PREPARED IN COOPERATION WITH THE
CITY OF TUCSON

EXPLANATION

QTs — ALLUVIUM—Clay, silt, sand, and gravel of the aquifer — TERTIARY AND QUATERNARY

TpЄr — BEDROCK—Granitic, metamorphic, volcanic, and indurated sedimentary rocks of the mountains — PRECAMBRIAN TO TERTIARY

GENERALIZED GEOLOGIC CONTACT

A–A′ (A1, A2, A3) — LINE OF GEOHYDROLOGIC SECTION--Dot is well along section line; letter and number, A2, are geohydrologic section and sequence of well in section

CONVERSION FACTORS

For readers who prefer to use metric units (International System), conversion factors for the inch-pound units in this report are listed below:

Multiply inch-pound unit	By	To obtain metric unit
inch (in.)	25.40	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
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)

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

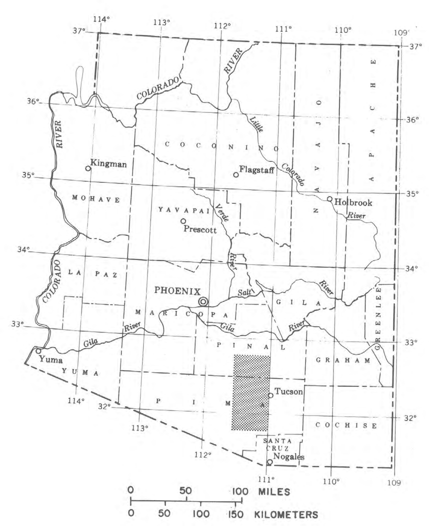
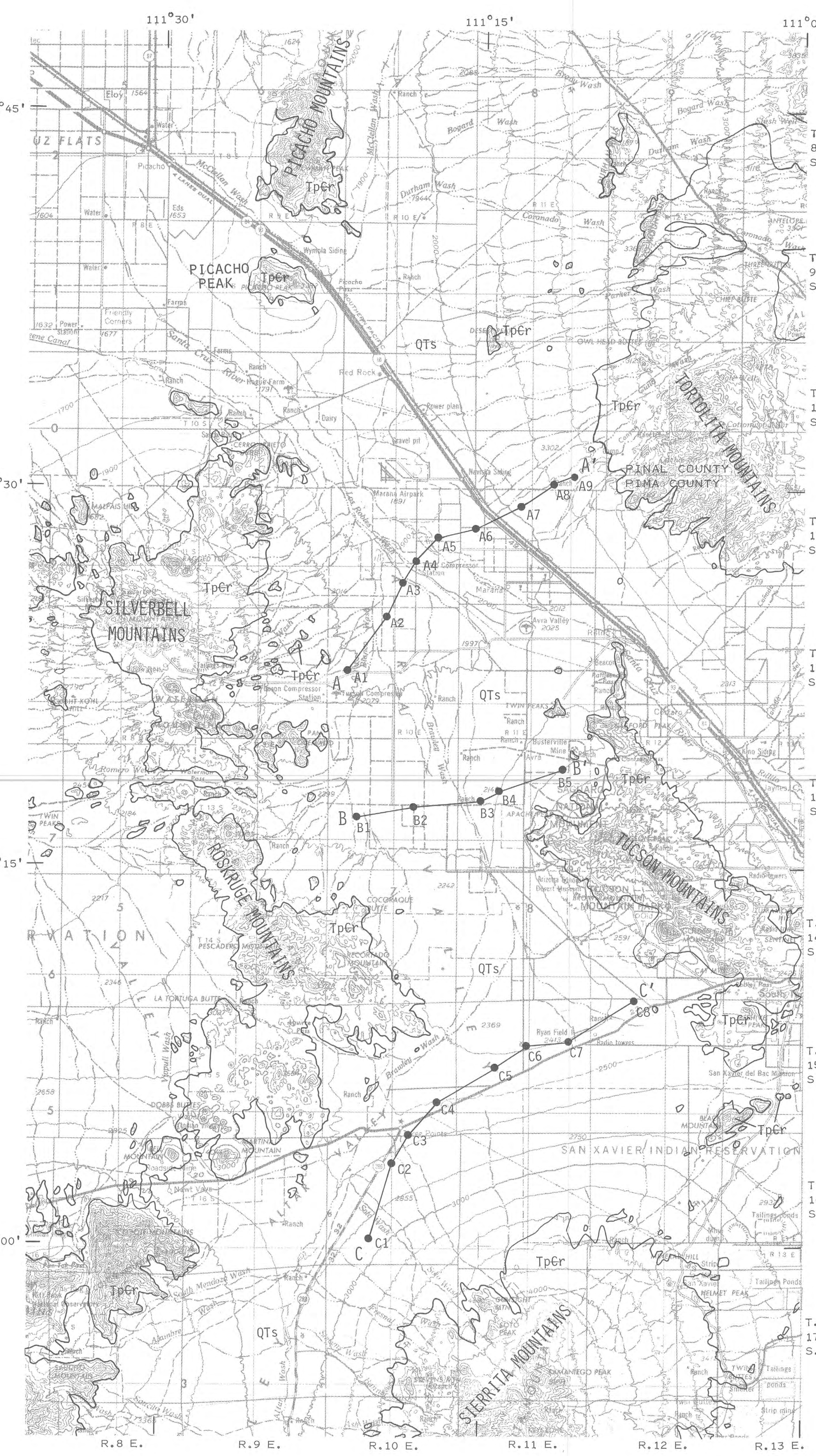


Figure 1.--Area of report (shaded).



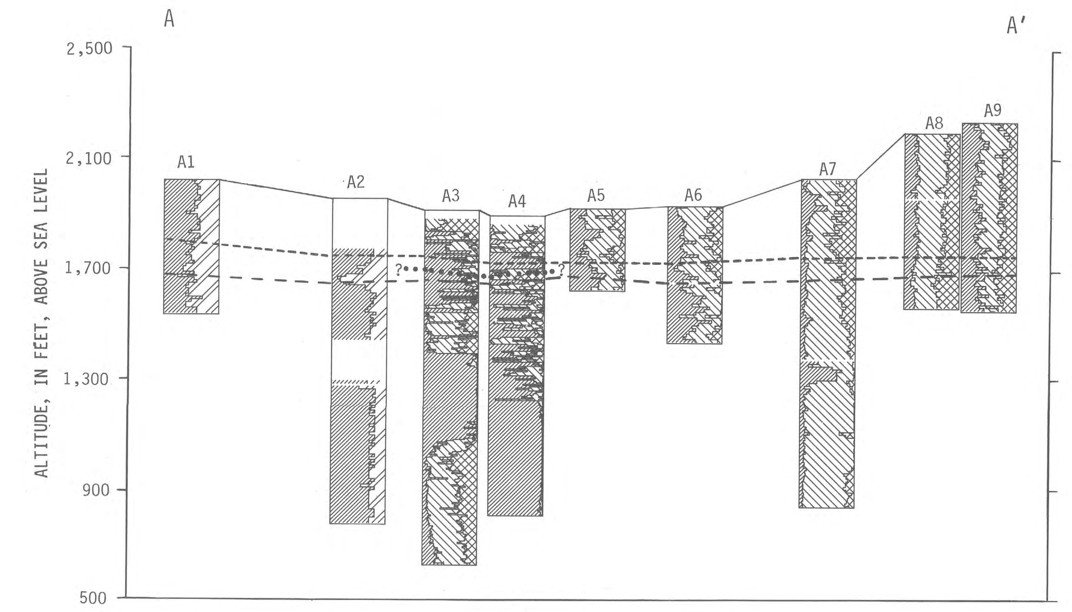
BASE FROM U.S. GEOLOGICAL SURVEY 1:250,000
NOGALES, 1956-69 AND TUCSON, 1956-77

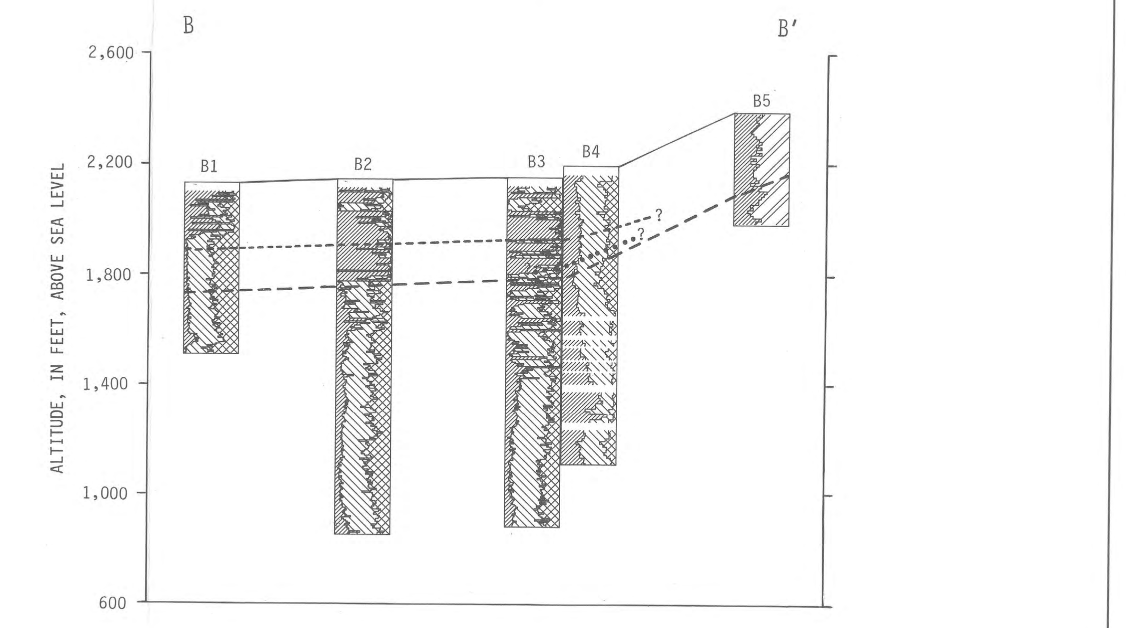
GEOLOGY FROM WILSON AND OTHERS (1969), COOLEY (1973), ALLEN (1981), AND WHALLON (1983)

5 0 5 MILES
5 0 5 KILOMETERS

TOPOGRAPHIC CONTOUR INTERVAL 200 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Figure 2.--Generalized distribution of rock types in Avra Valley.





EXPLANATION

A5 — PARTICLE-SIZE DISTRIBUTION LOGS FOR SELECTED WELLS—Patterns show respective proportion by weight of clay, silt, sand, and gravel in samples from drill cuttings. Letter and number, A5, are geohydrologic section and sequence of well in section

Silt and clay

Sand

Gravel

Sand and gravel

No data

WATER LEVELS

Measured or approximated in 1940; queried where uncertain

Measured or approximated in 1985; queried where uncertain. Probably represents the regional water table

Measured or approximated in 1985; queried where uncertain. Probably represents a perched water table

10 0 10 MILES
5 0 10 KILOMETERS

NATIONAL GEODETIC VERTICAL DATUM OF 1929

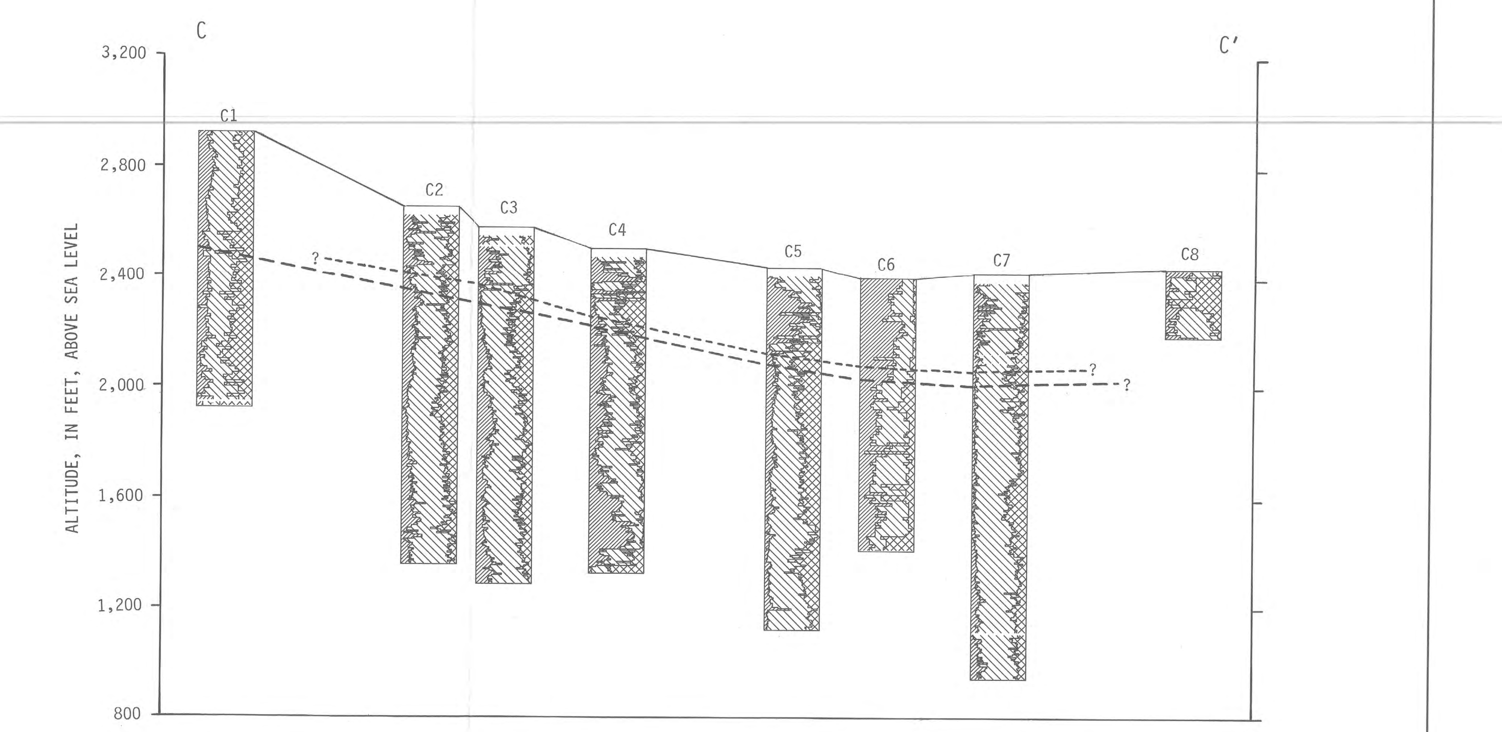


Figure 3.--Geohydrologic sections in Avra Valley.

INTRODUCTION

Avra Valley is a north-trending alluvial basin about 15 mi west of Tucson in Pima and Pinal Counties in south-central Arizona (fig. 1). The valley includes about 520 mi^2 of which about 100 mi^2 is in the San Xavier Indian Reservation. The basin is bounded on the east by the Tortolita, Tucson, and Sierrita Mountains and on the west by the Picacho, Silverbell, and Roskruge Mountains. The climate of the valley is semiarid; the average annual precipitation ranges from 8 to 12 in., and the average annual lake evaporation ranges from 58 to 62 in. (Sellers and Hill, 1974). Two major ephemeral streams--Santa Cruz River and Brawley Wash--drain the area. Santa Cruz River and Brawley Wash and their tributaries provide a source of recharge to an extensive alluvial aquifer that underlies the valley floor.

Since 1940, the amount of ground water pumped from the aquifer has been greater than the amount of natural recharge from infiltration and underflow. Overdraft of the aquifer resulted in substantial water-level declines throughout the valley. Until 1969, use of ground water in Avra Valley was for irrigation. Since 1969, the city of Tucson has pumped and transported ground water for municipal use in the adjacent Tucson basin from lands that were purchased and retired from agriculture.

The purpose of this report is to describe ground-water conditions in Avra Valley as of 1985. A brief discussion of the geohydrologic setting and history of ground-water development are given to define aquifer characteristics, changes in ground-water levels, and ground-water pumpage since 1940. This report was prepared in cooperation with the city of Tucson as part of a continuing study to evaluate the potential for aquifer compaction, land subsidence, and earth fissures in Avra Valley and Tucson basin (Anderson and others, 1982; Anderson, 1987; S.R. Anderson and R.T. Hanson, hydrologists, U.S. Geological Survey, written commun., 1987).

The hydrologic data on which these maps are based are available, for the most part, in computer-printout form at the Arizona Department of Water Resources, 99 East Virginia, Phoenix; at Tucson Water, 310 West Alameda, Tucson; and at U.S. Geological Survey offices in Federal Building, 300 West Congress Street, Tucson; and 3738 N. 16th Street, Suite E, Phoenix. Material from which copies can be made at the requester's expense is available at the Tucson and Phoenix offices of the U.S. Geological Survey.

GEOHYDROLOGIC SETTING

The mountains surrounding Avra Valley consist of granitic, metamorphic, volcanic, and indurated sedimentary rocks of Precambrian to Tertiary age (fig. 2). Rocks of the mountains generally yield only small to moderate amounts of water to wells and springs along the margins of the basin. The valley floor is underlain by saturated alluvium of Tertiary and Quaternary age (figs. 2 and 3). Sediments in the upper 1,000 ft of the aquifer consist mainly of unconsolidated clay, silt, sand, and gravel and, in places, yield more than 3,000 gal/min of water to properly constructed wells. The aquifer consists mainly of sand and gravel along the edges of the basin, along major stream channels, and in the southern part of the valley. Thick deposits of clay and silt underlie the northern and central parts of the valley. In general, sand and gravel deposits are the most permeable and yield the most water to wells; clay and silt deposits are less permeable and yield less water to wells.

The water-bearing alluvial deposits of Avra Valley generally are interconnected hydraulically to a depth of at least 700 ft and form a single unconfined aquifer (Moosburner, 1972). In parts of the valley, water below a depth of about 1,100 ft is confined below clay and silt layers, and water levels in wells may rise above the regional water table (Moosburner, 1972). In addition, anomalously shallow ground-water levels and cascading water, which may be the result of perched irrigation return flow, also occur in many wells throughout parts of the basin (Reeter and Cady, 1982; Whallon, 1983). Perched and confined water is most likely to occur in the northern and central parts of the valley where the aquifer consists mainly of clay and silt (figs. 2 and 3). Conversely, uniform water levels and water-table conditions are most likely to occur along the edges of the basin and in the southern part of the valley where the aquifer consists mainly of sand and gravel (figs. 2 and 3).

GROUND-WATER CONDITIONS IN AVRA VALLEY, PIMA AND PINAL COUNTIES, ARIZONA — 1985

BY
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1987