UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Water Resources Division

PROGRESS REPORT ON THE GROUND-WATER INVESTIGATION IN THE SAN GORGONIO PASS AREA, CALIFORNIA

By

R. M. Bloyd, Jr.

Prepared in cooperation with the
San Gorgonio Pass Water Agency

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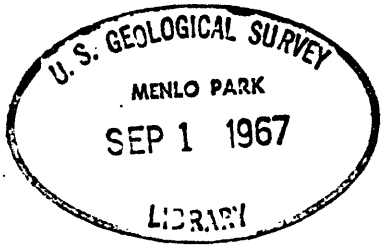

Menlo Park, California
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PROGRESS REPORT ON THE GROUND-WATER INVESTIGATION IN THE SAN GORGONIO PASS AREA, CALIFORNIA

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INTRODUCTION

In July 1966, in accordance with the terms of a cooperative agreement with the San Gorgonio Pass Water Agency, the U.S. Geological Survey began a ground-water investigation of the Agency area. The purpose of the investigation is to determine the technical feasibility of storing imported water in the unsaturated part of the natural ground-water reservoir in the Agency area (fig. 1). The scope of the investigation includes:

1. Collection, organization, and analysis of pertinent hydrologic data.

2. Compilation of a geologic map, showing geologic units of hydrologic importance.

3. Delineation and description of the physical structure, boundaries, and subdivisions of the ground-water storage units.

4. Description of the aquifer system as related to source, occurrence, and movement of ground water.

5. Computation of a hydrologic budget.

The purpose of this report is to describe the progress of the investigation and to outline additional data requirements.

The work is being done by the U.S. Geological Survey, Water Resources Division, under the general direction of R. Stanley Lord, chief of the California district, and under the immediate supervision of L. C. Dutcher, chief of the Garden Grove subdistrict office.

STATUS OF THE INVESTIGATION

The data collected suggest that the ground-water basin in the San Gorgonio Pass Water Agency area is not one or two large storage units but many storage units (fig. 1). Many faults impede the flow of ground water and form many of the storage-unit boundaries. In most cases the faults are concealed, but are postulated from ground-water and geophysical data.

The large ground-water storage unit underlying the area between Beaumont and Cherry Valley is probably suitable for underground storage of imported water. Some of the reasons for this preliminary conclusion are that the subunit:

1. Apparently is bounded on the east, south, and west by faults which act as barriers to ground-water outflow.

2. Is near the center of the Agency area so that the loss of recharged water by ground-water outflow from the Agency will not be a major problem.

3. Has a large potential-storage volume.

4. Is at a high surface altitude, making possible maximum use of a gravity-flow distribution system from the storage unit to points of local water use.

5. Is close to several probable alinements of local conveyance facilities.

6. Seemingly has a considerable thickness of unsaturated alluvium with characteristics that make it suitable for accepting recharge and releasing water to wells.

A smaller storage unit, the center of which is in sec. 6, T. 3 S., R. 2 E., also seems to be suitable for underground storage of imported water. Gravity and magnetic geophysical studies show that bedrock is at a considerable depth in this storage unit, relative to the depth to bedrock in adjacent storage units. Hence, potential-storage volume may be large. However, there are no known wells in this storage unit. Before any decision is made to use this storage unit, a number of test wells probably are needed to determine the occurrence and pattern of movement of the existing ground water. The use of this storage unit would be most practical for storing water for use in the Cabazon area.

A short summary of progress is presented for each of the items listed under scope of the investigation.

Hydrologic data have been collected from the California Department of Water Resources, the Riverside County Flood Control and Water Conservation District, the Banning Water Co., the Beaumont Irrigation District, and the San Gorgonio Pass Water Agency. These data were organized and analyzed in evaluating the initial need for additional data collection. After evaluation, more than 200 wells were canvassed by the U.S. Geological Survey. A literature search was also made. References to previous and related hydrologic or geologic investigations of the San Gorgonio Pass Water Agency area are listed at the end of this report.

A preliminary geologic map (fig. 1) has been prepared. For the purposes of this report, the only geologic units shown are the unconsolidated deposits that are the principal source of ground water to wells and the consolidated rocks. Further refinement will be made after determination of the location and extent of many inferred faults.

The earth's gravity field has been measured at more than 500 stations in the Agency area, and the earth's magnetism has been measured at about 250 stations. One of the main purposes for collecting these data is to assist in determining the location and extent of the inferred faults, especially in areas where water-level measurements cannot be made because there are no wells. Bedrock, or consolidated rock, is more dense than are the unconsolidated deposits. Hence, high relative gravity values suggest bedrock at shallow depth and low relative gravity values suggest bedrock at greater depth. If a gravity traverse is made across a fault with vertical offset at depth, a plot of gravity values versus distance along the traverse will usually yield a curve or line with a significant slope. Therefore, analysis of gravity data makes it possible to postulate the approximate location and extent of fault zones that are buried under the unconsolidated deposits but have a vertical displacement in bedrock. Magnetic data sometimes make possible a more precise determination of the location and extent of faults, because fault movement frequently has a measurable effect on the earth's magnetic field.

An analysis of presently available data shows that the ground-water reservoir in the San Gorgonio Pass Water Agency area is made up of many storage units. More detailed delineation and description of the ground-water storage units will be made after all geophysical and test-augering exploration is completed.

A preliminary water-level contour map has been prepared which shows the general direction of ground-water movement in the San Gorgonio Pass Water Agency (fig. 1). The general pattern of movement is from the small storage units in the canyons that border San Gorgonio Pass on the north into the main storage units on the floor of the pass, and then either eastward through the narrows in sec. 8, T. 3 S., R. 3 E., or westward through San Timoteo Canyon. There are two large pumping depressions, toward which some ground water flows. One is centered under the city of Beaumont, and the other is centered in the area between Beaumont and Banning. There is a small pumping depression centered in sec. 23, T. 2 S., R. 2 W. In the subunit underlying the Banning area, the flow of ground water is toward the south and southeast. This probably indicates that some ground water is flowing from the pass area toward the Colorado River Aqueduct tunnel. Some ground water also flows southward into the canyon at the south end of Highland Springs Avenue.

Average annual precipitation, evaporation, and recoverable water have been determined as a part of the hydrologic budget. However, no estimates of ground-water outflow from the area or estimates of changes in the quantity of ground water in storage have been made.

In summary, the additional work on the investigation cannot be done until the location and extent of the many inferred faults are more accurately determined. Then the location of the storage-unit boundaries can be determined, the aquifer system can be defined, and the storage capacity of the underground storage units and the hydrologic budget can be estimated. Therefore, more accurate determination of the fault locations and of the elements of the hydrologic budget are now of primary importance. A program designed to obtain this information is described in the following section.

ADDITIONAL WORK PLANS

Several shallow test holes will be augered to determine the difference in water levels across suspected faults. The test holes will be across the trace of the suspected fault in secs. 25 and 26, T. 2 S., R. 2 W., and across the traces of the suspected faults that parallel San Timoteo Canyon in secs. 26, 27, 35, and 36, T. 2 S., R. 2 W. (fig. 1).

Core samples for permeability tests will be taken from auger holes in the northern part of the storage unit which underlies the area between Beaumont and Cherry Valley and in the storage unit centered in sec. 6, T. 3 S., R. 2 E. The permeability tests on the samples will help determine the technical feasibility of using surface spreading grounds to recharge imported water.

The augering, logging, and sampling, as well as the permeability determinations on core samples, will be done by the Hydrologic Laboratory, Water Resources Division, at no extra cost to the San Gorgonio Pass Water Agency. Geological Survey equipment can auger test holes and take core samples to a depth of about 100 to 125 feet.

If the Agency decides to pursue further the possibility of storing imported water in the storage unit centered in sec. 6, T. 3 S., R. 2 E., a minimum of three deeper test holes is suggested, presumably under a commercial drilling contract to be let by the Agency. The test holes should be drilled to a depth of about 50 feet below the water table. The estimated depths of the proposed test holes are from 200 to 600 feet. The holes should be developed by airlifting or bailing to insure that they reflect the true water level.

Test drilling or seismic surveys probably will not be necessary to estimate the quantity of ground-water contributed from San Gorgonio Pass to the ground-water outflow through the narrows in sec. 8, T. 3 S., R. 3 E. If at a later date the Agency needs a refined outflow estimate, test drilling or seismic surveys, or both, will probably be necessary.

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