800	<18	40	--
	05–30–96	10	1,800	12	13	--

*Resampled after being pumped with large pump.

GROUND WATER—Continued

Well 601

LOCATION.—Lat 33°33'07", long 110°53'06", in NW1/4NW1/4NE1/4, sec. 1, T. 2 N., R. 14 E. (A-02-14)01abb, 43 m east of Pinal Creek, and 20 km northwest of Globe.

Landowner: Cyprus Miami Mining Corporation.

LAND-SURFACE DATUM.—870.73 m above National Geodetic Vertical Datum of 1929 (levels by Water Resources Division, U.S. Geological Survey).

REMARKS.—Caving occurred after the casing was placed in the borehole. Natural material fills the borehole annulus around the well screen. Pumping water from this well is difficult.

DRILLING AND WELL CONSTRUCTION

Well 601 was cased with nominal 10-centimeter diameter, schedule 40, PVC pipe. The well has a single 0.9-meter length of slotted, 10-centimeter diameter, schedule 80, PVC pipe as the well screen. The screen has 1,470 factory-cut slots 3.8 cm long by 0.64 mm wide for a total open area of 358 cm^2.

The borehole annulus is filled with natural material to between 3.4 and 5.2 m below land surface. Bentonite was placed on top of this uneven surface, but a good seal was not achieved. Sand and natural material was placed on top of the bentonite up to approximately 1.2 m below land surface. Cement grout seals the well from the land surface to 1.2 m below land surface and was used to set a 1.5-meter-long steel security casing.

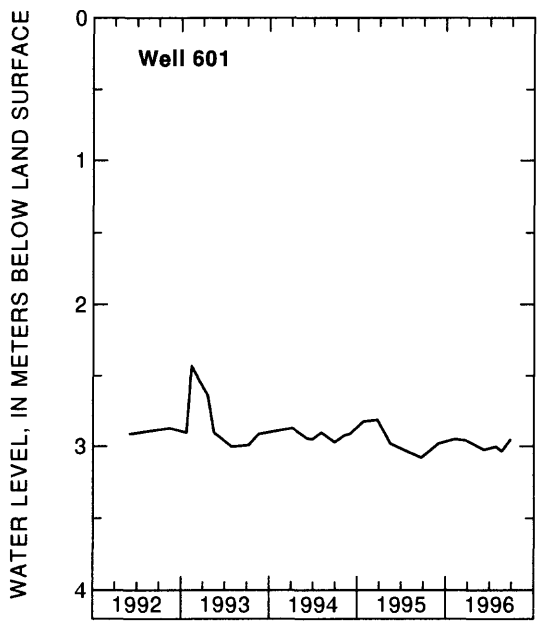
Logs: D, driller's.

Well	Section location	Date completed	Drilling method	Hole depth (meters)	Well depth (meters)	Screened interval (meters)	Geologic Unit	Bottom of seal (meters)	Logs available
601	abb	03–31–92	Hollow-stem auger	12.0	8.9	8.0–8.9	Alluvium	1.2	D

GROUND WATER—Continued

Well 601—Continued

Date	Water level, in meters below land surface	Date	Water level, in meters below land surface	Date	Water level, in meters below land surface	Date	Water level, in meters below land surface
10–06–93	2.99	08–03–94	2.90	03–24–95	2.81	03–26–96	2.96
11–17–93	2.91	09–27–94	2.97	05–16–95	2.98	06–06–96	3.02
04–06–94	2.87	11–07–94	2.92	09–21–95	3.08	07–26–96	3.00
06–05–94	2.94	11–30–94	2.91	12–01–95	2.98	08–20–96	3.03
06–27–94	2.95	01–25–95	2.82	02–06–96	2.95	09–26–96	2.95



Hydrograph of Well 601.

GROUND WATER—Continued

Well 601—Continued

Field Measurements

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; mV, millivolts; °C, degrees Celsius; mg/L, milligrams per liter; IT, incremental titration; L/min, liters per minute; --, no data]

Well	Date	Specific conductance (µS/cm)	pH (standard units)	Oxidation reduction potential (mV)	Temperature, water (°C)	Oxygen, dissolved (mg/L)	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)	Average discharge (L/min)	Pumping period (hours)
601	11–17–93	2,730	6.4	--	18.0	0.9	122	149	2.3	0.72
	06–21–94	2,590	6.6	420	20.0	1.9	138	168	2.6	.52
	11–07–94	2,590	6.3	--	19.0	.7	122	149	1.1	1.18
	05–16–95	2,700	6.5	--	20.0	--	125	--	2.3	--
	06–06–96	2,260	6.2	368	19.5	.4	114	139	--	--

Laboratory Measurements

[Laboratory—10, USGS National Water-Quality Laboratory, Arvada, Colorado; 20, USGS research laboratory, Ocala, Florida; 110, USGS research laboratory (K.G. Stollenwerk), Lakewood, Colorado; 140, USGS research laboratory, Menlo Park, California; mg/L, milligrams per liter; mol/L, moles per liter; µg/L, micrograms per liter; --, no data; <, actual value is known to be less than value shown]

Well	Date	Laboratory	Ionic balance (percent)	Ionic strength (mol/L)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)
601	11–17–93	110	-1.1	0.083	670	91	36	--	1,900	80
	06–21–94	110	1.8	.071	510	110	76	--	1,500	71
	06–21–94	140	.49	.071	510	110	72	4.8	1,600	71
	11–07–94	140	-.56	.067	470	100	72	5.6	1,500	60
	05–16–95	140	.42	.066	460	100	70	4.2	1,600	50
	06–06–96	10	3.7	.059	410	88	64	3.7	1,300	45

Well	Date	Laboratory	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Aluminum, dissolved (µg/L as Al)	Barium, dissolved (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Boron, dissolved (µg/L as B)	Cadmium, dissolved (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)	Cobalt, dissolved (µg/L as Co)
601	11–17–93	110	--	37	<1,000	--	--	--	<100	--	<40
	06–21–94	110	--	44	<5,000	--	--	--	--	--	--
	06–21–94	140	--	45	<110	--	--	--	--	--	<20
	11–07–94	110	--	--	--	--	--	--	--	--	--
	11–07–94	140	--	51	<110	--	--	--	--	--	20
	05–16–95	140	--	45	<110	--	--	--	--	--	<20
	06–06–96	10	46	52	<5.0	23	<2.5	30	<5.0	<25	<15

GROUND WATER—Continued

Well 601—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Copper, dissolved (µg/L as Cu)	Iron, dissolved (µg/L as Fe)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Molybdenum, dissolved (µg/L as Mo)	Nickel, dissolved (µg/L as Ni)	Silver, dissolved (µg/L as Ag)
601	11–17–93	110	<20	120	--	--	900	--	<100	--
	06–21–94	110	<100	<200	--	--	300	--	<500	--
	06–21–94	140	<30	<130	--	--	370	--	<90	--
	11–07–94	110	--	--	--	--	--	--	--	--
	11–07–94	140	<30	<130	--	--	310	--	<90	--
	05–16–95	140	<30	<130	--	--	420	--	<90	--
	06–06–96	10	<50	<15	<50	110	320	<50	60	<5.0

Well	Date	Laboratory	Strontium, dissolved (µg/L as Sr)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Zn)	Carbon, inorganic, dissolved (mg/L as C)
601	11–17–93	110	1,900	--	<30	--
	06–21–94	110	1,900	--	<150	--
	06–21–94	140	1,900	--	<20	--
	11–07–94	110	--	--	--	--
	11–07–94	140	--	--	<20	--
	05–16–95	140	1,600	--	30	--
	06–06–96	10	1,600	<30	<15	--
	06–06–96	20	--	--	--	35

GROUND WATER—Continued

Well Group 700

LOCATION.—Lat 33°34'03", long 110°53'45", in SE1/4SE1/4SE1/4, sec. 26, T. 3 N., R. 14 E. (A-03-14)26ddd, 52 m east of Pinal Creek, and 21 km northwest of Globe.

Landowner: Cyprus Miami Mining Corporation.

LAND-SURFACE DATUM.—844.90 m above National Geodetic Vertical Datum of 1929 (levels by Water Resources Division, U.S. Geological Survey).

DRILLING AND WELL CONSTRUCTION

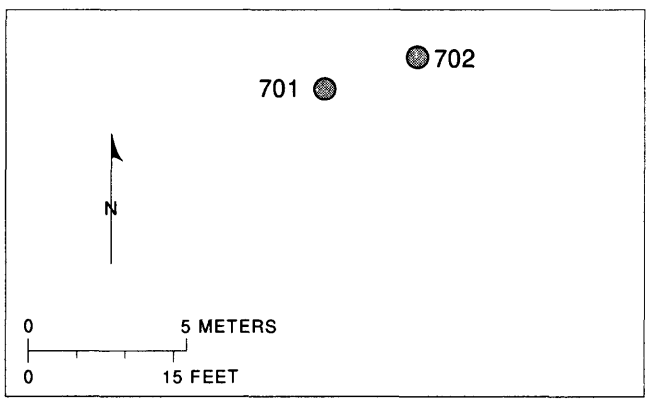
Well 701 was cased with nominal 10-centimeter diameter, schedule 40, PVC pipe. The well has a 0.9-meter length of slotted, 10-centimeter diameter, schedule 80, PVC pipe as the well screen. The screen has 1,470 factory-cut slots 3.6 cm long by 0.64 mm wide for a total open area of 339 cm^2. The hole caved during installation of casing. The borehole annulus around the screen is filled with washed pea gravel from uncontaminated local alluvium. A layer of bentonite pellets was placed in the annulus from approximately 0.3 to 1.0 m above the screen. A concrete seal extends from the land surface to a depth of 3.6 m.

Well 702 was cased with nominal 5-centimeter diameter, class 160, PVC pipe. The well has a 0.9-meter length of slotted, 5-centimeter diameter, class 160, PVC pipe as the well screen. The screen has 216 field-cut slots that average 4.6 cm long and are 0.51 mm wide for a total open area of 51 cm^2. The hole caved during installation of casing. The borehole annulus around the screen is filled with washed pea gravel from uncontaminated local alluvium. A layer of bentonite pellets was placed in the annulus from approximately 1.2 to 2.1 m above the screen. A concrete seal extends from the land surface to a depth of 5.2 m.

Logs: D, driller's; G, geologist; P, particle size.

Well	Section location	Date completed	Drilling method	Hole depth (meters)	Well depth (meters)	Screened interval (meters)	Geologic Unit	Bottom of seal (meters)	Logs available
701	ddd1	05–11–90	Hollow-stem auger	8.7	5.0	4.1–5.0	Alluvium	3.6	D
702	ddd2	05–11–90	Hollow-stem auger	8.1	7.3	6.4–7.3	Alluvium	5.2	DGP

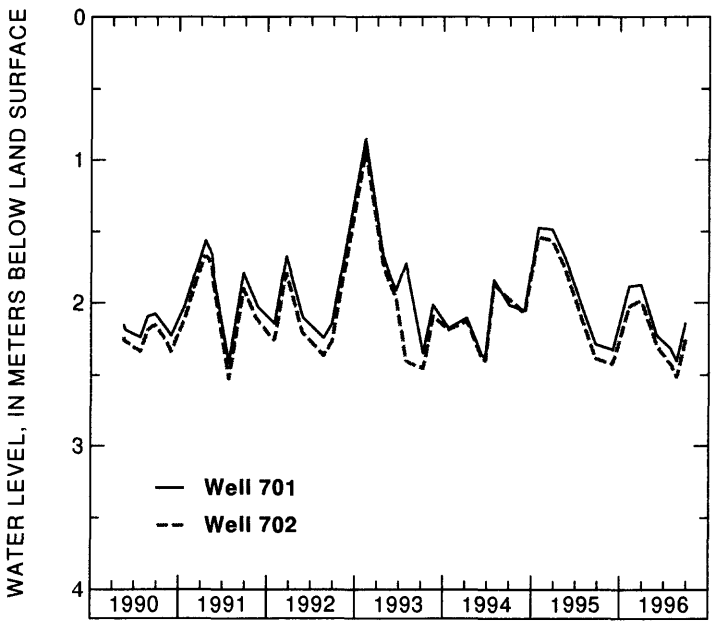
WELL GROUP 700 SITE PLAN



GROUND WATER—Continued

Well Group 700—Continued

	Water level, in meters below land surface										
	Well number										
Date	701	702	Date	701	702	Date	701	702	Date	701	702
10–06–93	2.34	2.45	06–21–94	2.38	2.40	03–24–95	1.48	1.56	03–27–96	1.87	1.98
11–17–93	2.01	2.09	07–28–94	1.84	1.87	05–16–95	1.68	1.76	05–30–96	2.22	2.29
01–21–94	2.17	2.18	09–28–94	2.01	2.03	09–21–95	2.28	2.38	07–25–96	2.31	2.42
04–06–94	2.10	2.12	12–01–94	2.05	2.07	12–01–95	2.32	2.42	08–20–96	2.40	2.51
06–05–94	2.35	2.37	01–26–95	1.47	1.54	02–07–96	1.88	2.02	09–26–96	2.13	2.25



Hydrographs of Wells 701 and 702.

GROUND WATER—Continued

Well Group 700—Continued

Field Measurements

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; mV, millivolts; °C, degrees Celsius; mg/L, milligrams per liter; IT, incremental titration; L/min, liters per minute; --, no data]

Well	Date	Specific conductance (µS/cm)	pH (standard units)	Oxidation reduction potential (mV)	Temperature, air (°C)	Temperature, water (°C)	Oxygen, dissolved (mg/L)	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)	Average discharge (L/min)	Pumping period (hours)
701	06–21–94	2,720	6.9	315	--	17.5	0.1	192	234	4.2	0.73
	05–16–95	2,840	6.9	--	27.0	17.0	.1	194	237	3.0	.48
	05–30–96	2,260	6.9	340	33.0	21.5	.2	160	195	4.2	.63
702	06–21–94	2,760	6.9	313	--	17.0	.1	188	229	4.2	.35
	05–16–95	2,820	6.9	--	28.0	18.5	.1	186	226	1.9	.37
	05–31–96	2,410	6.9	412	--	19.0	4.7	165	201	1.5	.43

Laboratory Measurements

[10, USGS National Water-Quality Laboratory, Arvada, Colorado; 110, USGS research laboratory (K.G. Stollenwerk), Lakewood, Colorado; 140, USGS research laboratory, Menlo Park, California; mol/L, moles per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data; <, actual value is known to be less than value shown]

Well	Date	Laboratory	Ionic balance (percent)	Ionic strength (mol/L)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)
701	06–21–94	110	-4.9	0.071	470	110	80	--	1,600
	06–21–94	140	-1.4	.069	480	110	77	3.6	1,500
	05–16–95	140	1.9	.073	510	120	87	3.8	1,500
	05–30–96	10	.13	.055	390	85	69	3.8	1,200
702	06–21–94	110	-.45	.075	520	120	98	--	1,600
	06–21–94	140	-2.0	.071	490	110	79	4.6	1,600
	05–16–95	140	.49	.073	510	120	82	1.6	1,600
	05–31–96	10	5.9	.059	470	88	57	3.9	1,200

Well	Date	Laboratory	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Aluminum, dissolved (µg/L as Al)	Barium, dissolved (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Boron, dissolved (µg/L as B)
701	06–21–94	110	82	--	40	<5,000	--	--	--
	06–21–94	140	75	--	41	<110	--	--	--
	05–16–95	140	69	--	36	<110	--	--	--
	05–30–96	10	48	0.50	39	11	23	<2.5	81
702	06–21–94	110	80	--	43	<5,000	--	--	--
	06–21–94	140	77	--	41	<110	--	--	--
	05–16–95	140	72	--	36	<110	--	--	--
	05–31–96	10	48	.40	43	<5.0	20	<1.5	68

GROUND WATER—Continued

Well Group 700—Continued

Laboratory Measurements—Continued

Well	Date	Laboratory	Cadmium, dissolved (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)	Cobalt, dissolved (µg/L as Co)	Copper, dissolved (µg/L as Cu)	Iron, dissolved (µg/L as Fe)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)
701	06–21–94	110	--	--	--	<100	<200	--	--
	06–21–94	140	--	--	50	<30	140	--	--
	05–16–95	140	--	--	<20	<30	210	--	--
	05–30–96	10	<5.0	<25	<15	<30	33	<50	83
702	06–21–94	110	--	--	--	<100	<200	--	--
	06–21–94	140	--	--	40	<30	<130	--	--
	05–16–95	140	--	--	<20	<30	<130	--	--
	05–31–96	10	<3.0	<15	14	<30	<9.0	<30	54

Well	Date	Laboratory	Manganese, dissolved (µg/L as Mn)	Molybdenum, dissolved (µg/L as Mo)	Nickel, dissolved (µg/L as Ni)	Silver, dissolved (µg/L as Ag)	Strontium, dissolved (µg/L as Sr)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Zn)
701	06–21–94	110	1,300	--	<500	--	1,700	--	<150
	06–21–94	140	1,400	--	<90	--	1,600	--	<20
	05–16–95	140	1,600	--	<90	--	1,700	--	30
	05–30–96	10	1,100	<50	<50	<5.0	1,500	<30	<15
702	06–21–94	110	790	--	<500	--	1,900	--	<150
	06–21–94	140	810	--	<90	--	1,700	--	<20
	05–16–95	140	1,000	--	<90	--	1,700	--	100
	05–31–96	10	1,100	40	<30	<3.0	1,400	<18	<9.0

GROUND WATER—Continued

Quality Control Data

Laboratory Measurements

[Laboratory—10, USGS National Water-Quality Laboratory, Arvada, Colorado; 140, USGS research laboratory, Menlo Park, California; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data; <, actual value is known to be less than value shown]

Sample type	Date	Laboratory	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)
Filter blank	11–09–94	10	0.05	<0.01	<0.20	<0.10	<0.10
Pump blank	11–14–94	10	.05	<.01	<.20	<.10	.10
Water blank	11–16–94	10	<.02	<.01	<.20	<.10	<.10
Water blank	05–22–95	140	10	<.24	<.18	<.05	3.0
Pump blank	05–22–95	140	<.06	<.24	<.18	<.05	2.0
Pump blank	06–07–96	10	.05	.02	<.20	<.10	<.10

Sample type	Date	Laboratory	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Aluminum, dissolved (µg/L as Al)	Barium, dissolved (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Boron, dissolved (µg/L as B)
Filter blank	11–09–94	10	<0.10	<0.10	<0.01	<10	<2	<0.5	<10
Pump blank	11–14–94	10	<.10	<.10	.02	<10	<2	<.5	<10
Water blank	11–16–94	10	<.10	<.10	<.01	<10	<2	<.5	<10
Water blank	05–22–95	140	.2	--	<.2	<110	--	--	--
Pump blank	05–22–95	140	.2	--	<.2	<110	--	--	--
Pump blank	06–07–96	10	<.10	<.10	.04	10	<2	<.5	9

GROUND WATER—Continued

Quality Control Data—Continued

Laboratory Measurements—Continued

Sample type	Date	Laboratory	Cadmium, dissolved (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)	Cobalt, dissolved (µg/L as Co)	Copper, dissolved (µg/L as Cu)	Iron, dissolved (µg/L as Fe)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)
Filter blank	11–09–94	10	2.0	<5	<3	<10	12	20	<4
Pump blank	11–14–94	10	3.0	<5	<3	<10	<3	20	<4
Water blank	11–16–94	10	2.0	<5	<3	<10	<3	20	<4
Water blank	05–22–95	140	--	--	<20	<30	<130	--	--
Pump blank	05–22–95	140	--	--	<20	60	870	--	--
Pump blank	06–07–96	10	<1.0	<5	<3	<10	14	<10	<4

Sample type	Date	Laboratory	Manganese, dissolved (µg/L as Mn)	Molybdenum, dissolved (µg/L as Mo)	Nickel, dissolved (µg/L as Ni)	Silver, dissolved (µg/L as Ag)	Strontium, dissolved (µg/L as Sr)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Mo)
Filter blank	11–09–94	10	<1	20	<10	<1.0	<1	<6	<3
Pump blank	11–14–94	10	<1	20	<10	<1.0	<1	<6	<3
Water blank	11–16–94	10	<1	<10	<10	<1.0	<1	<6	<3
Water blank	05–22–95	140	<60	--	<90	--	<15	--	<20
Pump blank	05–22–95	140	<60	--	<90	--	<15	--	<20
Pump blank	06–07–96	10	<1	<10	<10	<1.0	<1	<6	3

GROUND WATER—Continued

Miscellaneous Ground-Water Data

Field Measurements

[°C, degrees Celsius; mg/L, milligrams per liter; IT, incremental titration. Samples were collected from auger holes drilled in the unsaturated zone]

Site location	Date	pH (standard units)	Temperature, water (°C)	Oxygen, dissolved (mg/L)	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)
(A-02-15)18abd1	06–12–95	7.3	28.5	4.8	132	161
(D-04-16)08bcc1	06–11–95	7.4	29.0	2.2	297	362
(D-04-16)08bcc4	06–11–95	7.2	33.5	2.0	314	383

Laboratory Measurements

Laboratory—140, USGS research laboratory, Menlo Park, California; mol/L, moles per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; *analysis from USGS research laboratory, Ocala, Florida; <, actual value is known to be less than value shown. Samples were collected from auger holes drilled in the unsaturated zone]

Site location	Date	Laboratory	Ionic balance (percent)	Ionic strength (mol/L)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)
(A-02-15)18abd1	06–12–95	140	-5.0	0.012	96	19	18	3.5
(D-04-16)08bcc1	06–11–95	140	-.47	.014	93	32	37	4.9
(D-04-16)08bcc4	06–11–95	140	-.16	.013	100	28	38	4.9

Site location	Date	Laboratory	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Silica, dissolved (mg/L as SiO_2)	Aluminum, dissolved (µg/L as Al)	Cobalt, dissolved (µg/L as Co)	Copper, dissolved (µg/L as Cu)
(A-02-15)18abd1	06–12–95	140	180	7.0	12	<110	63	<30
(D-04-16)08bcc1	06–11–95	140	120	24	15	<110	<20	<30
(D-04-16)08bcc4	06–11–95	140	100	27	15	<110	<20	<30

Site Location	Date	Laboratory	Iron, dissolved (µg/L as Fe)	Manganese, dissolved (µg/L as Mn)	Nickel, dissolved (µg/L as Ni)	Strontium, dissolved (µg/L as Sr)	Zinc, dissolved (µg/L as Zn)	Carbon, inorganic, total (mg/L as C)*
(A-02-15)18abd1	06–12–95	140	<130	1,290	<90	400	<20	53
(D-04-16)08bcc1	06–11–95	140	<130	66	<90	500	<20	74
(D-04-16)08bcc4	06–11–95	140	<130	68	<90	500	200	75

SURFACE WATER

333156110521100 Pinal Creek at Head of Flow near Globe, Arizona

LOCATION.—See fig. 3 for locations of head of flow.

Field Measurements

[ft^3/s, cubic feet per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; mm, millimeters; mg/L, milligrams per liter; IT, incremental titration; --, no data]

Date	Time	Discharge, instantaneous (ft^3/s)	Specific conductance (µS/cm)	pH (standard units)	Temperature, air (°C)	Temperature, water (°C)	Barometric pressure (mm of mercury)	Oxygen, dissolved (mg/L)	Oxygen, dissolved (percent saturation)	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)
10–04–93	1000	0.01	2,300	6.6	28.5	22.0	687	2.2	28	105	--
12–03–93	1200	<.01	1,620	6.9	--	10.0	695	3.9	38	136	--
02–01–94	0900	.01	2,480	6.1	3.0	7.0	693	7.0	64	66	--
04–06–94	0915	<.01	2,520	6.2	14.0	15.0	687	2.6	29	64	--
06–03–94	0915	.03	2,780	6.5	26.0	18.0	694	3.6	42	106	--
08–02–94	1230	<.01	3,510	6.3	35.0	27.0	683	2.3	33	98	--
09–27–94	0955	<.01	3,450	6.5	22.0	20.0	685	6.2	77	111	--
11–30–94	0915	<.01	3,190	6.2	10.5	7.0	692	5.0	46	79	--
01–25–95	1020	.01	2,750	6.5	10.0	10.5	684	4.1	41	142	--
03–23–95	1245	.17	1,900	5.9	22.0	17.0	681	2.5	30	45	--
06–05–95	1100	.30	2,200	6.1	29.0	21.0	683	5.0	63	60	--
08–10–95	1350	.40	2,800	6.2	36.0	26.0	683	5.0	69	69	--
09–27–95	1230	.02	2,700	6.1	29.0	24.5	688	4.3	58	77	94
11–29–95	0935	.06	2,600	6.1	8.0	18.0	--	1.5	--	77	94
02–06–96	0945	.02	2,750	6.2	11.0	13.5	692	6.2	66	31	--
03–26–96	1030	.12	2,700	6.1	22.0	16.0	684	1.8	21	61	75
05–30–96	1020	.13	2,650	6.1	28.0	22.0	683	1.9	24	71	87
07–26–96	0825	<.01	3,000	6.5	22.0	23.0	687	--	---	88	108
09–27–96	0900	<.01	3,200	6.1	21.0	22.0	686	1.0	13	85	104

333156110521100 Pinal Creek at Head of Flow near Globe, Arizona—Continued

Laboratory Measurements

[Laboratory—10, USGS National Water-Quality Laboratory, Arvada, Colorado; 140, USGS research laboratory, Menlo Park, California; mol/L, moles per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, no data]

Date	Laboratory	Ionic balance (percent)	Ionic strength (mol/L)	Solids, sum of constituents, dissolved (mg/L)	Calcium, total (mg/L as Ca)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)
10–04–93	140	8.25	0.057	1,970	390	420	95	60	7.1	1,200
12–03–93	140	7.8	.051	1,770	360	380	80	57	5.9	1,100
02–01–94	140	1.4	.056	1,940	380	370	89	58	5.2	1,300
04–06–94	140	1.4	.061	2,130	410	400	97	59	6.7	1,400
06–03–94	140	2.5	.069	2,420	530	480	110	70	3.8	1,600
08–02–94	140	.30	.089	3,110	580	570	150	89	5.1	2,100
09–27–94	140	4.8	.092	3,160	580	620	160	99	5.4	2,100
11–30–94	140	5.8	.087	2,960	510	600	150	88	6.6	1,900
01–25–95	140	4.6	.075	2,610	520	530	120	65	6.4	1,700
03–23–95	140	.89	.046	1,630	270	290	73	49	4.8	1,100
06–05–95	140	-3.0	.055	1,950	--	340	80	52	6.6	1,300
08–10–95	140	1.9	.069	2,400	--	450	107	65	7.9	1,600
09–27–95	140	-1.3	.073	2,520	--	450	120	70	5.5	1,700
11–29–95	140	.59	.068	2,330	--	440	110	60	5.0	1,600
02–06–96	140	1.43	.069	2,360	--	450	110	60	4.7	1,600
03–26–96	140	1.66	.070	2,410	--	470	110	70	4.8	1,600
05–30–96	10	--	--	2,400	--	440	110	62	5.3	1,600
05–30–96	140	--	--	---	--	430	110	63	7.1	--
07–26–96	10	.53	.083	2,880	--	560	130	76	5.5	1,900
09–27–96	10	1.15	.081	2,850	--	540	130	76	5.2	1,900

333156110521100 Pinal Creek at Head of Flow near Globe, Arizona—Continued

Laboratory Measurements—Continued

Date	Laboratory	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Aluminum, total (µg/L as Al)	Aluminum, dissolved (µg/L as Al)	Cobalt, total (µg/L as Co)	Cobalt, dissolved (µg/L as Co)	Copper, total (µg/L as Cu)	Copper, dissolved (µg/L as Cu)
10–04–93	140	53	--	15	<110	<110	<20	<20	<30	<30
12–03–93	140	49	--	11	<110	<110	<20	<20	40	<30
02–01–94	140	56	--	14	170	210	<20	20	40	40
04–06–94	140	52	--	18	410	170	40	<20	50	<30
06–03–94	140	59	--	19	600	<110	<20	<20	<30	<30
08–02–94	140	74	--	28	2,300	<110	<80	<80	88	<30
09–27–94	140	71	--	25	1,000	<110	30	<20	80	<30
11–30–94	140	67	--	25	<110	<110	<20	40	50	<30
01–25–95	140	59	--	13	1,200	<100	50	30	120	70
03–23–95	140	36	--	20	630	540	90	80	70	60
06–05–95	140	32	--	21	--	221	--	90	--	662
08–10–95	140	48	--	27	--	<110	--	112	--	<30
09–27–95	140	49	--	27	--	<110	--	40	--	<30
11–29–95	140	6.0	--	20	--	<110	--	30	--	<30
02–06–96	140	52	1.0	20	--	<110	--	30	--	<30
03–26–96	140	52	1.0	20	--	150	--	30	--	<30
05–30–96	10	48	1.0	52	--	--	--	10	--	<30
05–30–96	140	--	--	20	--	<110	--	40	--	40
07–26–96	10	58	.90	55	--	8.3	--	21	--	<30
09–27–96	10	59	.50	58	--	11	--	17	--	<30

333156110521100 Pinal Creek at Head of Flow near Globe, Arizona—Continued

Laboratory Measurements—Continued

Date	Laboratory	Iron, total (µg/L as Fe)	Iron, dissolved (µg/L as Fe)	Manganese, total (µg/L as Mn)	Manganese, dissolved (µg/L as Mn)	Nickel, total (mg/L as Ni)	Nickel, dissolved (mg/L as Ni)	Strontium, dissolved (µg/L as Sr)	Zinc, total (µg/L as Zn)	Zinc, dissolved (µg/L as Zn)
10–04–93	140	<130	<130	15,000	15,600	--	170	1,300	70	60
12–03–93	140	450	<130	4,800	5,550	<90	<90	1,100	30	30
02–01–94	140	<130	<130	22,000	21,100	390	330	1,200	100	100
04–06–94	140	330	<130	35,000	33,200	390	400	1,300	100	100
06–03–94	140	820	<130	18,000	16,500	170	170	1,600	40	<20
08–02–94	140	1,400	<130	36,000	34,200	190	200	2,000	80	60
09–27–94	140	1,000	<130	32,000	34,100	180	170	2,000	60	40
11–30–94	140	390	<130	30,000	32,700	180	160	1,900	70	50
01–25–95	140	1,600	<130	34,200	34,200	140	140	1,700	90	70
03–23–95	140	<130	<130	32,000	36,000	350	390	980	100	100
06–05–95	140	--	<130	--	27,500	--	282	1,110	--	115
08–10–95	140	--	<130	--	52,700	--	258	1,390	--	<20
09–27–95	140	--	<130	--	49,100	--	270	1,500	--	30
11–29–95	140	--	<130	--	45,500	--	250	1,500	--	50
02–06–96	140	--	<130	--	43,200	--	280	1,400	--	60
03–26–96	140	--	<130	--	42,600	--	290	1,500	--	50
05–30–96	10	--	< 9.0	--	37,000	--	270	1,600	--	21
05–30–96	140	--	<130	--	38,800	--	250	1,400	--	50
07–26–96	10	--	260	--	36,000	--	90	1,800	--	19
09–27–96	10	--	51	--	29,000	--	160	1,800	--	<9.0

Date	Laboratory	Barium, dissolved (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Boron, dissolved (µg/L as B)	Cadmium, dissolved (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)	Molybdenum, dissolved (µg/L as Mo)	Silver, dissolved (µg/L as Ag)	Vanadium, dissolved (µg/L as V)
05–30–96	10	24	<1.5	--	<3.0	17	<30	150	<30	<3.0	<18
07–26–96	10	27	<1.5	100	<3.0	19	<30	150	<30	7.0	<18
09–27–96	10	27	<1.5	72	<3.0	17	40	150	<30	<3.0	<18

SURFACE WATER—Continued

09498380 Pinal Creek at Setka Ranch near Globe, Arizona

LOCATION.—Lat 33°32'23", long 110°52'26", in SE1/4SW1/4SW1/4, sec. 6, T. 2 N., R. 15 E., at an unpaved ford 2.9 km downstream from Hicks Crossing, 5.1 km upstream from Inspiration Dam, 11.3 km upstream from mouth, and 18 km northwest of Globe.

DRAINAGE AREA.—458 km^2, including approximately 85 km^2 that is partly or entirely noncontributing due to mine pits and dumps.

CHANNEL ELEVATION.—884 m above National Geodetic Vertical Datum of 1929, from topographic map.

PERIOD OF RECORD.—July 1987 to current year.

REMARKS.—Station was formerly identified by number 333223110522600.

Field Measurements

[ft^3/s, cubic feet per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; mm, millimeters; mg/L, milligrams per liter; IT, incremental titration; --, no data]

Date	Time	Discharge, instantaneous (ft^3/s)	Specific conductance (µS/cm)	pH (standard units)	Temperature, air (°C)	Temperature, water (°C)	Barometric pressure (mm of mercury)	Oxygen, dissolved (mg/L)	Oxygen, dissolved (percent saturation)	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)
10-04-93	1400	5.5	2,950	6.9	34.0	24.0	685	8.1	108	67	--
12-02-93	1150	5.9	2,170	6.7	17.0	17.5	696	8.0	92	73	--
02-01-94	1220	6.2	3,000	6.7	9.5	14.5	694	9.6	105	67	82
04-06-94	1200	6.4	2,950	6.6	20.0	19.0	686	8.5	104	66	--
06-03-94	1240	4.1	3,050	6.6	37.0	25.0	684	7.5	103	60	--
08-03-94	0800	4.0	3,020	6.8	23.0	21.0	684	6.8	86	64	--
09-27-94	1310	4.0	3,000	6.6	34.5	25.0	685	6.6	91	56	--
11-30-94	1325	4.9	2,790	6.6	15.0	16.5	690	7.7	88	55	67
01-25-95	1400	6.6	2,690	6.4	10.5	15.0	684	6.9	77	51	--
03-23-95	1500	7.3	2,800	6.5	22.5	20.0	681	6.5	81	48	--
06-05-95	1505	4.3	2,700	6.2	33.0	23.0	681	6.8	90	40	--
08-10-95	1840	3.2	2,600	6.2	28.0	20.0	684	6.3	78	37	--
09-27-95	1545	3.0	2,520	6.2	29.0	20.5	687	7.2	90	34	42
09-29-95	1122	3.5	2,540	6.5	25.0	22.5	686	6.5	84	--	--
11-29-95	1430	3.4	2,500	6.3	16.0	18.0	694	6.9	81	34	40
02-06-96	1340	3.5	2,500	6.2	25.0	20.0	691	7.4	90	66	81
03-26-96	1350	4.5	2,500	6.3	20.5	20.0	684	7.1	88	26	32
05-30-96	1335	3.0	2,500	6.4	31.0	24.0	683	7.2	97	27	33
07-26-96	1005	2.6	2,500	5.9	23.0	26.0	689	7.6	99	24	30
09-27-96	1035	3.4	3,000	6.2	20.0	20.0	686	7.4	92	24	--

SURFACE WATER—Continued

09498380 Pinal Creek at Setka Ranch near Globe, Arizona—Continued

Laboratory Measurements

[Laboratory—10, USGS National Water-Quality Laboratory, Arvada, Colorado; 140, USGS research laboratory, Menlo Park, California; mol/L, moles per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data; <, actual value is known to be less than value shown]

Date	Laboratory	Ionic balance (percent)	Ionic strength (mol/L)	Solids, sum of constituents, dissolved (mg/L)	Calcium, total (mg/L as Ca)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)
10–04–93	140	4.7	0.080	2,750	500	530	130	83	6.1	1,800
12–02–93	140	2.7	.077	2,680	490	490	130	78	4.5	1,800
02–01–94	140	-.21	.075	2,600	--	470	120	75	6.5	1,700
04–06–94	140	-1.8	.074	2,610	480	460	110	66	5.0	1,800
06–03–94	140	-.30	.078	2,740	510	490	120	73	4.8	1,900
08–03–94	140	4.4	.076	2,610	520	500	120	72	4.5	1,700
09–27–94	140	-3.5	.075	2,690	490	460	110	66	3.3	1,900
11–30–94	140	-1.9	.074	2,580	480	460	110	66	5.8	1,700
01–25–95	140	3.1	.076	2,640	470	490	120	70	6.5	1,800
03–23–95	140	1.1	.071	2,480	460	450	110	64	5.2	1,700
06–05–95	140	6.1	.069	2,360	--	460	107	65	8.0	1,500
08–10–95	140	.99	.066	2,300	--	420	95	57	6.6	1,500
09–27–95	140	-2.8	.067	2,340	--	400	100	60	8.0	1,600
11–29–95	140	-1.8	.063	2,210	--	390	90	60	5.4	1,500
02–06–96	140	.19	.062	--	--	390	90	60	5.8	1,400
03–26–96	140	3.6	.062	--	--	400	100	60	7.2	1,400
05–30–96	10	-.65	--	2,120	--	380	87	55	5.8	1,400
05–30–96	140	--	--	--	--	350	90	56	5.5	--
07–26–96	10	-.80	.060	2,110	--	380	84	51	6.1	1,400
09–27–96	10	--	--	2,110	--	370	86	54	5.6	1,400

SURFACE WATER—Continued

09498380 Pinal Creek at Setka Ranch near Globe, Arizona—Continued

Laboratory Measurements—Continued

Date	Laboratory	Chloride, dissolved (mg/L as Cl)	Silica, dissolved (mg/L as SiO_2)	Aluminum, total (µg/L as Al)	Aluminum, dissolved (µg/L as Al)	Cobalt, total (µg/L as Co)	Cobalt, dissolved (µg/L as Co)	Copper, total (µg/L as Cu)	Copper, dissolved (µg/L as Cu)
10–04–93	140	66	31	520	210	110	80	<30	<30
12–02–93	140	59	30	520	330	120	130	60	<30
02–01–94	140	57	30	--	430	--	170	--	<30
04–06–94	140	57	31	640	420	170	170	<30	170
06–03–94	140	57	31	--	340	60	160	<30	<30
08–03–94	140	50	32	930	310	160	130	50	<30
09–27–94	140	53	32	720	360	200	170	40	<30
11–30–94	140	51	30	990	490	250	200	<30	<30
01–25–95	140	49	32	1,800	1,100	410	410	80	50
03–23–95	140	50	31	2,300	820	460	440	70	40
06–05–95	140	44	34	--	1,280	--	648	--	<30
08–10–95	140	45	33	--	1,650	--	712	--	<30
09–27–95	140	51	33	--	1,400	--	640	--	<30
11–29–95	140	49	30	--	1,600	--	630	--	<30
02–06–96	140	46	30	--	1,700	--	550	--	50
03–26–96	140	46	30	--	1,600	--	600	--	70
05–30–96	10	44	66	--	--	--	570	--	90
05–30–96	140	--	30	--	1,100	--	600	--	80
07–26–96	10	43	65	--	1,070	--	570	--	90
09–27–96	10	44	67	--	1,490	--	570	--	120

09498380 Pinal Creek at Setka Ranch near Globe, Arizona—Continued

Laboratory Measurements—Continued

Date	Laboratory	Iron, total (µg/L as Fe)	Iron, dissolved (µg/L as Fe)	Manganese, total (µg/L as Mn)	Manganese, dissolved (µg/L as Mn)	Nickel, total (µg/L as Ni)	Nickel, dissolved (µg/L as Ni)	Strontium, dissolved (µg/L as Sr)	Zinc, total (µg/L as Zn)	Zinc, dissolved (µg/L as Zn)
10-04-93	140	130	<130	--	62,500	490	490	1,700	100	90
12-02-93	140	250	<130	57,000	57,500	500	500	1,700	100	100
02-01-94	140	--	<130	--	59,400	--	560	1,600	--	200
04-06-94	140	120	<130	63,000	60,400	550	540	1,500	200	200
06-03-94	140	<130	<130	--	65,300	--	590	1,700	--	200
08-03-94	140	640	<130	73,000	69,400	570	570	1,700	100	100
09-27-94	140	210	<130	69,000	67,900	650	570	1,500	100	100
11-30-94	140	230	<130	67,000	66,800	640	580	1,500	200	100
01-25-95	140	700	<130	72,000	75,100	750	790	1,600	500	500
03-23-95	140	1,300	<130	68,000	66,400	730	710	1,500	600	600
06-05-95	140	--	<130	--	72,400	--	843	1,470	--	866
08-10-95	140	--	<130	--	67,900	--	795	1,300	--	1,020
09-27-95	140	--	<130	--	63,000	--	710	1,300	--	1,000
11-29-95	140	--	<130	--	60,800	--	700	1,300	--	1,000
02-06-96	140	--	<130	--	63,000	--	770	1,300	--	980
03-26-96	140	--	<130	--	64,400	--	780	1,300	--	1,100
05-30-96	10	--	53	--	58,000	--	750	1,300	--	1,100
05-30-96	140	--	<130	--	60,700	--	730	1,200	--	1,100
07-26-96	10	--	46	--	59,000	--	760	1,300	--	1,100
09-27-96	10	--	67	--	61,000	--	770	1,200	--	1,200

Date	Laboratory	Fluoride, dissolved (mg/L as F)	Barium, dissolved (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Boron, dissolved (µg/L as B)	Cadmium, dissolved (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)	Molybdenum, dissolved (µg/L as Mo)	Silver, dissolved (µg/L as Ag)	Vanadium, dissolved (µg/L as V)
02-06-96	10	5.5	--	--	--	--	--	--	--	--	--	--
03-26-96	10	5.4	--	--	--	--	--	--	--	--	--	--
05-30-96	10	4.8	26	5.4	--	11	21	40	190	30	8.0	<18
07-26-96	10	5.2	26	4.9	77	7.0	30	<30	180	<30	8.0	<18
09-27-96	10	5.6	25	5.2	70	12	<15	50	180	<30	7.0	<18

09498400 Pinal Creek at Inspiration Dam near Globe, Arizona

LOCATION.—Lat 33°34'23", long 110°54'02", in NE1/4NW1/4SE1/4, sec. 26, T. 3 N., R. 14 E., in Tonto National Forest, on right bank 2.1 m upstream from Inspiration Dam, 6.2 km upstream from mouth, and 22 km northwest of Globe.

DRAINAGE AREA.—504 km^2, including approximately 85 km^2 that is partly or entirely noncontributing due to mine pits and dumps.

Water Discharge Records

PERIOD OF RECORD.—July 1980 to current year.

GAGE.—Water-stage recorder in stilling well. Elevation of gage is 835 m above National Geodetic Vertical Datum of 1929, from topographic map. In February 1991 a steel-plate weir with "V" notch was added to the concrete dam lip, 2.1 m below the stilling well. The "V" notch is 2.1 m from the right bank.

AVERAGE DISCHARGE.—16 years (water years 1981–96), 0.42 m^3/s (13,000,000 m^3/yr).

REMARKS.— Records rated as fair for water years 1994, 1995, and 1996.

Monthly and yearly mean discharge, in cubic meters per second

Water year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	The year
1992*	0.12	0.19	0.17	0.19	0.38	0.35	0.20	0.23	0.16	0.15	0.22	0.19	0.21
1993*	.17	.17	.30	12.46	11.50	1.90	.85	.56	.46	.28	.30	.29	2.38
1994	.28	.31	.28	.28	.33	.29	.26	.24	.22	.20	.20	.22	.26
1995	.24	.24	.25	.68	.36	.44	.31	.29	.21	.19	.20	.21	.30
1996	.19	.21	.22	.21	.22	.23	.22	.19	.17	.16	.15	.15	.19

*Water Years 1992 and 1993 are corrected values from Gellenbeck (1994).

Monthly and yearly discharge, in thousands of cubic meters

Water year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	The year
1992*	328	484	468	508	958	933	531	610	429	406	605	487	6,752
1993*	461	434	812	33,400	27,800	5,105	2,210	1,487	1,189	758	796	749	75,200
1994	752	815	758	758	808	781	688	649	570	546	539	581	8,250
1995	630	616	682	1,835	877	1,168	807	774	557	504	535	537	9,514
1996	534	552	582	575	554	607	570	514	449	417	393	393	6,139

*Water Years 1992 and 1993 are corrected values from Gellenbeck (1994).

09498400 Pinal Creek at Inspiration Dam near Globe, Arizona—Continued

PERIOD OF RECORD.—November 1989 to current year.

Field Measurements

[ft^3/s, cubic feet per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; mm, millimeters; mg/L, milligrams per liter; IT, incremental titration; NTU, nephelometric turbidity units; cols./100 mL, colonies per 100 milliliters; µm, micrometer; mf, membrane filter; K, based on nonideal colony count; --, no data]

Date	Time	Discharge, instantaneous (ft^3/s)	Specific conductance (µS/cm)	pH (standard units)	Temperature, air (°C)	Temperature, water (°C)	Barometric pressure (mm of mercury)	Oxygen, dissolved (mg/L)	Oxygen, dissolved (percent saturation)
10-04-93	1730	9.1	2,960	7.7	30.5	22.0	688	8.0	103
12-01-93	1640	10	3,000	7.6	10.0	15.5	693	8.4	94
02-01-94	1630	10	2,950	7.9	9.5	13.5	695	9.6	102
04-06-94	1500	9.8	2,910	7.9	24.0	22.5	688	7.9	103
06-03-94	1630	7.8	2,950	7.8	34.0	28.0	687	6.8	98
08-03-94	1210	6.4	2,950	7.8	29.0	30.5	688	6.3	94
09-28-94	1120	8.2	3,000	7.8	30.5	24.0	691	7.1	95
12-01-94	1035	8.4	2,790	7.7	8.0	12.0	693	9.7	100
01-26-95	1230	13	2,620	7.8	10.0	14.5	690	8.2	90
03-24-95	1200	13	2,900	7.8	11.0	16.0	687	7.8	89
06-06-95	1145	7.9	3,400	7.8	29.0	25.0	685	7.2	99
08-11-95	1505	6.4	2,800	8.0	33.5	33.0	690	6.5	101
09-29-95	1530	7.1	2,800	7.9	--	27.0	689	6.8	96
11-30-95	1040	8.5	2,700	7.7	15.0	14.0	700	9.2	99
02-07-96	1050	8.0	2,600	8.0	14.0	14.5	695	9.5	104
03-27-96	1132	7.4	2,600	7.8	20.0	18.0	691	8.7	102
05-31-96	1010	6.6	2,500	7.8	25.0	20.0	687	7.9	97
07-25-96	1015	5.9	2,500	7.8	34.0	25.0	691	7.3	99
09-26-96	1115	6.4	2,500	7.9	27.0	22.0	686	7.9	101

Date	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)	Turbidity (NTU)	E-Coli, water, whole, total, thermotol, urease, mf (cols./100 mL)	Coliform, fecal, 0.7 µm-mf (cols./100 mL)	Streptococci, fecal, 0.45 µm-mf (cols./100 mL)
10-04-93	98	120	--	--	--	--
12-01-93	94	114	0.60	--	100	61
02-01-94	97	119	.40	--	150	K15
04-06-94	99	121	.60	--	48	K16
06-03-94	77	94	.90	--	22	38
08-03-94	97	118	5.2	--	120	170
09-28-94	82	100	1.6	--	65	140
12-01-94	87	106	.50	K4	K4	K6
01-26-95	92	112	5.9	25	24	K23
03-24-95	88	108	3.7	94	110	50
06-06-95	71	86	1.2	--	--	--
08-11-95	58	71	4.6	K18	K16	700
09-29-95	60	73	23	K51	70	190
11-30-95	58	71	.40	--	K26	20
02-07-96	52	64	.40	--	2	--
03-27-96	51	63	.30	< 1	K3	K6
05-31-96	90	110	--	--	K3	K18
07-25-96	38	46	.50	--	K13	46
09-26-96	43	52	.40	--	K8	71

09498400 Pinal Creek at Inspiration Dam near Globe, Arizona—Continued

Laboratory Measurements

[Laboratory—10, USGS National Water-Quality Laboratory, Arvada, Colorado; 140, USGS research laboratory, Menlo Park, California; °C, degrees Celsius; mg/L, milligrams per liter; µg/L, micrograms per liter; sediment analyses are completed at the Iowa District Sediment Laboratory; --, no data; <, actual value is known to be less than value shown]

Date	Laboratory	Solids, residue at 180°C, dissolved (mg/L)	Solids, sum of constituents, dissolved (mg/L)	Residue, total at 105°C, suspended (mg/L)	Calcium, total (mg/L as Ca)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)
10-04-93	140	--	2,780	--	510	550	130	84
12-01-93	10	2,840	2,690	1	--	520	120	76
12-01-93	140	--	2,640	--	490	490	120	78
02-01-94	10	2,820	2,560	12	--	500	120	75
02-01-94	140	--	2,630	--	490	510	120	84
04-06-94	10	2,790	2,540	7	--	470	130	72
04-06-94	140	--	2,560	--	490	490	110	73
06-03-94	10	2,870	2,670	9	--	510	120	79
06-03-94	140	--	2,660	--	510	490	120	76
08-03-94	10	2,890	2,700	33	--	540	120	76
08-03-94	140	--	2,650	--	510	500	120	75
09-28-94	10	2,870	2,640	26	--	490	120	77
09-28-94	140	--	2,610	--	500	510	120	75
12-01-94	10	2,910	2,640	4	--	490	120	74
12-01-94	140	--	2,730	--	480	520	120	77
01-26-95	10	2,690	2,400	50	--	470	110	68
01-26-95	140	--	2,480	--	480	480	110	72
03-24-95	10	2,710	2,410	28	--	470	110	71
03-24-95	140	--	2,500	--	480	490	120	70
06-06-95	10	2,750	2,570	3	--	510	130	76
06-06-95	140	--	2,520	--	--	490	113	69
08-11-95	10	2,710	2,360	12	--	420	120	71
08-11-95	140	--	2,470	--	--	470	106	64
09-29-95	10	2,630	2,350	40	--	430	110	68
09-29-95	140	--	2,310	--	--	460	110	70
11-30-95	10	2,490	2,220	<1	--	420	97	62
11-30-95	140	--	2,160	--	--	440	110	70
02-07-96	10	2,460	2,210	<1	--	420	94	63
02-07-96	140	--	--	--	--	430	100	70
03-27-96	10	2,440	2,210	5	--	420	94	59
03-27-96	140	--	--	--	--	410	90	70
05-31-96	10	2,490	2,240	<1		420	97	62
05-31-96	140	--	--	--	--	390	90	63
07-25-96	10	2,390	2,170	4	--	410	90	58
09-26-96	10	2,380	--	--	--	410	95	63

09498400 Pinal Creek at Inspiration Dam near Globe, Arizona—Continued

Laboratory Measurements—Continued

Date	Laboratory	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Boron, total (µg/L as B)	Boron, dissolved (µg/L as B)	Copper, total (µg/L as Cu)	Copper, dissolved (µg/L as Cu)
10–04–93	140	5.0	1,800	72	--	--	--	<30	<30
12–01–93	10	4.9	1,800	63	1.1	--	70	14	10
12–01–93	140	4.2	1,700	67	--	--	--	<30	<30
02–01–94	10	4.1	1,700	62	1.3	--	70	13	8.0
02–01–94	140	4.8	1,700	65	--	--	--	<30	<30
04–06–94	10	4.2	1,700	63	1.3	--	70	11	8.0
04–06–94	140	5.6	1,700	64	--	--	--	<30	<30
06–03–94	10	4.6	1,800	63	1.4	--	70	9	5.0
06–03–94	140	4.5	1,800	63	--	--	--	<30	<30
08–03–94	10	5.1	1,800	59	1.3	--	80	85	5.0
08–03–94	140	5.2	1,800	61	--	--	--	80	<30
09–28–94	10	4.9	1,800	59	1.6	--	70	37	3.0
09–28–94	140	6.0	1,700	60	--	--	--	40	<30
12–01–94	10	4.4	1,800	58	1.5	70	--	11	7.0
12–01–94	140	6.1	1,800	59	--	--	--	<30	<30
01–26–95	10	4.2	1,600	58	1.8	70	--	49	6.0
01–26–95	140	5.5	1,600	56	--	--	--	60	<30
03–24–95	10	4.7	1,600	57	2.0	70	--	80	4.0
03–24–95	140	5.3	1,700	55	--	--	--	70	<30
06–06–95	10	5.0	1,700	52	2.3	70	--	16	10
06–06–95	140	6.4	1,700	50	--	--	--	--	<30
08–11–95	10	6.0	1,600	53	3.0	70	--	23	4.0
08–11–95	140	6.4	1,700	50	--	--	--	--	<30
09–29–95	10	5.0	1,600	50	3.0	80	--	80	4.0
09–29–95	140	6.3	1,500	44	--	--	--	--	<30
11–30–95	10	4.5	1,500	47	3.0	80	70	15	10
11–30–95	140	4.6	1,400	21	--	--	--	--	<30
02–07–96	10	4.7	1,500	49	3.0	70	60	17	12
02–07–96	140	6.8	1,500	50	3.2	--	--	--	<30
03–27–96	10	4.3	1,500	48	3.7	60	70	19	13
03–27–96	140	5.3	1,500	49	3.3	--	--	--	<30
05–31–96	10	4.5	1,500	47	3.1	80	70	15	10
05–31–96	140	6.4	--	--	--	--	--	--	<30
07–25–96	10	5.1	1,500	46	3.2	--	70	--	8.0
09–26–96	10	4.6	1,500	48	3.1	80	69	11	10

SURFACE WATER—Continued

09498400 Pinal Creek at Inspiration Dam near Globe, Arizona—Continued

Laboratory Measurements—Continued

Date	Laboratory	Iron, total (µg/L as Fe)	Iron, dissolved (µg/L as Fe)	Manganese, total (µg/L as Mn)	Manganese, dissolved (µg/L as Mn)	Nickel, total (µg/L as Ni)	Nickel, dissolved (µg/L as Ni)	Zinc, total (µg/L as Zn)	Zinc, dissolved (µg/L as Zn)
10–04–93	140	<130	<130	42,000	44,300	300	310	50	50
12–01–93	10	110	30	42,000	45,000	--	320	70	70
12–01–93	140	190	<130	42,000	42,900	310	310	80	70
02–01–94	10	80	30	38,000	38,000	--	480	90	80
02–01–94	140	130	<130	42,000	43,700	330	350	80	100
04–06–94	10	100	40	37,000	39,000	--	300	70	80
04–06–94	140	<130	<130	37,000	36,000	280	290	70	60
06–03–94	10	90	40	45,000	44,000	--	300	80	80
06–03–94	140	<130	<130	69,000	39,400	610	320	200	50
08–03–94	10	2,100	<10	35,000	36,000	--	210	40	20
08–03–94	140	1,800	<130	35,000	33,300	210	200	40	<20
09–28–94	10	960	20	36,000	35,000	--	300	40	20
09–28–94	140	980	<130	39,000	39,400	300	320	50	20
12–01–94	10	70	80	49,000	43,000	400	390	80	80
12–01–94	140	<130	<130	45,000	39,200	370	280	80	30
01–26–95	10	2,800	20	33,000	34,000	400	310	160	120
01–26–95	140	1,600	<130	32,000	31,600	300	310	200	100
03–24–95	10	3,300	<10	38,000	39,000	400	370	200	160
03–24–95	140	3,000	<130	36,000	33,800	350	340	200	200
06–06–95	10	90	20	52,000	49,000	500	490	290	260
06–06–95	140	--	<130	--	50,200	--	449	--	316
08–11–95	10	490	30	58,000	56,000	500	480	150	110
08–11–95	140	--	<130	--	56,400	--	456	--	112
09–29–95	10	2,900	38	50,000	52,000	500	480	230	120
09–29–95	140	--	<130	--	54,300	--	440	--	170
11–30–95	10	70	17	53,000	51,000	500	510	340	340
11–30–95	140	--	<130	--	51,200	--	490	--	370
02–07–96	10	40	<9.0	51,000	48,000	600	440	350	340
02–07–96	140	--	<130	--	50,200	--	500	--	360
03–27–96	10	50	22	47,000	45,000	500	410	340	330
03–27–96	140	--	<130	--	45,000	--	460	--	320
05–31–96	10	70	17	53,000	51,000	500	510	340	340
05–31–96	140	--	<130	--	45,500	--	490	--	350
07–25–96	10	--	<9.0	--	39,000	--	480	--	270
09–26–96	10	<10	<9.0	42,000	42,000	<100	480	330	310

SURFACE WATER—Continued

09498400 Pinal Creek at Inspiration Dam near Globe, Arizona—Continued

Laboratory Measurements—Continued

Date	Laboratory	Oxygen demand, chemical (high level) (mg/L)	Arsenic, total (µg/L as As)	Arsenic, dissolved (µg/L as As)	Antimony, total (µg/L as Sb)	Antimony, dissolved (µg/L as Sb)	Barium, dissolved (µg/L as Ba)	Beryllium, total (µg/L as Be)	Beryllium, dissolved (µg/L as Be)
10-04-93	10	--	--	--	--	--	--	--	--
12-01-93	10	87	1	<1	--	--	<100	--	--
02-01-94	10	92	<1	<1	--	--	<100	--	--
04-06-94	10	14	<1	<1	--	--	<100	--	--
06-03-94	10	87	<1	<1	--	--	<100	--	--
08-03-94	10	85	2	<1	--	--	<100	--	--
09-28-94	10	72	1	<1	--	--	<100	--	--
12-01-94	10	83	<1	<1	<1	--	<100	<10	--
01-26-95	10	56	1	<1	<1	--	<100	<10	--
03-24-95	10	60	1	<1	<1	--	100	<10	--
06-06-95	10	88	<1	<1	<1	--	<100	<10	--
08-11-95	10	91	<10	<1	<1	--	<100	<10	--
09-29-95	10	94	2	1	<1	--	27	<10	--
11-30-95	10	83	<1	<1	<1	<1.0	21	<10	<10
02-07-96	10	93	<1	<1	<1	<1.0	20	<10	<10
03-27-96	10	81	<1	<1	<1	<1.0	17	<10	<10
05-31-96	10	--	<1	<1	<1	<1.0	21	<10	<10
07-25-96	10	69	<1	<1	<1	<1.0	14	--	1.5
09-26-96	10	67	<1	<1	<1	<1.0	16	<10	2.0

Date	Laboratory	Cadmium, total (µg/L as Cd)	Cadmium, dissolved (µg/L as Cd)	Chromium, total (µg/L as Cr)	Chromium, dissolved (µg/L as Cr)	Lead, total (µg/L as Pb)	Lead, dissolved (µg/L as Pb)	Lithium, dissolved (µg/L as Li)
12-01-93	10	5	4.0	<1	1.0	<1	<1.0	170
02-01-94	10	4	4.0	<1	1.2	<1	<1.0	180
04-06-94	10	3	2.0	1	<1.0	<1	<1.0	160
06-03-94	10	3	3.0	<1	<1.0	<1	<1.0	180
08-03-94	10	2	2.0	12	<1.0	<1	<1.0	160
09-28-94	10	2	2.0	2	<1.0	1	<1.0	160
12-01-94	10	4	3.0	<1	<1.0	<1	<1.0	170
01-26-95	10	4	4.0	3	1.2	2	<1.0	170
03-24-95	10	5	5.0	3	<1.0	16	<1.0	150
06-06-95	10	6	7.0	<1	<1.0	<1	<1.0	200
08-11-95	10	7	7.0	<2	1.1	<1	<1.0	220
09-29-95	10	7	6.0	2	<1.0	1	<1.0	210
11-30-95	10	7	7.0	<1	<1.0	<1	<1.0	210
02-07-96	10	6	7.0	<1	<1.0	<1	<1.0	190
03-27-96	10	7	7.0	<1	<1.0	<1	<1.0	160
05-31-96	10	7	7.0	<1	<1.0	<1	<1.0	210
07-25-96	10	--	6.0	--	<1.0	--	<1.0	160
09-26-96	10	6	6.0	<1	<1.0	<1	<1.0	170

09498400 Pinal Creek at Inspiration Dam near Globe, Arizona—Continued

Laboratory Measurements

Date	Laboratory	Mercury, total (µg/L as Hg)	Mercury, dissolved (µg/L as Hg)	Molybdenum, dissolved (µg/L as Mo)	Selenium, total (µg/L as Se)	Selenium, dissolved (µg/L as Se)	Silver, dissolved (µg/L as Ag)
12–01–93	10	<0.10	--	<1.0	<1	<1	<1.0
02–01–94	10	<.10	--	2.0	<1	<1	<1.0
04–06–94	10	<.10	--	2.0	<1	<1	<1.0
06–03–94	10	<.10	--	1.0	<1	<1	<1.0
08–03–94	10	<.10	--	5.0	<1	<1	<1.0
09–28–94	10	<.10	--	3.0	<1	<1	<1.0
12–01–94	10	<.10	<.1	2.2	<1	<1	<1.0
01–26–95	10	<.10	<.1	2.3	<1	<1	<1.0
03–24–95	10	<.10	<.1	<1.0	<1	<1	<1.0
06–06–95	10	<.10	<.1	1.5	<1	<1	<1.0
08–11–95	10	<.10	<.1	2.5	<2	<1	<1.0
09–29–95	10	<.10	<.1	2.4	<1	<1	<1.0
11–30–95	10	<.10	.1	1.8	<1	<1	<1.0
02–07–96	10	<.10	<.1	1.1	<1	<1	<1.0
03–27–96	10	<.10	<.1	<1.0	<1	<1	<1.0
05–31–96	10	<.10	<.1	1.8	<1	<1	<1.0
07–25–96	10	<.10	<.1	2.0	<1	<1	<1.0
09–26–96	10	<.10	<.1	1.3	<1	<1	<1.0

Date	Laboratory	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)	Nitrogen, ammonia and organic, total (mg/L as N)	Nitrogen, NO_2 and NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus, ortho total (mg/L as P)	Sediment, suspended (mg/L)
12–01–93	10	0.050	<0.010	<0.20	0.240	0.080	0.050	440
02–01–94	10	.050	<.010	.28	.070	.100	.030	74
04–06–94	10	.060	<.010	<.20	.020	.040	.030	7
06–03–94	10	.090	<.010	.22	<.020	.040	.030	14
08–03–94	10	.040	<.010	<.20	.030	.100	.020	58
09–28–94	10	.040	<.010	<.20	.030	.060	.030	35
12–01–94	10	<.040	--	<.20	<.020	.020	--	1
01–26–95	10	.040	--	<.20	.020	.110	--	767
03–24–95	10	.040	--	<.20	.060	.140	--	158
06–06–95	10	.030	--	<.20	<.020	.020	--	7
08–11–95	10	.050	--	.22	.020	.030	--	22
09–29–95	10	.050	--	.20	.030	.090	--	--
11–30–95	10	.060	--	<.20	<.020	.030	--	--
02–07–96	10	.070	--	<.20	<.020	<.020	--	--
03–27–96	10	.060	--	<.20	<.020	.040	--	2
05–31–96	10	.040	--	.22	<.020	<.020	--	--
07–25–96	10	.030	--	.25	<.020	.030	--	--
09–26–96	10	.020	--	<.20	<.020	.030	--	--

SURFACE WATER—Continued

09498400 Pinal Creek at Inspiration Dam near Globe, Arizona—Continued

Laboratory Measurements—Continued

Date	Laboratory	Aluminum, total (µg/L as Al)	Aluminum, dissolved (µg/L as Al)	Cobalt, total (µg/L as Co)	Cobalt, dissolved (µg/L as Co)	Silica, dissolved (mg/L as SiO_2)	Strontium, dissolved (µg/L as Sr)
10–04–93	140	<110	<110	60	30	27	1,900
12–01–93	140	260	180	70	81	27	1,800
02–01–94	140	<110	130	70	70	28	1,800
04–06–94	140	240	120	90	70	26	1,700
06–03–94	140	580	<110	180	30	28	1,700
08–03–94	140	1,500	<110	80	<80	28	1,700
09–28–94	140	1,000	<110	50	<20	29	1,800
12–01–94	140	<110	<110	120	60	28	1,700
01–26–95	140	1,400	<100	130	100	25	1,700
03–24–95	140	2,400	<110	150	140	26	1,700
06–06–95	140	--	259	--	323	30	1,600
08–11–95	140	--	<110	--	285	30	1,500
09–29–95	140	--	<110	--	200	31	1,600
11–30–95	140	--	370	--	270	30	1,500
02–07–96	140	--	360	--	270	30	1,500
03–27–96	140	--	350	--	220	30	1,400
05–31–96	140	--	250	--	210	30	1,400

SURFACE WATER—Continued

333706110545800 Pinal Creek at Mouth near Globe, Arizona

LOCATION.—Lat 33°37'06", long 110°54'58", in NW1/4SW1/4NW1/4, sec. 10, T. 3 N., R. 14 E., in Tonto National Forest, 6.2 km downstream from Inspiration Dam, and 28 km northwest of Globe.

DRAINAGE AREA.—516 km^2, including approximately 85 km^2 that is partly or entirely noncontributing due to mine pits and dumps.

CHANNEL ELEVATION.—658 m above National Geodetic Vertical Datum of 1929, from topographic map.

Field Measurements

[ft^3/s, cubic feet per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; mg/L, milligrams per liter; IT, incremental titration]

Date	Time	Discharge, instantaneous (ft^3/s)	Specific conductance (µS/cm)	pH (standard units)	Temperature, air (°C)	Temperature, water (°C)	Barometric pressure (mm of mercury)	Oxygen, dissolved (mg/L)	Alkalinity, water, dissolved, IT field (mg/L as $CaCO_3$)	Bicarbonate, water, dissolved, IT field (mg/L as HCO_3)
10–05–93	1240	10	2,950	8.3	30.0	24.0	703	8.0	93	113

Laboratory Measurements

[Laboratory—140, USGS research laboratory, Menlo Park, California; mg/L, milligrams per liter; µg/L, micrograms per liter; <, actual value is known to be less than value shown]

Date	Laboratory	Calcium, total (mg/L as Ca)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)
10–05–93	140	500	560	140	89	5.2	1,700	71

Date	Aluminum, total (µg/L as Al)	Aluminum, dissolved (µg/L as Al)	Cobalt, total (µg/L as Co)	Cobalt, dissolved (µg/L as Co)	Copper, total (µg/L as Cu)	Copper, dissolved (µg/L as Cu)	Iron, total (µg/L as Fe)	Iron, dissolved (µg/L as Fe)
10–05–93	240	120	100	20	<30	<30	150	<130

Date	Manganese, total (µg/L as Mn)	Manganese, dissolved (µg/L as Mn)	Nickel, total (mg/L as Ni)	Nickel, dissolved (mg/L as Ni)	Silica, dissolved (mg/L as SiO_2)	Strontium, dissolved (µg/L as Sr)	Zinc, total (µg/L as Zn)	Zinc, dissolved (µg/L as Zn)
10–05–93	38,000	42,000	250	280	28	1.7	90	30

PRECIPITATION

Globe Ranger Station

LOCATION.—Lat 33°22'40", long 110°46'11", in NE1/4NW1/4NW1/4, sec. 1, T. 1 S., R. 15 E., at U.S. Forest Service ranger station 2.4 km southeast of Globe post office.

ELEVATION.—1,097 m above National Geodetic Vertical Datum of 1929, from topographic map.

PERIOD OF RECORD.—March 1981 to current year. Between January 1907 and February 1981, precipitation near Globe was recorded at 10 locations ranging from 0.8 km north to 3.9 km northwest of the present site at elevations between 1,049 and 1,131 m. The longest periods at a single site were from January 1907 to September 1925 at elevation 1,090 m and from May 1953 to June 1975 at elevation 1,080 m.

Precipitation, in millimeters

[M, insufficient or partial data (1–9 daily values missing); N/A, data not available]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly total
1993	M219	153	35	0	14	0	11	50	9	46	86	9	M632
1994	5	56	27	14	21	9	61	97	51	66	49	84	540
1995	84	31	50	12	6	0	1	59	68	0	27	0	338
1996	4	88	19	0	0	5	59	25	62	N/A	N/A	N/A	N/A

Monthly precipitation statistics, in millimeters, 1907–95 (all gage sites)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean	43	38	38	14	10	9	64	71	35	30	27	47
Maximum	219	155	121	72	70	49	172	206	136	156	121	218
Minimum	0	0	0	0	0	0	7	8	0	0	0	0
Number of observations	89	89	89	89	89	88	88	88	88	88	88	87

Annual precipitation statistics, in millimeters, 1907–95 (all gage sites)

Mean	426
Maximum	712
Minimum	203
Number of observations	86

PRECIPITATION—Continued

Miami

LOCATION.—Lat 33°24'15", long 110°52'09", in SE1/4NE1/4NW1/4, sec. 30, T. 1 N., R. 15 E., at Miami East plant site of BHP, 0.5 km northwest of Miami post office.

ELEVATION.—1,084 m above National Geodetic Vertical Datum of 1929, from topographic map.

PERIOD OF RECORD.—February 1914 to current year.

Precipitation, in millimeters

[N/A, data not available]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly total
1994	4	80	30	17	11	2	71	87	51	59	40	76	528
1995	111	38	64	9	6	0	5	62	50	0	21	6	373
1996	0	85	11	0	0	9	70	22	N/A	N/A	N/A	N/A	N/A

Monthly precipitation statistics, in millimeters, 1914–95

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean	56	46	48	19	11	9	63	79	39	33	35	61
Maximum	261	206	173	100	64	91	219	213	179	193	181	293
Minimum	0	0	0	0	0	0	9	8	0	0	0	0
Number of observations	81	82	82	82	82	82	82	82	82	82	82	82

Annual precipitation statistics, in millimeters, 1914–95

Mean	497
Maximum	715
Minimum	167
Number of observations	81