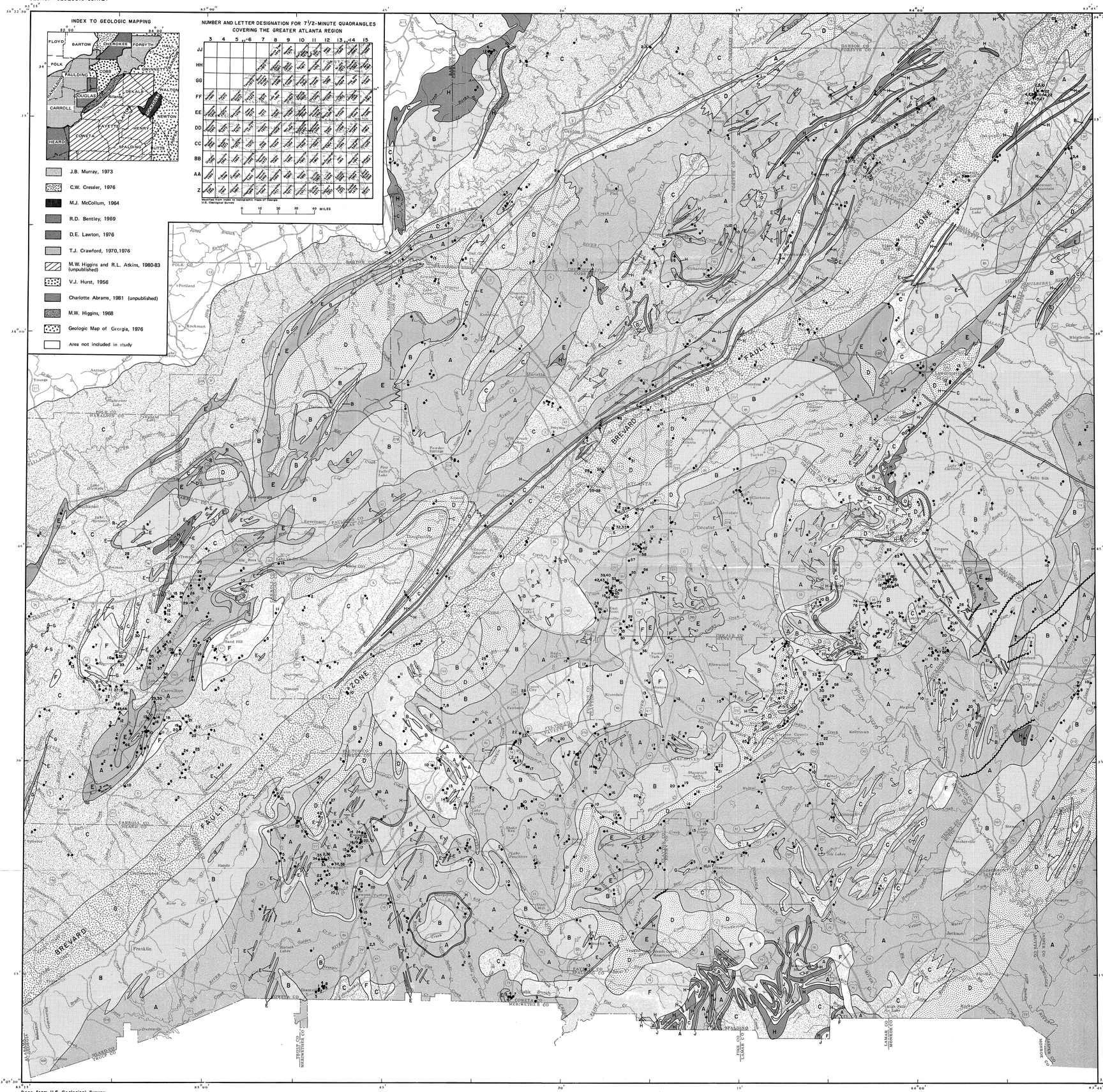
GEORGIA DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION
GEORGIA GEOLOGIC SURVEY

Prepared in cooperation with the
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

INFORMATION CIRCULAR 63
PLATE I



EXPLANATION

Principal Water-Bearing Units

A

YIELD—Well yields range from 20 to 275 gal/min, averaging 56 gal/min.
DEPTH—Wells range in depth from 35 to 2,175 ft, averaging 294 ft. Casing depths range from 0 to 200 ft, averaging 60 ft.
TOPOGRAPHIC SETTINGS—Twenty-two percent of the wells occupy slopes, 35 percent are in broad lowlands, 22 percent are on uplands-ridge crests, and 4 percent are in draws and hollows.
METHODS—Effective methods for selecting high-yielding well sites are (1) contact zones within multilayered rock units, (2) small-scale structures that localize drainage development, (3) zones of fracture concentration, (4) topography and soil thickness, and (5) stress relief fractures in settings similar to the one shown in figure 28. In the area of dendritic drainage, the methods are effective mainly in headwaters areas, especially where the strike of the rock layers and drainage courses are parallel.
ROCK TYPE—Unit A is a complex aquifer consisting of interlayered amphibolite, gneiss, and schist in varying proportions and thicknesses. In some areas the unit is predominantly amphibolite containing thin layers of gneiss. In others, the dominant rock type is gneiss interlayered with amphibolite or schist, or both. Also common are areas of gneiss interlayered with schist and schist interlayered with gneiss. Interlayering of two different lithologies, and commonly three, is highly significant because the contact zones between the contrasting layers have the potential for developing increased permeability. Wells in the unit may penetrate several permeable contact zones that contribute to the total yield.

B

YIELD—Well yields in Unit B range from 20 to 348 gal/min, averaging 72 gal/min.
DEPTH—Wells range in depth from 40 to 825 ft, averaging 271 ft. Casing depths range from 3 to 266 ft, averaging 34 ft.
TOPOGRAPHIC SETTINGS—Thirty-three percent of the wells occupy slopes, 45 percent are in broad lowlands, 2 percent are on uplands-ridge crests, and 14 percent are in draws and hollows.
METHODS—Effective methods for well site selection are (1) stress relief fractures in topographic settings similar to those shown in figures 12-14 and 28, (2) shear zones, (3) contact zones with Units A, C, E, and possibly G, (4) small-scale structures that localize drainage development, and (5) fault zones. In the area of dendritic drainage, the last three methods are effective mainly in headwaters areas.
ROCK TYPE—Unit B consists of granitic gneiss containing biotite, muscovite, quartz, and feldspar in order of increasing abundance. In some areas the unit includes layers of amphibolite and other rocks.

C

YIELD—Well yields range from 20 to 150 gal/min, averaging 47 gal/min.
DEPTH—Wells range in depth from 67 to 700 ft, averaging 195 ft. Casing depths range from 4 to 144 ft, averaging 53 ft.
TOPOGRAPHIC SETTINGS—Nineteen percent of the wells occupy slopes, 19 percent are in broad lowlands, 27 percent are on uplands-ridge crests, and 20 percent are in draws and hollows.
METHODS—Effective methods for selecting well sites are (1) small-scale structures that localize drainage development, (2) contact zones with Units B, D, E, F, H, and in some areas G, and (3) contact zones between schists and graywacke and quartzite layers within the unit. In the area of dendritic drainage, the methods will be effective mainly in headwaters areas.
ROCK TYPE—The unit consists of muscovite, feldspar, sillimanite, and quartz schists locally interlayered with thin to thick beds of graywacke, quartzite, and other rocks. Garnet, graphite, and biotite are common accessary minerals. In places, the schists are interlayered with hornblendic units.

D

YIELD—Well yields range from 20 to 351 gal/min, averaging 56 gal/min.
DEPTH—Wells range in depth from 82 to 710 ft, averaging 270 ft. Casing depths range from 7 to 140 ft, averaging 36 ft.
TOPOGRAPHIC SETTINGS—Twenty percent of the wells occupy slopes, 27 percent are in broad lowlands, 36 percent are on uplands-ridge crests, and 6 percent are in draws and hollows.
METHODS—Effective methods for selecting well sites are (1) small-scale structures that localize drainage development, (2) contact zones between rocks of contrasting character, both with Units A, C, E, and G at the edge of the unit and with dissimilar rock layers within the unit, (3) topography and soil thickness, (4) fault zones, and (5) stress relief fractures. In the area of dendritic drainage, the first four methods are effective mainly in headwaters areas. Stress relief fractures may be present beneath topographic settings similar to those shown in figures 12-14 and 28.
ROCK TYPE—The principal rock type in the unit is biotite gneiss. In some areas, lenses of amphibolite and layers of schist and other rocks also occur. Deep weathering and a thick red soil characterize the unit.

E

YIELD—Well yields range from 20 to 471 gal/min, averaging 79 gal/min.
DEPTH—Wells range in depth from 67 to 386 ft, averaging 191 ft. Casing depths range from 8 to 116 ft, averaging 46 ft.
TOPOGRAPHIC SETTINGS—Seventeen percent of the wells occupy slopes, 35 percent are in broad lowlands, 28 percent are on uplands-ridge crests, and 3 percent are in draws and hollows.
METHODS—Effective methods for selecting well sites are (1) contact zones with Units B, C, D, F, and G, (2) small-scale structures that localize drainage development, (3) zones of fracture concentration that parallel drainages, and (4) stress relief fractures. In the area of dendritic drainage, the first three methods are effective mainly in headwaters areas.
ROCK TYPE—The unit consists of metamorphosed mafic rocks, including amphibolite, hornblende gneiss, metagabbro, metavolcanics, and metamorphosed ultramafic rocks (mafic rocks without feldspar). Locally the rocks are chloritized. Diabase, a dark intrusive rock that forms dikes, also is part of this unit. Interlayers of biotite and granitic gneiss and schist also occur.

F

YIELD—Well yields range from 20 to 150 gal/min, averaging 43 gal/min.
DEPTH—Wells range in depth from 43 to 422 ft, averaging 192 ft. Casing depths range from 11 to 187 ft, averaging 57 ft.
TOPOGRAPHIC SETTINGS—Thirty percent of the wells occupy slopes, 30 percent are in broad lowlands, 15 percent are on uplands-ridge crests, and 15 percent are in draws and hollows.
METHODS—Effective methods for selecting well sites are (1) contact zones with Units A, C, E, G, and possibly Unit D depending on the degree of foliation, and with inclusions of contrasting character, (2) small-scale structures that localize drainage development, (3) topography and soil thickness where low bedrock permeability requires the use of bored wells, (4) zones of fracture concentration, and (5) fault zones. The methods should be most useful in headwaters areas, except for (3) which can be applied in most areas having a suitable combination of topographic setting and saprolite thickness.
ROCK TYPE—The unit consists primarily of muscovite and biotite granite. Inclusions of schist, gneiss, amphibolite, and other rocks may occur locally.

G

YIELD—Well yields range from 20 to 225 gal/min, averaging 74 gal/min.
DEPTH—Wells range in depth from 110 to 800 ft, averaging 323 ft. Casing depths range from 8 to 207 ft, averaging 84 ft.
TOPOGRAPHIC SETTINGS—Four percent of the wells occupy slopes, 75 percent are in broad lowlands, 15 percent are on uplands-ridge crests, and 4 percent are in draws and hollows.
METHODS—Effective methods for selecting well sites are (1) small-scale structures that localize drainage development, including the dip and strike of foliation and layering, (2) contact zones between rock layers of contrasting character where exposures are adequate to reveal rock types in low-lying areas, and (3) topography and soil thickness.
ROCK TYPE—The unit includes a variety of cataclastic rocks formed by the crushing and fracturing of preexisting rocks as a result of mechanical forces, as well as unaltered rocks from other units. Some of the most common cataclastic rocks are mylonite, phyllonite, and button schist, all classified according to texture rather than mineralogy.

H

YIELD—Well yields range from 20 to 200 gal/min, averaging 72 gal/min.
DEPTH—Wells range in depth from 122 to 500 ft, averaging 297 ft. Casing depths range from 30 to 85 ft, averaging 38 ft.
TOPOGRAPHIC SETTINGS—Forty-five percent of the wells occupy slopes, 9 percent are in broad lowlands, 27 percent are on uplands-ridge crests, and 18 percent are in draws and hollows.
METHODS—Effective methods for selecting well sites are (1) small-scale structures that localize drainage development, especially the dip and strike of layering and jointing, (2) contact zones, mainly with Units A and C, and (3) zones of fracture concentration in favorable topographic settings. In the area of dendritic drainage, the methods are mainly effective in headwaters areas.
ROCK TYPE—The unit consists mainly of muscovite-bearing quartzite that in the south part of the area commonly contains garnet and sillimanite. In some areas the quartzite is interlayered with phyllite or schist.

J

YIELD—Well yields in Unit J range from 31-150 gal/min, averaging 76 gal/min.
DEPTH—Wells range in depth from 240 to 505 ft, averaging 376 ft. Casing depths range from 28 to 314 ft, averaging 138 ft.
TOPOGRAPHIC SETTINGS—One hundred percent of the wells are in broad lowlands.
METHODS—Effective methods for well site selection are (1) small-scale structures that localize drainage development, (2) topography and soil thickness, and (3) zones of fracture concentration, taking into account surface indications of bedrock permeability such as lines of sinkholes and depressions, and straight stream and valley segments. In the area of dendritic drainage, the methods may be effective mainly in headwaters areas.
ROCK TYPE—In the north half of the area, Unit J consists of micaceous marble and calcareous mica schist. Being highly soluble, much of the unit accumulates a thick soil cover and is poorly exposed. Outcrop widths indicate that the unit probably is several hundred feet thick. In the south part of the area, the unit consists of 50 to 200 ft of thinly layered calcareous metatuff containing lenses and layers of calcite marble.

CONTACT—Approximately located; dashed where less accurate; dotted where concealed

SHEAR ZONE

WELL AND IDENTIFICATION NUMBER

Cartography by Willis G. Hester and Ellie S. Block

WATER-BEARING UNITS AND LOCATIONS OF HIGH-YIELDING WELLS IN THE GREATER ATLANTA REGION, GEORGIA.