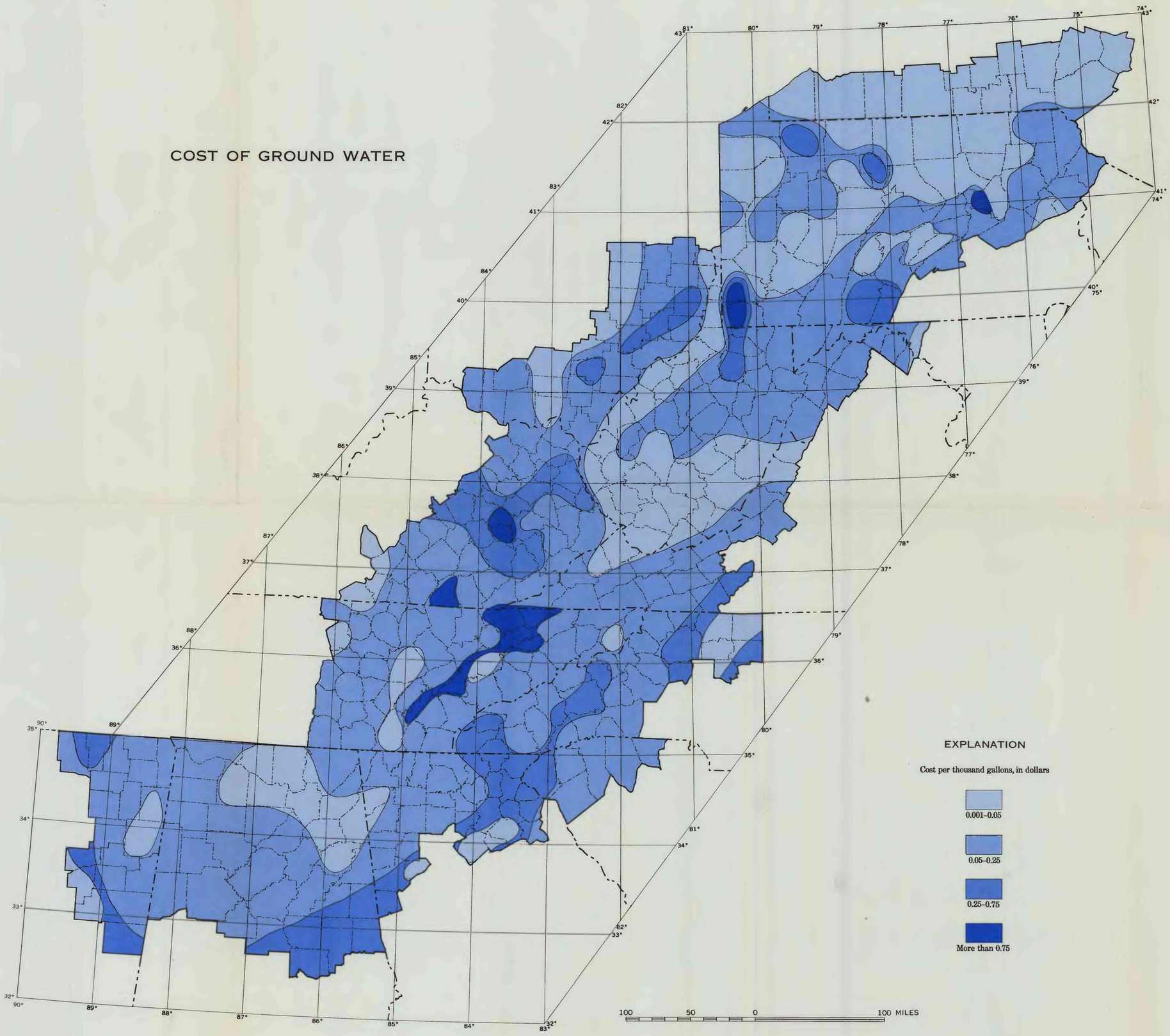
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
DEPARTMENT OF THE ARMY
OFFICE OF THE APPALACHIAN STUDIES CORPS OF ENGINEERS

HYDROLOGIC INVESTIGATIONS
ATLAS HA-295 (SHEET 4 OF 4)

COST OF GROUND WATER



This map shows the approximate *minimum* cost per thousand gallons of ground water delivered at the well head from well fields obtaining 1 mgd (million gallons per day) based upon the assumptions indicated. It was assumed that a well field would be constructed to yield 1 mgd in each county. Each such well field was assumed to be constructed at the optimum site in the county on the basis of yield regardless of location or distance to points of use.

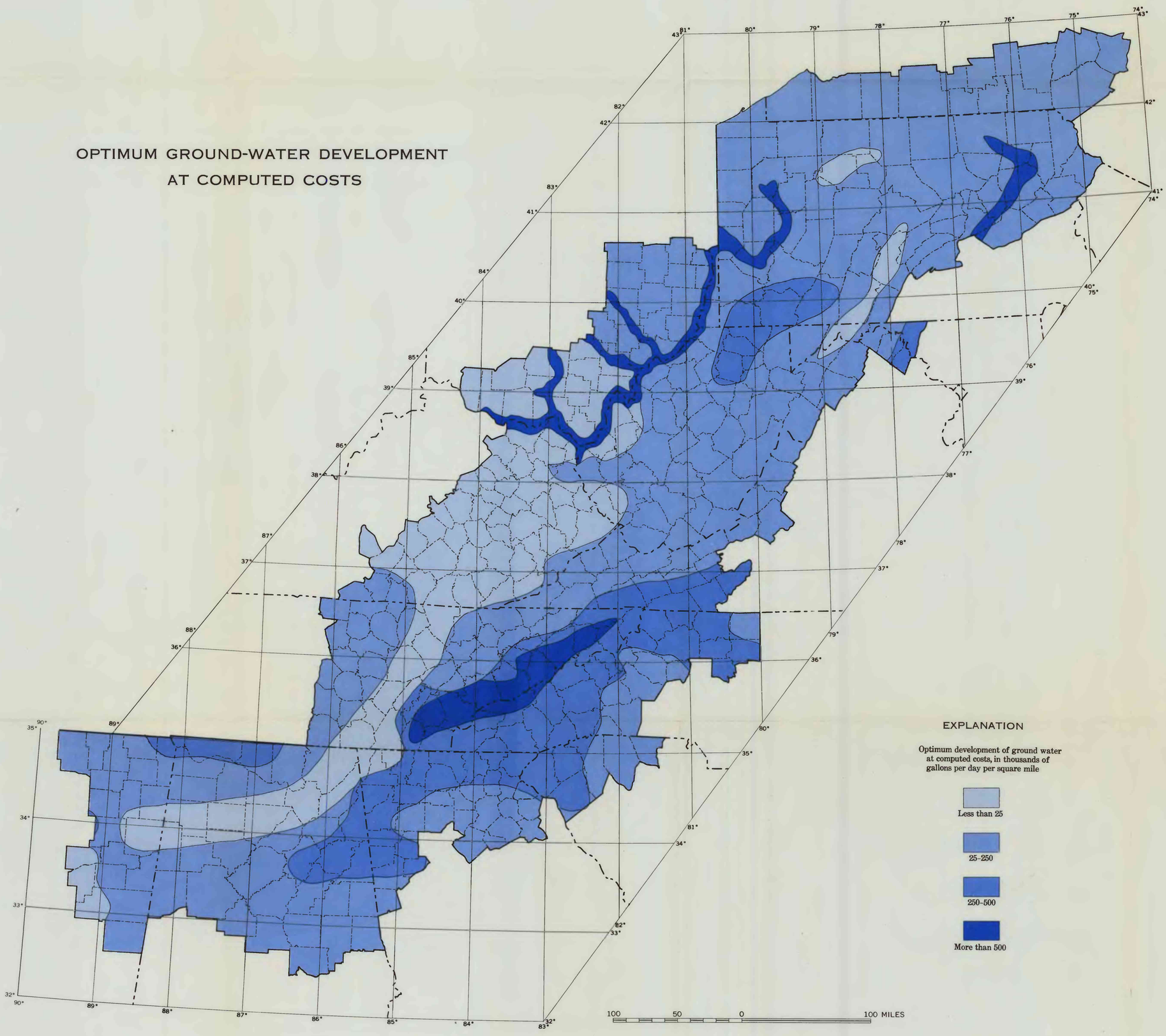
The costs of constructing the well fields have previously been indicated on the map entitled "The Cost of Well Fields." The construction costs were depreciated over a 25-year period at 3¾ percent interest, according to standard interest formulas. The cost of construction and interest were related to a pumping rate of 1 mgd for a 25-year period to derive an "overhead" cost per 1,000 gallons.

The cost of pumping was based upon an assumed electric power rate of $0.025 per kilowatt hour. The power used to pump 1 mgd was based upon 90 percent pump efficiency and continuous 24-hour pumpage at sufficient horsepower to lift 1 mgd against the total estimated head. The daily cost of pumping was related to 1 mgd to derive "pumping" costs per 1,000 gallons.

The sum of the overhead and the pumping cost for each county gives a cost per 1,000 gallons of water at the well head. This cost does not include water treatment, nor does it include cost of land, of exploratory drilling, or of testing. The cost of water shown on the map indicates the approximate minimum cost by counties. The cost of water in amounts less than 1 mgd would generally be less than the cost shown if a single well supplies all of the required water. The cost of water in amounts greater than 1 mgd would be the same as that shown on the map except that where individual wells yield more than 1 mgd the cost of water per 1,000 gallons would be less than that shown.

Those contemplating the development of ground-water supplies in the region should use these cost figures only for preliminary comparisons similar to their intended uses in regional planning. For the actual location and design of well fields competent geologic and engineering advice should be sought.

OPTIMUM GROUND-WATER DEVELOPMENT AT COMPUTED COSTS



This map indicates the optimum amount of ground water, in gallons per day per square mile, that may be developed in the region at the computed cost. The map is not intended to indicate the maximum amount of ground water that is available for development. In most counties the optimum amount is between 25 percent and 50 percent of the maximum amount available under existing natural conditions. The optimum amount of ground water is based upon cost figures used on previous sheets of this atlas and the development of ground water in the amounts indicated on this sheet would be within those costs.

Two principal factors were used to calculate the optimum development of ground water. The first factor is the amount of ground-water discharge that may be salvaged for use without the areal lowering of water levels. The second factor is the additional amount of ground water that is available by areal lowering of the water levels to the depths used on previous sheets for the calculated pumping costs. The sum of the two factors is taken as the optimum amount of ground water for development. These factors were used for calculations throughout the region, except along major streams containing thick, well-sorted sediments that allow stream infiltration to well fields. Along such streams, where the low flow exceeded 500,000 gallons per day, the calculations were based upon well spacing and pumping rates.

The development of ground water in excess of the amounts indicated on this map is possible but the costs would increase considerably over those given on previous sheets of this atlas.

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GROUND-WATER RESOURCES OF THE APPALACHIAN REGION

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