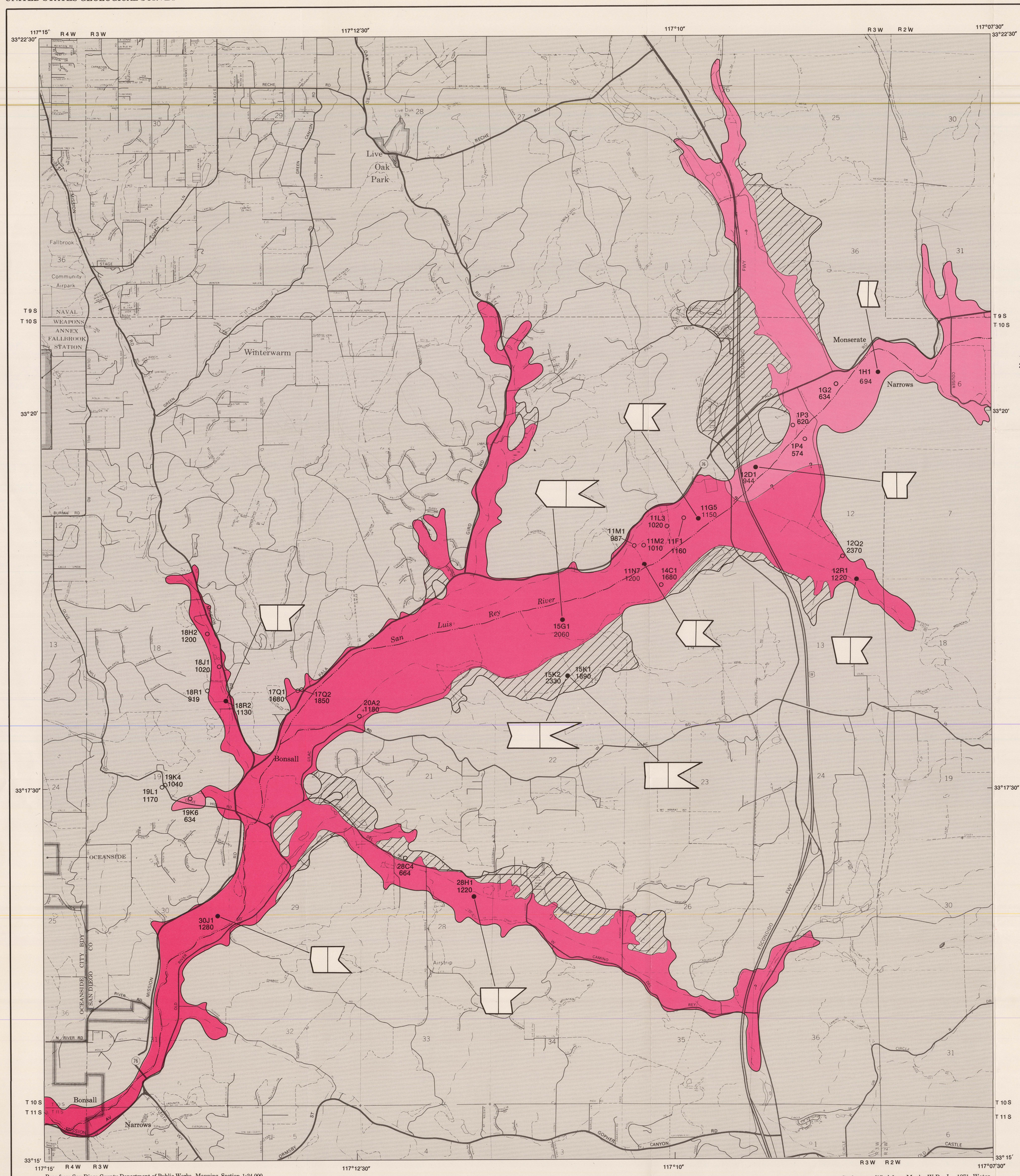
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Prepared in cooperation with the
RAINBOW MUNICIPAL **WATER** DISTRICT

WATER–RESOURCES INVESTIGATIONS
REPORT 85–4112 (SHEET 5 of 5)



EXPLANATION

ALLUVIUM– Colors indicate range of dissolved-solids concentration, in milligrams per liter. Queried where uncertain

- Less than 500
- 500 to 1000
- More than 1000

COLLUVIUM AND WEATHERED CRYSTALLINE ROCKS– Generally covered by a thin layer of alluvium

CRYSTALLINE ROCKS– Generally covered by a thin layer of alluvium and colluvium near stream channels

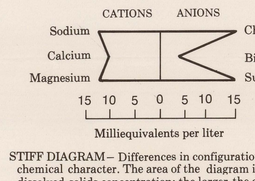
CONTACT

BOUNDARY OF GROUND– WATER BASIN

1H1 694 ● WELL–Upper number is well number. Lower number is dissolved-solids concentration, in milligrams per liter

1G2 634 ○ WELL– Upper number is well number. Lower number is dissolved-solids concentration, in milligrams per liter, estimated from specific conductance, in microsiemens per centimeter at 25 degrees Celsius

12Q2 2370 ○ SPRING– Upper number is spring number. Lower number is dissolved-solids concentration, in milligrams per liter estimated from specific conductance, in microsiemens per centimeter at 25 degrees Celsius



STIFF DIAGRAM– Differences in configuration reflect differences in chemical character. The area of the diagram is an indication of the dissolved-solids concentration; the larger the area of the diagram, the greater the dissolved-solids concentration

GROUND–WATER QUALITY IN SPRING 1984

Field measurements of specific conductance of water from 29 wells and 1 spring were made in autumn 1983 and spring 1984. Specific-conductance data were converted to dissolved-solids concentrations using the relation:

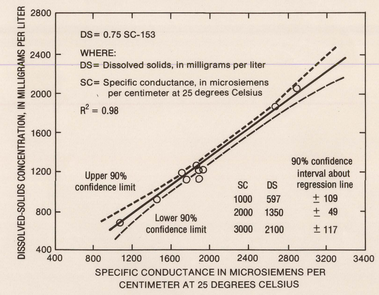
$$DS = 0.75SC - 153$$

where
DS is dissolved-solids concentration, in milligrams per liter; and
SC is specific conductance, in microsiemens per centimeter at 25°C.

The relation was developed, with data collected by the U.S. Geological Survey in spring 1984, using linear regression. Eleven samples with dissolved-solids concentrations ranging from 694 to 2,330 mg/L were used in the analyses, and an R^2 of 0.98 was obtained. (R^2 is a statistic which describes the "goodness of fit" of data about a line. It may range from 0 for a very poor fit to 1 for a perfect fit). The data base included analyses from two wells outside the alluvial aquifer: well 10S/3W-15K1 is 60 feet deep and yields water from weathered crystalline rock; well 10S/3W-15K2 is 300 feet deep and yields water from two fractures in crystalline rock at 120 and 275 feet below land surface. The relation between dissolved-solids concentration and specific conductance is basin specific and care should be used when extrapolating to other areas.

Dissolved-solids concentrations (estimated and measured) of water from 30 sites in the Bonsall area ranged from 574 to 2,370 mg/L. Ground water with a dissolved-solids concentration less than 1,000 mg/L was generally restricted to the eastern part of the aquifer. However, three wells (10S/3W-18R1, 10S/3W-19K6, and 10S/3W-28C4) in the western part of the aquifer yielded water with dissolved-solids concentrations less than 1,000 mg/L. These wells were located in side canyons, and at least one well (10S/3W-28C4) was completed in colluvium and weathered crystalline rocks. Nine of eleven wells yielded water with sulfate concentrations that exceeded the EPA (U.S. Environmental Protection Agency) recommended limit of 250 mg/L. Nine of eleven wells yielded water with chloride concentrations that exceeded the EPA recommended limit of 250 mg/L. No wells yielded water that exceeded the EPA recommended limit of 10 mg/L nitrate as nitrogen.

The small diagrams to the side are stiff diagrams. Stiff diagrams graphically show relative magnitude of major dissolved ions in water, expressed in milliequivalents per liter. Concentrations in milligrams per liter are converted to milliequivalents per liter by dividing by the atomic weight and then multiplying by the ionic charge. When an analysis is expressed in milliequivalents per liter, unit concentrations of all ions are chemically equivalent. Differences in configuration of stiff diagrams reflect differences in chemical character of water from wells. The area of the diagram is an indication of the dissolved-solids concentration; the larger the area of the diagram, the greater the dissolved-solids concentration.



RELATION BETWEEN DISSOLVED-SOLIDS CONCENTRATION AND SPECIFIC CONDUCTANCE IN THE BONSALL AREA OF THE SAN LUIS REY RIVER VALLEY, SAN DIEGO COUNTY, CALIFORNIA

Geology modified from Moyle, W.R., Jr., 1971, Water wells in the San Luis Rey River valley area, San Diego County, California: California Department of Water Resources Bulletin 91-18, 347 p.

For additional information write to:
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GROUND–WATER QUALITY IN SPRING 1984

MAPS OF THE BONSALL AREA OF THE SAN LUIS REY RIVER VALLEY, SAN DIEGO COUNTY, CALIFORNIA SHOWING GEOLOGY, HYDROLOGY, AND GROUND–WATER QUALITY

BY
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