DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

FOLIO OF THE
TUCSON AREA, ARIZONA
MAP I–844–L

Colored areas are underlain by saturated alluvial deposits, which form the main ground-water reservoir. Gray areas are underlain by rocks that contain only small amounts of recoverable ground water

Suitable quality
Area of ground water whose chemical quality is generally satisfactory for domestic supply without treatment

Dissolved solids
Ground water generally containing more than 1,000 mg/l (milligrams per liter) dissolved solids

Fluoride
Ground water generally containing more than 1.4 mg/l fluoride

Nitrate
Ground water generally containing more than 45 mg/l nitrate

Hardness
Ground water generally having more than 150 mg/l hardness as calcium carbonate

In the Tucson area most ground water meets both the mandatory and recommended chemical-quality limits of the U.S. Public Health Service drinking-water standards (U.S. Public Health Service, 1962). The most commonly found undesirable water-quality features of the Tucson area are concentrations of dissolved solids, fluoride, nitrate, and hardness. Locally, trace elements in concentrations undesirable in drinking water also may be present, but data are presently inadequate to define these areas. Concentrations of dissolved solids, fluoride, nitrate, and hardness in ground water vary also with well depth and time of pumping. The distribution of the chemical constituents shown on the map represents concentrations in the water in roughly the upper 300 feet (about 100 meters) of the saturated alluvial deposits during the active pumping seasons in 1965–73. Most concentration limits used on this map are mandatory or recommended by the Public Health Service. The Public Health Service drinking-water standards (1962) are applicable to all public water supplies used by interstate carriers, which are subject to Public Health Service regulations.

Dissolved solids are the total quantity of salts or minerals dissolved in the water. Primarily on the basis of taste, the recommended limit for dissolved solids is 500 mg/l (milligrams per liter) (U.S. Public Health Service, 1962, p. 7); both nationally and locally, more highly mineralized water is commonly used for public supplies if water of lower concentration is unavailable. In the Tucson area, water that contains more than 1,000 mg/l dissolved solids generally is not used for public supply without mixing with water of lower concentration. The disadvantages of objectionable amounts of dissolved solids can be overcome by use of bottled water or a deionizing system. More detailed information on dissolved solids is available in Kister (1974).

Fluoride in drinking water will cause mottling of teeth and other more serious health problems in children if too much is ingested; a small amount of fluoride strengthens teeth and helps prevent dental caries (U.S. Public Health Service, 1962, p. 41). Because the amount of water and fluoride consumed by humans depends partly on air temperature, the Public Health Service limits for fluoride concentration in drinking water are defined on the basis of the annual average of maximum daily air temperatures. The optimum concentration of fluoride in the Tucson area is 0.7 mg/l, and twice this amount (1.4 mg/l) constitutes grounds for rejection of the water for public use. Areas of high fluoride are mainly along the Santa Cruz River and adjacent to the Silver Reef Mountains in the northwest part of the mapped area.

Nitrate in drinking water may cause methemoglobinemia, a condition that can be fatal to infants during the first few months of life. The concentration at which nitrate in water is potentially dangerous has not been well established, but no problems have been experienced at concentrations of less than 45 mg/l. Hence the recommended nitrate limit in drinking water is 45 mg/l (U.S. Public Health Service, 1962, p. 7). In the Tucson area most nitrate concentrations greater than 45 mg/l are found locally in ground water along the Santa Cruz River.

Hardness—the soap-consuming property of water—is caused mainly by the calcium and magnesium content of water. Hardness reduces the effectiveness of soap by forming an insoluble residue, and it causes incrustation on pipes, utensils, and appliances. Hardness is not known to be a health hazard, and, therefore, no optimum or maximum hardness concentration has been set. Nationally, water with a hardness of less than 150 mg/l generally is not objectionable for domestic supplies (Edward E. Johnson, Inc., 1966, p. 68). For water of greater hardness, the disadvantages of incrustation and soap consumption can be reduced by use of a water-softening or deionizing system.

Water pumped from depths greater than the uppermost 300 feet (roughly 100 meters) of saturated alluvial deposits may vary significantly in quality from that represented in the mapped area (Laney, 1972, p. 20). In general, in the Santa Cruz River valley fluoride concentrations in ground water increase with depth, whereas the amounts of dissolved solids, nitrate, and hardness decrease with depth. The variation of water quality with depth in Avra and Altar Valleys is not yet determined but may be similar to that in the Santa Cruz River valley.

REFERENCES

Edward E. Johnson, Inc., 1966, Ground water and wells: St. Paul, Minn., 440 p.

Kister, L. R., 1974, Dissolved-solids content of ground water in the Tucson area, Arizona: U.S. Geol. Survey Misc. Geol. Inv. Map I–845–G, 1974.

Laney, R. L., 1972, Chemical quality of the water in the Tucson basin, Arizona: U.S. Geol. Survey Water-Supply Paper 1939-D, 46 p.

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SCALE 1:250 000

5 0 5 10 15 MILES

5 0 5 10 15 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
DATUM IS MEAN SEA LEVEL
1974 MAGNETIC DECLINATION VARIES FROM 13°30' TO 12°30' EAST

MAP SHOWING CHEMICAL QUALITY OF GROUND WATER FOR PUBLIC SUPPLY IN THE TUCSON AREA, ARIZONA

By

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1974

Base from U.S. Geological Survey
Ajo 1953–69, Tucson and Nogales 1956–62

For sale by U.S. Geological Survey
Denver, Colo. 80225 and Reston, Va. 22092, price 75 cents

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