DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
ARIZONA DEPARTMENT OF WATER RESOURCES

WATER-RESOURCES INVESTIGATIONS
OPEN-FILE REPORT 81-804
SHEET 1 OF 2

DEPTH TO WATER, ALTITUDE OF THE WATER LEVEL, AND WELL DEPTH

INTRODUCTION

The Agua Fria area includes about 1,500 mi^2 in central Arizona. The area is bounded by the Prescott National Forest on the west, north, and east; by the Tonto National Forest on the southeast; and by the Bradshaw Mountains and Lake Pleasant on the southwest. Ground-water development has been slight, and in 1978 about 3,200 acre-ft of ground water was withdrawn; of this, about 2,200 acre-ft was used for irrigation, 600 acre-ft for public supply, and 400 acre-ft for domestic and stock supplies. Public-supply use has increased about 20 percent since 1975, although the number of users has increased nearly 30 percent (data in files of Arizona Corporation Commission, Phoenix, Ariz.). Many small-capacity wells have been drilled in the area, and only selected wells are shown on the maps in areas of high well density.

The hydrologic data on which these maps are based are available, for the most part, in computer-printout form and may be consulted at the Arizona Department of Water Resources, 99 East Virginia, Phoenix, and at U.S. Geological Survey offices in: Federal Building, 301 West Congress Street, Tucson, and Valley Center, Suite 1880, Phoenix. Material from which copies can be made at private expense is available at the Tucson and Phoenix offices of the U.S. Geological Survey.

ROCK UNITS AND THEIR WATER-BEARING PROPERTIES

In the Agua Fria area the water-bearing characteristics of the units that make up the aquifers differ greatly because of large differences in rock type and extent of fracturing. In order of decreasing yield potential the major water-bearing units are the unconsolidated deposits, conglomerate, volcanic clastic deposits, and lake deposits. Minor water-bearing units consist of basaltic to rhyolitic volcanic rocks; and schist, gneiss, and granite.

Unconsolidated Deposits

Poorly sorted volcanic and granitic gravel, sand, and silt form intermittent terraces and are present in and along the Agua Fria River and its major tributaries. Well yields generally range from 10 to 600 gal/min; the wide range in well yields is caused more by differences in pump capacity and type than by the characteristics of the aquifer.

In the Lonesome Valley area, the deposits are present as a veneer on pediment surfaces and in terraces that grade into basin fill. Although the unit is of varied thickness, drillers' logs indicate a thickness of about 1,000 ft near Dewey and Humboldt. The deposits contain large amounts of sand and clay, and well yields generally range from 1 to 50 gal/min.

In the Black Canyon City area, the unconsolidated deposits are hydraulically separated from the underlying water-bearing schist by confining layers of clay and silica-rich caliche. According to available data, the unit is about 200 ft thick in the terraced parts of T. 8 N., R. 2 E., south of the Agua Fria River and is thinner elsewhere in the area. Well yields generally are 10 to 100 gal/min.

The deposits are present in places north of Lake Pleasant between French Creek and the Agua Fria River. Well logs and exploration-hole data (data in files of U.S. Water and Power Resources Service, Phoenix, Ariz.; R. C. Hanna, landowner, written commun., 1979) indicate that the deposits may be as much as several tens of feet thick but generally are drained of water.

Conglomerate

Boulder to pebble conglomerate occurs from Bumble Bee northward to the Orme Ranch and Lonesome Valley areas and is considered the main water-bearing unit on the basis of areal extent. East of Orme Ranch, the conglomerate may underlie and be hydraulically connected with exposed volcanic rocks. In this area the water-level contours may apply to water in both units. Generally, well yields range from 10 to 50 gal/min; however, yields of more than 200 gal/min were reported for several wells that penetrate the conglomerate in the Lonesome Valley area.

Volcanic Clastic Deposits

Water-laid volcanic clastic deposits consist of clasts of basalt, rhyolite, andesite, latite, tuff, schist, granite, and pegmatite in a tuffaceous to sandy matrix and are present between Lake Pleasant and the Bradshaw Mountains. The deposits, which may be as much as 600 ft thick in places (Ward, 1977), unconformably overlie andesitic and basaltic rocks along the lower reaches of Castle and French Creeks and thick lake deposits between the lower reaches of Humbug Creek and the Agua Fria River.

Lake Deposits

Lake deposits consist of interbedded limestone, clay, siltstone, mudstone, and volcanic-rich marl and are present to depths of at least 1,000 ft east of Solo Springs (R. C. Hanna, landowner, written commun., 1979). Yields from neither this unit nor the overlying volcanic clastic deposits can be substantiated owing to the lack of wells. According to exploration-hole data (R. C. Hanna, landowner, written commun., 1979), however, the lake deposits probably have a lower water-yielding potential than the more permeable volcanic clastic deposits.

Basaltic to Rhyolitic Volcanic Rocks

Basaltic to rhyolitic volcanic rocks crop out in about 25 percent of the Agua Fria area and, in places, include tuff and agglomerate (Wilson and others, 1957; Arizona Bureau of Mines, 1958). Most of the wells that penetrate these rocks are equipped with windmills and furnish water for livestock. East and south of Orme Ranch, well yields range from 5 to 35 gal/min, as indicated by bailing tests. In sec. 4, T. 7 N., R. 1 W., a domestic well near Castle Creek yields about 11 gal/min from latite (Ward, 1977); during periods of high flow, some water may enter the well from the gravel, which is in hydraulic connection with the creek.

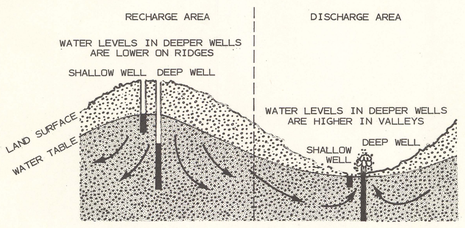
Schist, Gneiss, and Granite

Schist, gneiss, and granite crop out mainly in the western part of the Agua Fria area and east of Black Canyon City in the New River Mountains. The water-bearing capacity of these rocks depends primarily on the degree of fracturing. Well yields generally range from 1 to 25 gal/min. Ground water occurs under confined conditions along most of the north, east, and south flanks of the Bradshaw Mountains, where extensive folding and faulting restrict ground-water movement. In Black Canyon City impermeable beds of clay and silica-rich caliche aid in confining the ground water, and yields generally are from 10 to 20 gal/min from wells that penetrate the schist.

GROUND-WATER MOVEMENT AND DEPTH TO WATER

In most of the Agua Fria area, ground water generally moves southward in the direction of the surface-water drainage. In Lonesome Valley, however, the ground-water divide probably is southeast of the topographic divide, and some ground water may move northward. Recharge to the aquifer occurs primarily from direct infiltration of rain, snowmelt, and streamflow.

In the Agua Fria area the depth to water ranges from 400 ft below the land surface to a few feet above the land surface. The schematic sketch given below shows the distribution of water levels in wells in a valley-and-mountain setting like that in the Agua Fria area.



ARROWS SHOW GENERALIZED DIRECTION OF GROUND-WATER FLOW

Note that deep wells in the recharge areas tend to have greater depths to water than deep wells in the discharge areas; the deep wells in the discharge areas may flow at the land surface. The sketch is generally representative of conditions in the Agua Fria area; local deviations will occur owing to differences in aquifer material and the effects of geologic structure.

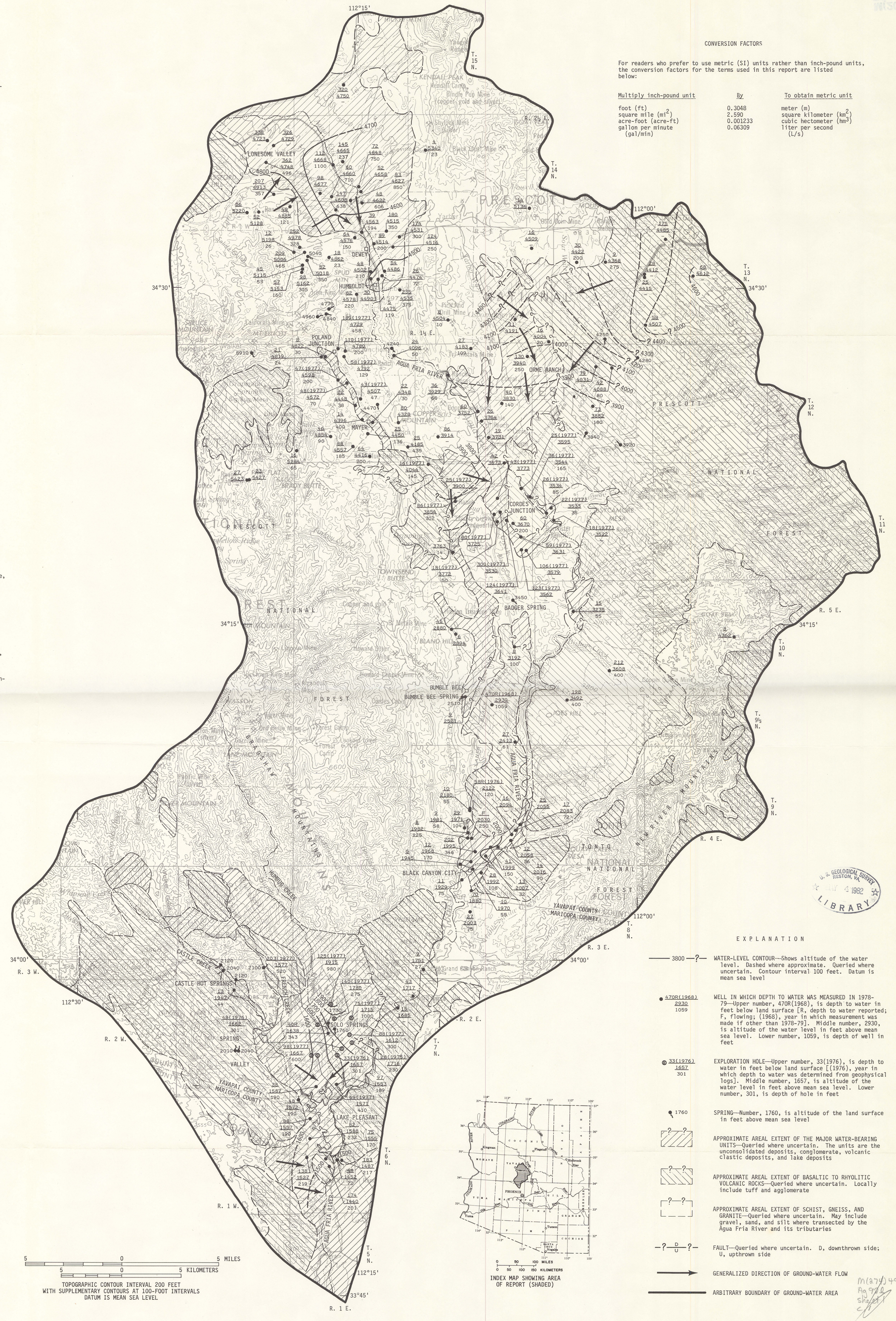
SPRINGS

Springs in the Agua Fria area issue mainly from crystalline rocks, but Solo Springs near Lake Pleasant issue from tuffaceous sandstone. Most springs that flow from the volcanic rocks are seasonal, and most springs that flow from the schist and granite are perennial. The perennial springs that issue from the schist near Poland Junction generally discharge from 1 to 5 gal/min; those from the granite discharge about 1 gal/min in Spring Valley near Lake Pleasant to more than 200 gal/min at Castle Hot Springs. According to local residents, the discharge of the hot springs has not changed perceptibly during the past several years. The thermal properties of the springs were evaluated by R. L. Satkin (1981).

CONVERSION FACTORS

For readers who prefer to use metric (SI) units rather than inch-pound units, the conversion factors for the terms used in this report are listed below:

Multiply inch-pound unit	By	To obtain metric unit
foot (ft)	0.3048	meter (m)
square mile (mi^2)	2.590	square kilometer (km^2)
acre-foot (acre-ft)	0.001233	cubic hectometer (hm^3)
gallon per minute (gal/min)	0.06309	liter per second (L/s)



5 0 5 MILES
5 0 5 KILOMETERS

TOPOGRAPHIC CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
DATUM IS MEAN SEA LEVEL

INDEX MAP SHOWING AREA OF REPORT (SHADED)

EXPLANATION

- 3800 —?— WATER-LEVEL CONTOUR—Shows altitude of the water level. Dashed where approximate. Queried where uncertain. Contour interval 100 feet. Datum is mean sea level
- ● 470R(1968) / 2930 / 1059 — WELL IN WHICH DEPTH TO WATER WAS MEASURED IN 1978-79—Upper number, 470R(1968), is depth to water in feet below land surface [R, depth to water reported; F, flowing; (1968), year in which measurement was made if other than 1978-79]. Middle number, 2930, is altitude of the water level in feet above mean sea level. Lower number, 1059, is depth of well in feet
- ◍ 33(1976) / 1657 / 301 — EXPLORATION HOLE—Upper number, 33(1976), is depth to water in feet below land surface [(1976), year in which depth to water was determined from geophysical logs]. Middle number, 1657, is altitude of the water level in feet above mean sea level. Lower number, 301, is depth of hole in feet
- 1760 — SPRING—Number, 1760, is altitude of the land surface in feet above mean sea level
- APPROXIMATE AREAL EXTENT OF THE MAJOR WATER-BEARING UNITS—Queried where uncertain. The units are the unconsolidated deposits, conglomerate, volcanic clastic deposits, and lake deposits
- APPROXIMATE AREAL EXTENT OF BASALTIC TO RHYOLITIC VOLCANIC ROCKS—Queried where uncertain. Locally include tuff and agglomerate
- APPROXIMATE AREAL EXTENT OF SCHIST, GNEISS, AND GRANITE—Queried where uncertain. May include gravel, sand, and silt where transected by the Agua Fria River and its tributaries
- —?—D/U—?— FAULT—Queried where uncertain. D, downthrown side; U, upthrown side
- GENERALIZED DIRECTION OF GROUND-WATER FLOW
- ARBITRARY BOUNDARY OF GROUND-WATER AREA

BASE FROM U.S. GEOLOGICAL SURVEY
HOLBROOK 1:250,000, 1954,
PHOENIX 1:250,000, 1954, AND
PRESCOTT 1:250,000, 1954

DEPTH TO WATER, ALTITUDE OF THE WATER LEVEL, AND WELL DEPTH

MAPS SHOWING GROUND-WATER CONDITIONS IN THE AGUA FRIA AREA, YAVAPAI AND MARICOPA COUNTIES, ARIZONA—1979

BY
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