DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
ARIZONA DEPARTMENT OF WATER RESOURCES

WATER-RESOURCES INVESTIGATIONS
OPEN-FILE REPORT 82-87
SHEET 1 OF 2
DEPTH TO WATER, ALTITUDE OF THE
WATER LEVEL, AND WELL DEPTH

INTRODUCTION

The Bill Williams area includes about 3,200 mi^2 in Mohave, Yavapai, and Yuma Counties in west-central Arizona. The west half of the area is in the Basin and Range lowlands water province, and the east half is in the Central highlands water province (see index map). The Basin and Range lowlands province generally is characterized by high mountains separated by broad valleys filled with deposits that commonly store large amounts of ground water. The Central highlands province consists mostly of rugged mountain masses made up of igneous, metamorphic, and well-consolidated sedimentary rocks that contain little space for the storage of ground water except where highly fractured or faulted. A few small valleys between the mountains contain varying thicknesses of water-bearing deposits. The area is drained by the Bill Williams River and its major tributaries—the Big Sandy River and the Santa Maria River. Many reaches of the Big Sandy and Santa Maria Rivers and their major tributaries are perennial; the flow is sustained by ground-water discharge (Brown and others, 1978, sheet 2).

In the Bill Williams area most of the water used is from ground water, although a small amount of surface water also may be diverted. About 18,000 acre-ft of ground water was withdrawn in 1979 (U.S. Geological Survey, 1981). About 17,000 acre-ft was used for the irrigation of 5,200 acres, and the rest was used for domestic, stock, and public supplies. Most of the irrigated land is in Skull Valley and along lower Kirkland Creek and the Bill Williams River.

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.

GEOHYDROLOGY

In the Bill Williams area ground water occurs in basin-fill deposits, terrace and channel deposits, volcanic rocks, and crystalline rocks. The main water-bearing unit is the basin-fill deposits, which consist of boulder to pebble conglomerate and interbedded coarse- to fine-grained sandstone, siltstone, mudstone, and in places rhyolitic and basaltic tuff. The basin-fill deposits are recharged mainly from the infiltration of streamflow and precipitation along the mountain fronts. In general, the ground water moves in the same direction as the streamflow. Northwest-trending high-angle normal faults generally separate the basin-fill deposits from the crystalline rocks of the steeply sloping mountains. The thickness of the basin-fill deposits, estimated from test-hole data, is 200 to more than 1,000 ft in Copper Basin in the Central highlands province and may be more than 5,000 ft in the Bullard Wash-Date Creek area in the Basin and Range lowlands province. Elsewhere in the Central highlands province, the deposits occupy shallow depressions and troughs of buried canyons where, in places, they are overlain by volcanic rocks. In the northwestern part of the province extensive basalt flows overlie the basin-fill deposits, which are 700 ft thick where exposed on the south wall of the canyon of Boulder Creek (Anderson and others, 1955, p. 25). The large-capacity wells in the basin fill are reported to yield 50 to 1,200 gal/min.

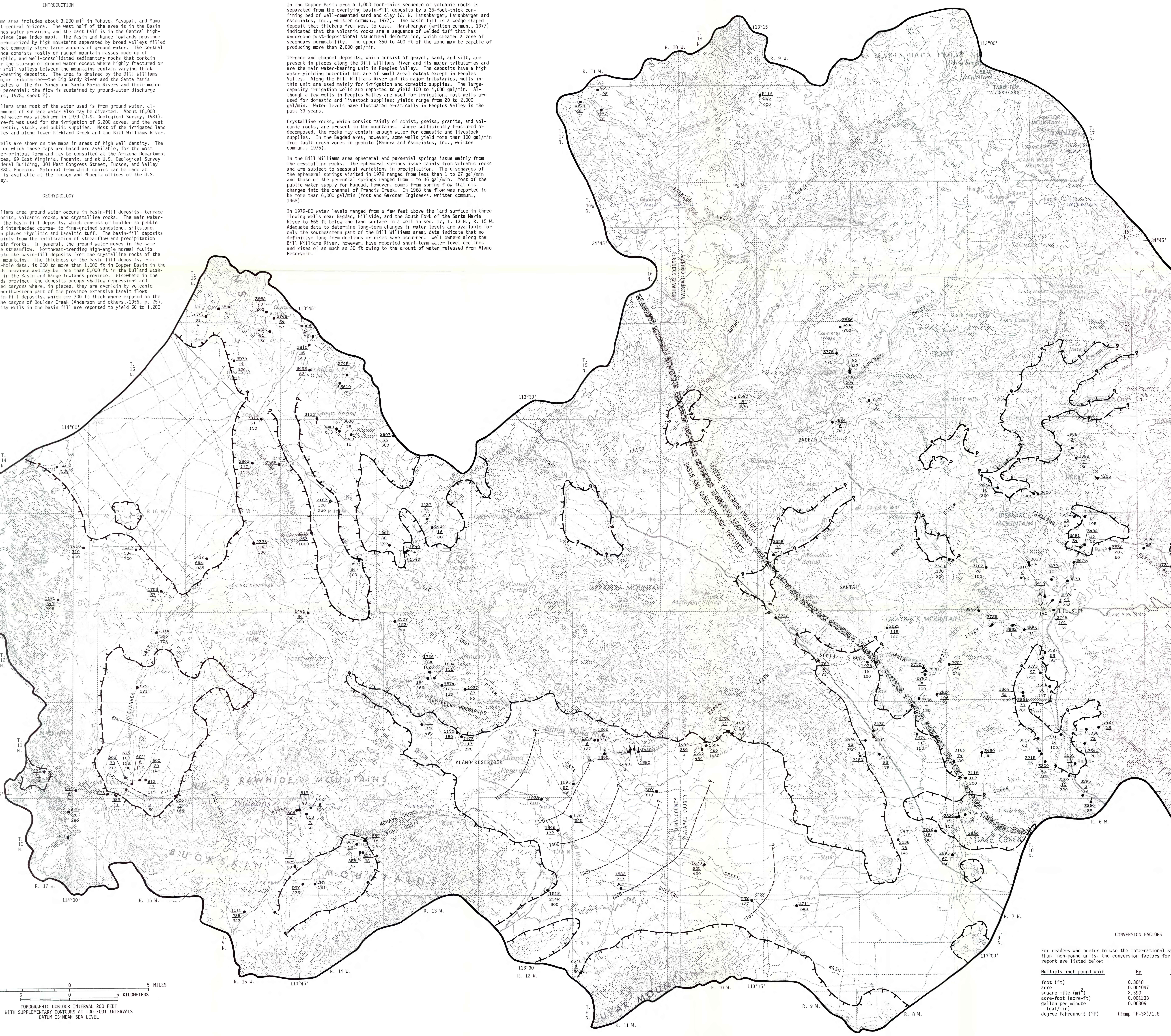
In the Copper Basin area a 1,000-foot-thick sequence of volcanic rocks is separated from the overlying basin-fill deposits by a 35-foot-thick confining bed of well-cemented sand and clay (J. W. Harshbarger, Harshbarger and Associates, Inc., written commun., 1977). The basin fill is a wedge-shaped deposit that thickens from west to east. Harshbarger (written commun., 1977) indicated that the volcanic rocks are a sequence of welded tuff that has undergone post-depositional structural deformation, which created a zone of secondary permeability. The upper 350 to 400 ft of the zone may be capable of producing more than 2,000 gal/min.

Terrace and channel deposits, which consist of gravel, sand, and silt, are present in places along the Bill Williams River and its major tributaries and are the main water-bearing unit in Peeples Valley. The deposits have a high water-yielding potential but are of small areal extent except in Peeples Valley. Along the Bill Williams River and its major tributaries, wells in this unit are used mainly for irrigation and domestic supplies. The large-capacity irrigation wells are reported to yield 100 to 4,000 gal/min. Although a few wells in Peeples Valley are used for irrigation, most wells are used for domestic and livestock supplies; yields range from 20 to 2,000 gal/min. Water levels have fluctuated erratically in Peeples Valley in the past 33 years.

Crystalline rocks, which consist mainly of schist, gneiss, granite, and volcanic rocks, are present in the mountains. Where sufficiently fractured or decomposed, the rocks may contain enough water for domestic and livestock supplies. In the Bagdad area, however, some wells yield more than 100 gal/min from fault-crush zones in granite (Manera and Associates, Inc., written commun., 1975).

In the Bill Williams area ephemeral and perennial springs issue mainly from the crystalline rocks. The ephemeral springs issue mainly from volcanic rocks and are subject to seasonal variations in precipitation. The discharges of the ephemeral springs visited in 1979 ranged from less than 1 to 27 gal/min and those of the perennial springs ranged from 1 to 36 gal/min. Most of the public water supply for Bagdad, however, comes from spring flow that discharges into the channel of Francis Creek. In 1968 the flow was reported to be more than 6,000 gal/min (Yost and Gardner Engineers, written commun., 1968).

In 1979-80 water levels ranged from a few feet above the land surface in three flowing wells near Bagdad, Hillside, and the South Fork of the Santa Maria River to 668 ft below the land surface in a well in sec. 17, T. 13 N., R. 15 W. Adequate data to determine long-term changes in water levels are available for only the southeastern part of the Bill Williams area; data indicate that no definitive long-term declines or rises have occurred. Well owners along the Bill Williams River, however, have reported short-term water-level declines and rises of as much as 30 ft owing to the amount of water released from Alamo Reservoir.



EXPLANATION

— — 4400 —?— WATER-LEVEL CONTOUR—Shows approximate altitude of the water level. Queried where uncertain. Contour interval 50 and 100 feet. Datum is mean sea level

● 1518 / 254R / 300 WELL IN WHICH DEPTH TO WATER WAS MEASURED IN 1979-80—Upper number, 1518, is altitude of the water level in feet above mean sea level. Middle number, 254R, is depth to water in feet below land surface (R, depth to water reported; F, flowing). Lower number, 300, is depth of well in feet

3610 / 18E SPRING FOR WHICH DATA WERE COLLECTED IN 1979—First number, 3610, is altitude of the land surface in feet above mean sea level. Second number, 18E, is discharge of spring in gallons per minute (E, estimated)

APPROXIMATE BOUNDARY OF THE MAIN WATER-BEARING UNIT—Queried where uncertain. The main water-bearing unit is the basin-fill deposits, which consist of boulder to pebble conglomerate and interbedded coarse- to fine-grained sandstone, siltstone, mudstone, and rhyolitic and basaltic tuff. In Peeples Valley the main water-bearing unit is the terrace and channel deposits, which consist of gravel, sand, and silt. Other water-bearing units include the volcanic rocks and the crystalline rocks of the mountains

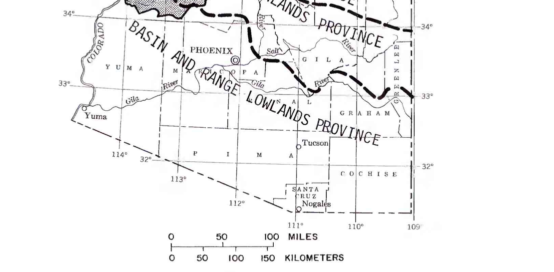
WATER-PROVINCE BOUNDARY

ARBITRARY BOUNDARY OF GROUND-WATER AREA

CONVERSION FACTORS

For readers who prefer to use the International System of Units (SI) 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 SI (metric) unit
foot (ft)	0.3048	meter (m)
acre	0.004047	square kilometer (km^2)
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)
degree Fahrenheit (°F)	(temp °F-32)/1.8	degree Celsius (°C)



AREA OF REPORT (SHADED) AND ARIZONA'S WATER PROVINCES

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

BASE FROM U.S. GEOLOGICAL SURVEY
NEEDLES 1:250,000, 1956 AND
PRESCOTT 1:250,000, 1954

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

MAPS SHOWING GROUND-WATER CONDITIONS IN THE BILL WILLIAMS AREA, MOHAVE, YAVAPAI, AND YUMA COUNTIES, ARIZONA-1980

BY
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