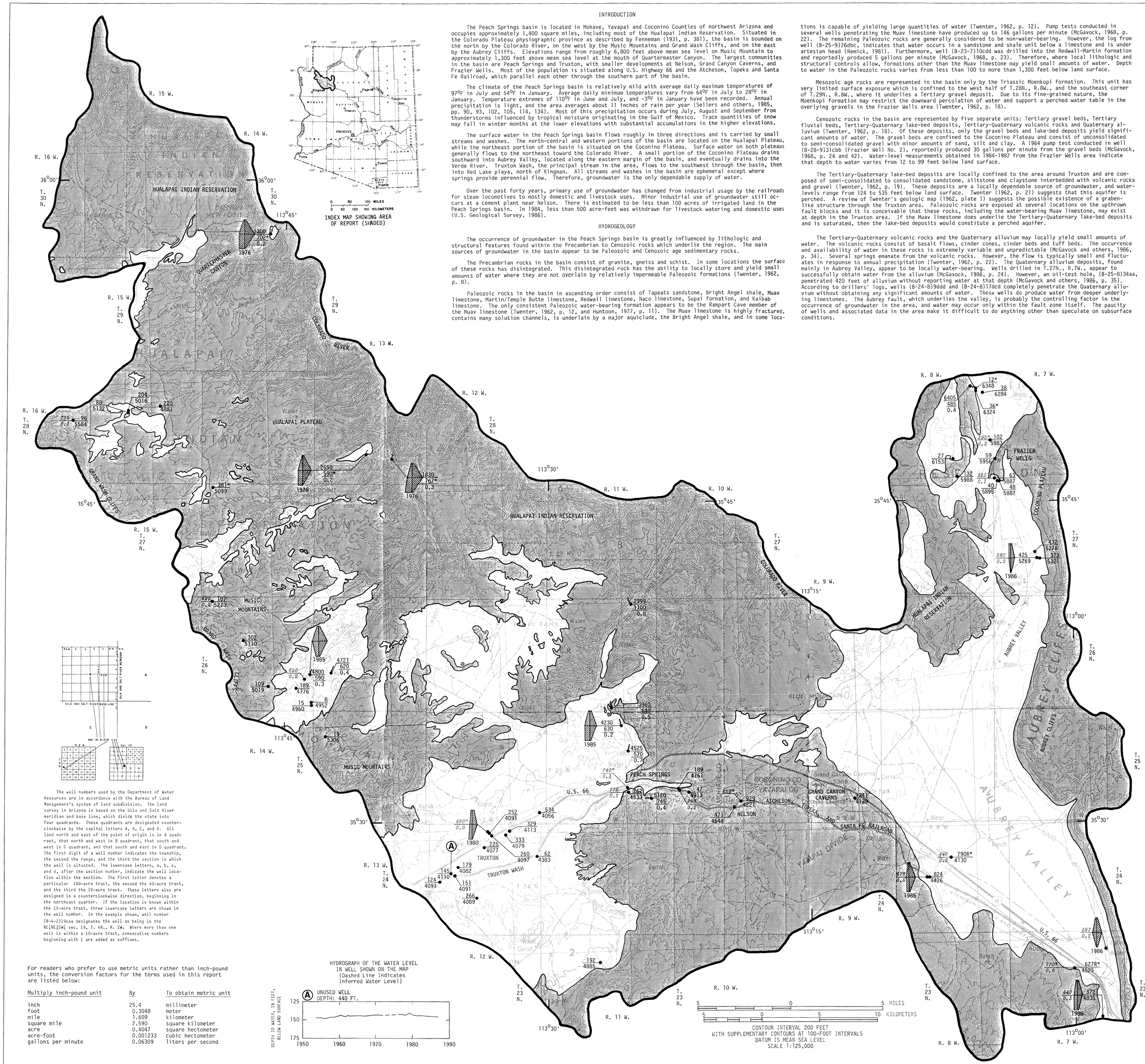

INDEX MAP SHOWING AREA OF REPORT (SHADED)

The well numbers used by the Department of Water Resources 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. These quadrants are designated counter-clockwise by the capital letters A, B, C, and D. All land north and east of the point of origin is in A quadrant, that north and west in B quadrant, that south and west in C quadrant, and that south and east in D quadrant. 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. In the example shown, well number (B-4-2)19cca designates the well as being in the NE¼NE¼SW¼ sec. 19, T. 4N., R. 2W. Where more than one well is within a 10-acre tract, consecutive numbers beginning with 1 are added as suffixes.

For readers who prefer to use metric 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
inch	25.4	millimeter
foot	0.3048	meter
mile	1.609	kilometer
square mile	2.590	square kilometer
acre	0.4047	square hectometer
acre-foot	0.001233	cubic hectometer
gallons per minute	0.06309	liters per second

INTRODUCTION

The Peach Springs basin is located in Mohave, Yavapai and Coconino Counties of northwest Arizona and occupies approximately 1,400 square miles, including most of the Hualapai Indian Reservation. Situated in the Colorado Plateau physiographic province as described by Fenneman (1931, p. 381), the basin is bounded on the north by the Colorado River, on the west by the Music Mountains and Grand Wash Cliffs, and on the east by the Aubrey Cliffs. Elevations range from roughly 6,800 feet above mean sea level on Music Mountain to approximately 1,300 feet above mean sea level at the mouth of Quartermaster Canyon. The largest communities in the basin are Peach Springs and Truxton, with smaller developments at Nelson, Grand Canyon Caverns, and Frazier Wells. Most of the population is situated along U.S. Highway 66 and the Atcheson, Topeka and Santa Fe Railroad, which parallel each other through the southern part of the basin.

The climate of the Peach Springs basin is relatively mild with average daily maximum temperatures of 97°F in July and 54°F in January. Average daily minimum temperatures vary from 64°F in July to 28°F in January. Temperature extremes of 110°F in June and July, and -3°F in January have been recorded. Annual precipitation is light, and the area averages about 11 inches of rain per year (Sellers and others, 1985, pp. 90, 93, 102, 105, 114, 134). Most of this precipitation occurs during July, August and September from thunderstorms influenced by tropical moisture originating in the Gulf of Mexico. Trace quantities of snow may fall in winter months at the lower elevations with substantial accumulations in the higher elevations.

The surface water in the Peach Springs basin flows roughly in three directions and is carried by small streams and washes. The north-central and western portions of the basin are located on the Hualapai Plateau, while the northeast portion of the basin is situated on the Coconino Plateau. Surface water on both plateaus generally flows to the northeast toward the Colorado River. A small portion of the Coconino Plateau drains southward into Aubrey Valley, located along the eastern margin of the basin, and eventually drains into the Verde River. Truxton Wash, the principal stream in the area, flows to the southwest through the basin, then into Red Lake playa, north of Kingman. All streams and washes in the basin are ephemeral except where springs provide perennial flow. Therefore, groundwater is the only dependable supply of water.

Over the past forty years, primary use of groundwater has changed from industrial usage by the railroads for steam locomotives to mostly domestic and livestock uses. Minor industrial use of groundwater still occurs at a cement plant near Nelson. There is estimated to be less than 100 acres of irrigated land in the Peach Springs basin. In 1984, less than 500 acre-feet was withdrawn for livestock watering and domestic uses (U.S. Geological Survey, 1986).

HYDROGEOLOGY

The occurrence of groundwater in the Peach Springs basin is greatly influenced by lithologic and structural features found within the Precambrian to Cenozoic rocks which underlie the region. The main sources of groundwater in the basin appear to be Paleozoic and Cenozoic age sedimentary rocks.

The Precambrian rocks in the basin consist of granite, gneiss and schist. In some locations the surface of these rocks has disintegrated. This disintegrated rock has the ability to locally store and yield small amounts of water where they are not overlain by relatively impermeable Paleozoic formations (Twenter, 1962, p. 8).

Paleozoic rocks in the basin in ascending order consist of Tapeats sandstone, Bright Angel shale, Muav limestone, Martin/Temple Butte limestone, Redwall limestone, Naco limestone, Supai formation, and Kaibab limestone. The only consistent Paleozoic water-bearing formation appears to be the Rampart Cave member of the Muav limestone (Twenter, 1962, p. 12, and Huntoon, 1977, p. 111). The Muav limestone is highly fractured, contains many solution channels, is underlain by a major aquiclude, the Bright Angel shale, and in some locations is capable of yielding large quantities of water (Twenter, 1962, p. 12). Pump tests conducted in several wells penetrating the Muav limestone have produced up to 146 gallons per minute (McGavock, 1968, p. 22). The remaining Paleozoic rocks are generally considered to be non-water-bearing. However, the log from well (B-25-9)26dbc, indicates that water occurs in a sandstone and shale unit below a limestone and is under artesian head (Remick, 1981). Furthermore, well (B-23-7)10cdd was drilled into the Redwall-Martin formation and reportedly produced 5 gallons per minute (McGavock, 1968, p. 23). Therefore, where local lithologic and structural controls allow, formations other than the Muav limestone may yield small amounts of water. Depth to water in the Paleozoic rocks varies from less than 100 to more than 1,300 feet below land surface.

Mesozoic age rocks are represented in the basin only by the Triassic Moenkopi formation. This unit has very limited surface exposure which is confined to the west half of T.28N., R.8W., and the southeast corner of T.29N., R.8W., where it underlies a Tertiary gravel deposit. Due to its fine-grained nature, the Moenkopi formation may restrict the downward percolation of water and support a perched water table in the overlying gravels in the Frazier Wells area (Twenter, 1962, p. 18).

Cenozoic rocks in the basin are represented by five separate units: Tertiary gravel beds, Tertiary fluvial beds, Tertiary-Quaternary lake-bed deposits, Tertiary-Quaternary volcanic rocks and Quaternary alluvium (Twenter, 1962, p. 18). Of these deposits, only the gravel beds and lake-bed deposits yield significant amounts of water. The gravel beds are confined to the Coconino Plateau and consist of unconsolidated to semi-consolidated gravel with minor amounts of sand, silt and clay. A 1964 pump test conducted in well (B-28-9)31cbb (Frazier Well No. 2), reportedly produced 30 gallons per minute from the gravel beds (McGavock, 1968, p. 24 and 42). Water-level measurements obtained in 1984-1987 from the Frazier Wells area indicate that depth to water varies from 12 to 99 feet below land surface.

The Tertiary-Quaternary lake-bed deposits are locally confined to the area around Truxton and are composed of semi-consolidated to consolidated sandstone, siltstone and claystone interbedded with volcanic rocks and gravel (Twenter, 1962, p. 19). These deposits are a locally dependable source of groundwater, and water-levels range from 124 to 535 feet below land surface. Twenter (1962, p. 21) suggests that this aquifer is perched. A review of Twenter's geologic map (1962, plate 1) suggests the possible existence of a graben-like structure through the Truxton area. Paleozoic rocks are exposed at several locations on the upthrown fault blocks and it is conceivable that these rocks, including the water-bearing Muav limestone, may exist at depth in the Truxton area. If the Muav limestone does underlie the Tertiary-Quaternary lake-bed deposits and is saturated, then the lake-bed deposits would constitute a perched aquifer.

The Tertiary-Quaternary volcanic rocks and the Quaternary alluvium may locally yield small amounts of water. The volcanic rocks consist of basalt flows, cinder cones, cinder beds and tuff beds. The occurrence and availability of water in these rocks is extremely variable and unpredictable (McGavock and others, 1986, p. 34). Several springs emanate from the volcanic rocks. However, the flow is typically small and fluctuates in response to annual precipitation (Twenter, 1962, p. 22). The Quaternary alluvium deposits, found mainly in Aubrey Valley, appear to be locally water-bearing. Wells drilled in T.27N., R.7W., appear to successfully obtain water from the alluvium (McGavock, 1968, p. 24). However, an oil-test hole, (B-25-8)34aa, penetrated 420 feet of alluvium without reporting water at that depth (McGavock and others, 1986, p. 35). According to drillers' logs, wells (B-24-8)9ddd and (B-24-8)17dcd completely penetrate the Quaternary alluvium without obtaining any significant amounts of water. These wells do produce water from deeper underlying limestones. The Aubrey fault, which underlies the valley, is probably the controlling factor in the occurrence of groundwater in the area, and water may occur only within the fault zone itself. The paucity of wells and associated data in the area make it difficult to do anything other than speculate on subsurface conditions.

GROUNDWATER MOVEMENT

Movement of groundwater in the Peach Springs basin is controlled by lithologic characteristics, regional tectonics and local structural features in the rocks. With the exception of Aubrey Valley, groundwater generally flows from southwest to northeast, more or less along the regional dip of the Paleozoic rocks (Twenter, 1962, p. 22). This direction may be locally modified by numerous faults and folds which exist in the basin. These features may be of local importance, providing barriers to and avenues for groundwater movement. Where faults juxtapose permeable and impermeable beds, groundwater may be found to flow along the fault zones. In Aubrey Valley, based on few and widespread data points, the general direction of groundwater flow appears to be from north to south.

CHANGES IN WATER LEVEL

Water levels have apparently changed very little throughout the basin, possibly due to the small number of wells and a corresponding small amount of pumpage. Although some railroad wells have been in use since the early part of the century, only one well in the basin was measured prior to 1980. Thus, any water-level changes that may have occurred as a result of early railroad pumpage or climatic variations were not recorded. Water-level changes between 1980 and 1987 range from a decline of 10.8 feet in well (B-25-10)26cda to a rise of 10.1 feet in well (B-25-11)26bad. Hydrograph A shows a rise in water level of 1.5 feet between 1953 and 1987.

GROUNDWATER QUALITY

The quality of groundwater in the Peach Springs basin is generally suitable for industrial, municipal and domestic uses. The specific conductance of water is an indication of the dissolved solids concentration in the water. The specific conductance of water collected from wells in the basin range from 260 to 1,100 micromhos per centimeter at 25°C. The dissolved solids concentration may be estimated by multiplying the specific conductance by 0.6, the approximate ratio of dissolved solids to specific conductance (Hem, 1970, p. 99). The maximum contaminant level for dissolved solids is 500 mg/L, as proposed in the secondary safe drinking water regulations of the U.S. Environmental Protection Agency (1977b, p. 17146) in accordance with the provisions of the Safe Drinking-Water Act (Public Law 93-523). Water from the few wells and springs that exceed this level emanates from the Muav limestone without any discernible pattern and may reflect local changes in lithology.

Fluoride concentrations in water collected from wells in the Peach Springs basin range from 0.0 to 0.8 mg/L. The maximum contaminant level for fluoride in public water supplies differs according to the annual average daily maximum air temperature (U.S. Environmental Protection Agency, 1977a, p. 67). The annual average daily maximum air temperature for the basin is 75°F (Sellers and others, 1985, p. 90) and, therefore, the maximum contaminant level for fluoride is 1.6 mg/L. None of the water samples collected had fluoride concentrations which exceed the maximum contaminant level.

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EXPLANATION

627R* / 4525 — WELL IN WHICH DEPTH TO WATER WAS MEASURED IN 1987--Upper number, 627, is the depth to water below land surface. The R next to 627 indicates a reported measurement. Asterisk indicates water level measurement was obtained in year other than 1987. The lower number, 4525, is the altitude of the water level in feet above mean sea level

740* / 0.3 — WELL FOR WHICH A WATER SAMPLE COLLECTED IN 1984-1987--Upper italicized number, 740, is specific conductance in micromhos per centimeter at 25°C (specific conductance is an indicator of dissolved solids concentration in water). Asterisk after number indicates water sample collected in years other than 1984-1987. Lower italicized number, 0.3, is the fluoride concentration in milligrams per liter

1300 / 702* / 0.2 — SPRING FIELD CHECKED IN 1984-1987--First number, 1300, is the altitude of the land surface in feet above mean sea level. Second number, 702, is the specific conductance in micromhos per centimeter at 25°C (specific conductance is an indicator of dissolved solids concentration in water). Asterisk after number indicates water sample collected in years other than 1984-1987. Third number, 0.2, is the fluoride concentration in milligrams per liter

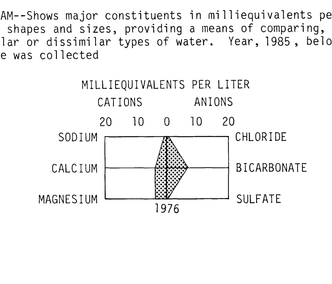
CENOZOIC SEDIMENTARY AND VOLCANIC DEPOSITS--Includes water-bearing lake-bed sediments and gravels, locally water-bearing alluvium and volcanic rocks, and non-water-bearing fluvial deposits (after Twenter, 1962)

PRECAMBRIAN, PALEOZOIC AND MESOZOIC SEDIMENTARY, IGNEOUS AND METAMORPHIC ROCK--Includes main water-bearing unit, the Muav limestone. Minor amounts of water may occur in other formations where lithologic and structural controls allow (after Twenter, 1962)

A — WELL FOR WHICH HYDROGRAPH DEPICTING CHANGES IN DEPTH TO GROUNDWATER IS SHOWN

ARBITRARY BOUNDARY OF GROUNDWATER BASIN

CHEMICAL QUALITY DIAGRAM--Shows major constituents in milliequivalents per liter. The diagrams are in a variety of shapes and sizes, providing a means of comparing, correlating, and characterizing similar or dissimilar types of water. Year, 1985, below diagram indicates year in which sample was collected



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

5 0 5 MILES
5 0 5 10 KILOMETERS

BASE FROM U.S. GEOLOGICAL SURVEY
GRAND CANYON, AZ., 1953, REV. 1970, 1:250,000
WILLIAMS, AZ., 1954, REV. 1970, 1:250,000

DEPTH TO WATER, ALTITUDE OF THE WATER LEVEL, AND CHEMICAL QUALITY OF WATER
MAP SHOWING GROUNDWATER CONDITIONS IN THE PEACH SPRINGS BASIN, MOHAVE, COCONINO, AND YAVAPAI COUNTIES, ARIZONA--1987
BY
S. M. MYERS

These hydrologic maps are available upon request from the Department of Water Resources, Basic Data Unit, 2810 South 24th Street, Suite 122, Phoenix, Arizona, 85034. The hydrologic data on which these maps are based are available, for the most part, in computer-printout form and may be consulted at the Department of Water Resources and at the U.S. Geological Survey offices located at: Federal Building, 301 West Congress Street, Tucson, Arizona, and 3738 North 16th Street, Suite E, Phoenix, Arizona.