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MAPS SHOWING GROUND-WATER LEVELS, SPRINGS, AND DEPTH TO GROUND WATER, BASIN AND RANGE PROVINCE, SOUTHERN CALIFORNIA

by

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INTRODUCTION

This report on ground-water levels, springs and depth to ground water in the Basin and Range province of southern California (see index map) was prepared as part of a program of the U.S. Geological Survey to identify prospective regions for further study relative to isolation of high-level nuclear waste (Bedinger, Sargent, and Reed, 1984), utilizing program guidelines defined in Sargent and Bedinger (1984). Also included in this report are selected references on pertinent geologic and hydrologic studies of the region. Other map reports in this series contain detailed data on ground-water quality, surface distribution of selected rock types, tectonic conditions, areal geophysics, Pleistocene lakes and marshes, and mineral and energy resources.

In the Basin and Range province, ground water occurs in basin-fill deposits and consolidated rocks. The basin fill consists mostly of unconsolidated to semi-indurated sedimentary deposits. The material ranges from poorly sorted to moderately sorted mixtures of gravel, sand, silt, and clay that were derived from the consolidated rocks in the nearby mountains. Evaporite deposits, limestone, conglomerate, and volcanic rocks are present in places in the unit. Some of the basins may contain as much as 9,000 feet of basin fill, but the most permeable rocks and most of the recoverable ground water is in the upper 1,000 feet of the unit.

The consolidated rocks consist mostly of sedimentary and volcanic rocks, with lesser amounts of metamorphic and intrusive rocks. The consolidated rocks make up the mountain ranges that border the basins and are the principal source of sedimentary material to the basin fill.

Few wells exist in the consolidated rocks compared to the greater number of wells in the basin fill. The yield of wells tapping many consolidated rock units is due to interception of water in fracture zones. In some areas in the Basin and Range, carbonate rock is extensive in the subsurface and provides interconnection between alluvial basins through fractures and solution channels. Although the consolidated rock commonly has very low permeability, and very low rates of ground-water flow, the entire ground-water system, basin fill and bedrock, must be treated as one integral system.

The faults shown on the map act as ground-water barriers. Head differences on opposite sides of faults range from a few feet to as much as several hundred feet. Other faults in the area, which are not shown on the map, may affect ground-water flow and ground-water quality.

GROUND-WATER LEVELS AND SPRINGS

The accompanying map shows the altitude of the ground-water level and the discharge and temperature of selected springs. This information was obtained primarily from reports listed in the "Selected references" and from files of the U.S. Geological Survey. The altitude of the ground-water level is shown by contours in those areas where sufficient data exist. In other areas, where regional data are inadequate to contour, data on selected wells are shown.

Ground-water-level changes occur daily, seasonally, and yearly in response to natural and man-induced hydrologic conditions. The ground-water-level map is a compilation of water-level measurements taken over a number of years. However, for any one ground-water study area the measurements generally were made during a relatively short time period. Collectively, the ground-water levels show the regional configuration of the ground-water surface.

Similarly, water temperatures and discharges of springs may vary with time. The reported values for individual springs were taken at one time; however, collectively the springs were measured over a number of years. Springs may issue from perched water tables or may be under artesian pressure; under these conditions the altitude of springs do not correspond to the altitude of the regional water table.

DEPTH TO GROUND WATER

The accompanying map shows the approximate depth to ground water below the land surface. In the basin fill, ground water moves in a continuous system, although perched ground water may occur in places. In areas with good topographic control, the depth to ground water can be predicted with reasonable accuracy between widely-spaced water-level data points, except where geologic discontinuities, such as faults, may alter the flow pattern. Where data are sufficiently closely spaced, lines of equal depth to water are shown; where data are inadequate to draw lines, data from selected wells are shown. In consolidated rocks, indicated by shaded patterns on the map, ground water occurs in poorly interconnected joints and fractures; water levels in wells may vary in depth within short distances, and numerous zones of perched water may exist.

Line patterns approximately delineate zones within which the depth to ground water is inferred to be greater than 500 feet. These are highly generalized areas based on very limited data on depth to ground water in wells tapping consolidated rock and basin fill and mine shafts; and on information gained from the location and discharge rates of springs, locations of gaining and losing reaches of streams; and estimates of geohydrologic conditions in areas. The areas delineated as possibly having depths to ground water of greater than 500 feet are recognized as having potential for evaluating prospective environments for isolation of high-level nuclear waste in the unsaturated zone.

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