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HYDROLOGIC INVESTIGATIONS
ATLAS HA-236

GROUND WATER IN BLACK SQUIRREL CREEK VALLEY, EL PASO COUNTY, COLORADO

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INTRODUCTION

Black Squirrel Creek valley is in east-central Colorado 25 miles east of Colorado Springs. The valley is semiarid, and principal part of the growing season—April through August, most of the precipitation occurs as thunderstorms during the Average annual precipitation at Big Springs Ranch near Elliott was 11.7 inches during 1951-60.

Black Squirrel Creek valley is a broad, nearly level plain. Because storms may be separated by long dry periods, most crops in the valley are irrigated with ground water. The surrounding areas are used for ranching. Both alluvium and bedrock stock and domestic wells. Larger yielding wells, 100 to more than 1,600 gpm (gallons per minute), may be drilled only in the alluvium in Black Squirrel Creek and its major tributaries. The purpose of this study was to determine ground-water conditions in the alluvium in 1964 and to point out possible effects of further ground-water development.

GEOLOGY

Alluvium in the Black Squirrel Creek valley contains chiefly of clay, silt, sand, and gravel of Pleistocene age. The alluvium is underlain by a thick sequence of Upper Cretaceous to Paleocene rock, sandstone, and arkosic conglomerate, which dips northward into a large structural basin. Because the unconsolidated deposits were derived principally from the bedrock formations, they are similar in the bedrock formations in color and texture. However, the alluvium is coarser grained and is more permeable than the bedrock. The alluvium was deposited in deep, narrow channels that trend south and southeast, as indicated on the bedrock-contour map. Its thickness ranges from a few feet to about 200 feet. Although data are inadequate to delineate the principal channel in the southern part of the valley, drillers' logs indicate that the channel continues southward to the Arkansas River valley. During Recent time, windblown sand and silt covered part of the valley, and streams have cut shallow channels in the sand and silt that have little relation to earlier channels.

GROUND WATER

The alluvial aquifer is recharged by infiltration of surface runoff originating in the valley above the project area, by underflow in channels, and from precipitation in the area. The aquifer is discharged by underflow out of the valley, by pumping, by evapotranspiration.

Underflow at the southern end of the valley is approximately equal to the underflow determined for section C-C′ (or 10,000 acre-feet per year. Irrigation pumpage from 95 wells and surface diversions during 1964, calculated from fuel and electric-power records, was 8,500 acre-feet. In March 1964, the Cheyenne Water District began pumping from eight large-capacity wells to provide municipal water for Colorado Springs. Municipal water delivered during the year was 5,200 acre-feet. Only a part of the water pumped for irrigation (less than 25 percent) returns to the aquifer; none of the municipal water returns. The quantity of water discharged by evapotranspiration and by infiltration to bedrock is unknown. Nonbenefical evaporation is operative where the depth to water is less than 10 feet are small. Most evaporation from the water table is beneficial and areas where the depth to water is less than 10 feet are small. Infiltration to bedrock is probably small because permeability of the sandstone and conglomerate is low, and the table is nearly impermeable. The performance of three wells tapping the alluvium on the principal channel is shown in the summary table of aquifer tests.

Configuration of the water table, depth to water, and saturated thickness shown on this atlas are representative of ground-water conditions during 1964. Local depressions in the water table are largely due to pumping and represent losses from storage. Also noted, but not shown, are many zones of "perched" ground water, principally in shallow Recent deposits. Wells in the Dawson deposits generally yield only a few gallons per minute and are unaffected by fluctuations of water level in the deeper aquifer. Pumpage in the perched ground-water zone does not affect storage in the deeper aquifer. The quantities of ground water in storage in the deeper aquifer in 1964 are estimated to be 20 percent of the volume of saturated material (based on previous studies of alluvial valleys in Colorado), or 400,000 acre-feet.

Observation-well records indicate that water levels rose during a brief period of high precipitation (1957-58) and gradually declined 2 to 7 feet by 1964. Declines of water level near the

CONCLUSIONS

Ground water may be pumped for short periods at a rate exceeding the underflow without seriously depleting the aquifer because of the large amount of water in storage compared with the amount pumped. If pumping greatly exceeds recharge year after year, depressions in the water table surrounding heavily pumped areas will spread and will reduce yields in adjacent wells; storage in the aquifer will gradually reduced, and, eventually, underflow out of the valley will decrease. Because it is economically feasible to pump large-capacity wells when yields are small, some water will always be available for domestic and stock uses.

If the ground-water resources of Black Squirrel Creek valley are to be fully utilized, more water could be pumped in the upper and lower parts of the valley. The results of more pumping in the valley would be both detrimental and beneficial. A general decline in water levels would cause an increase in pumping lifts, a reduction in well yields, and an increase in salinity. Benefits would include a reduction in nonbeneficial evaporatranspiration, creation of additional storage space by salvage of excess surface runoff, a decrease in underflow out of the valley, and utilization of the large quantity of water in storage.

Periodic measurements of water levels in selected wells should be continued to aid in planning further ground-water development.

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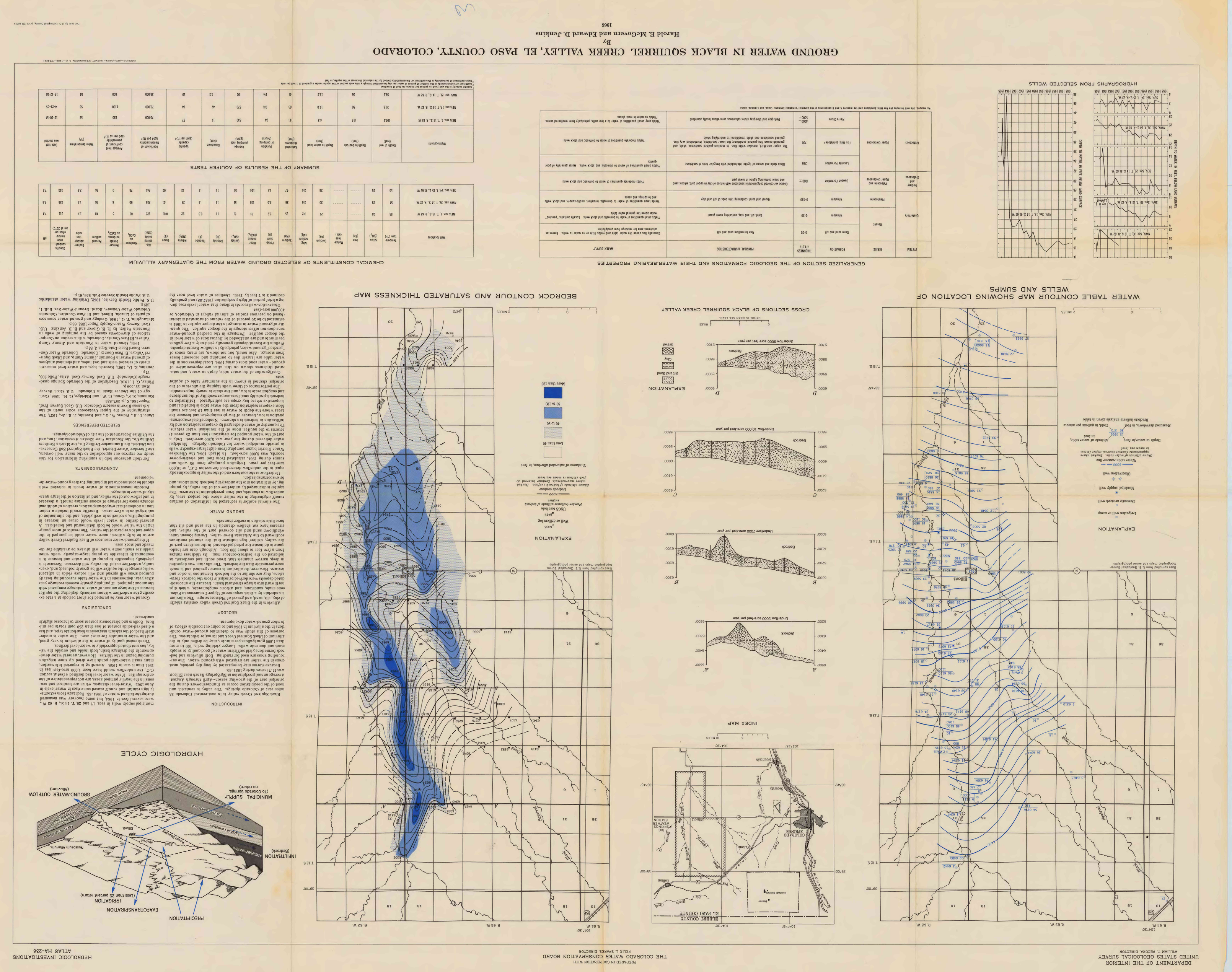

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