DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

WATER-RESOURCES INVESTIGATIONS REPORT 88-4061

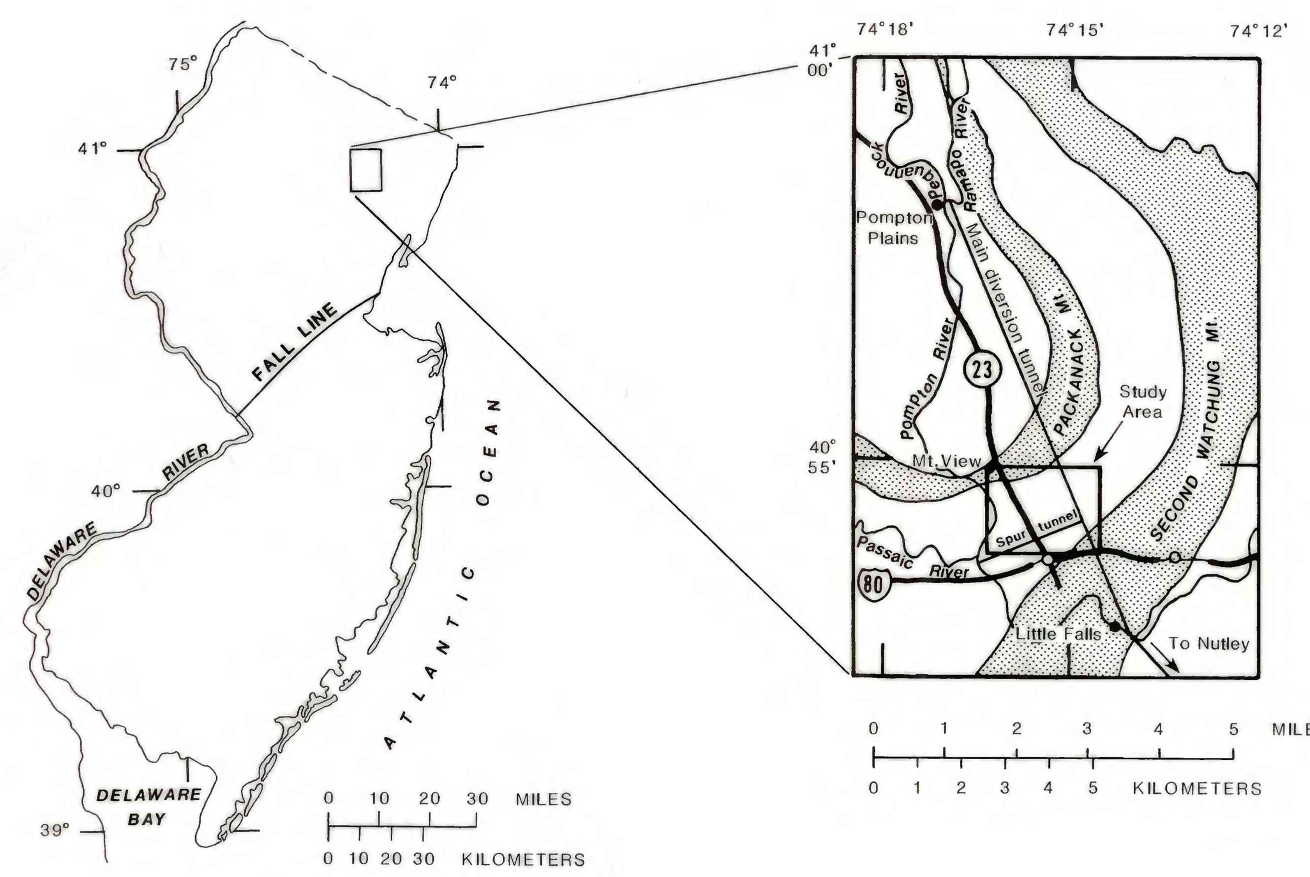

Figure 1.--Index maps showing the location of the study area and proposed flood water diversion tunnel

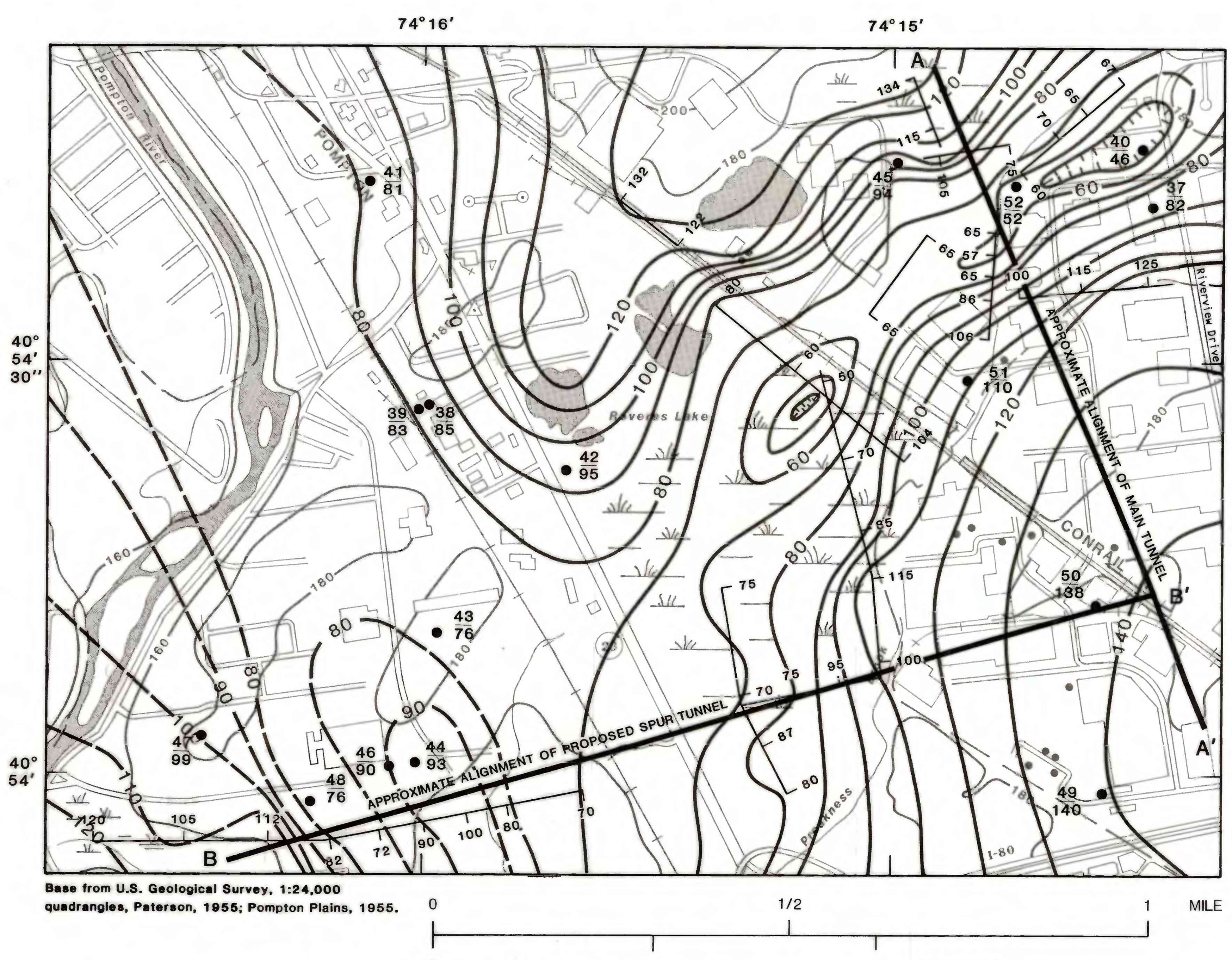

Figure 2.--Bedrock-surface contour map and proposed tunnel alignments

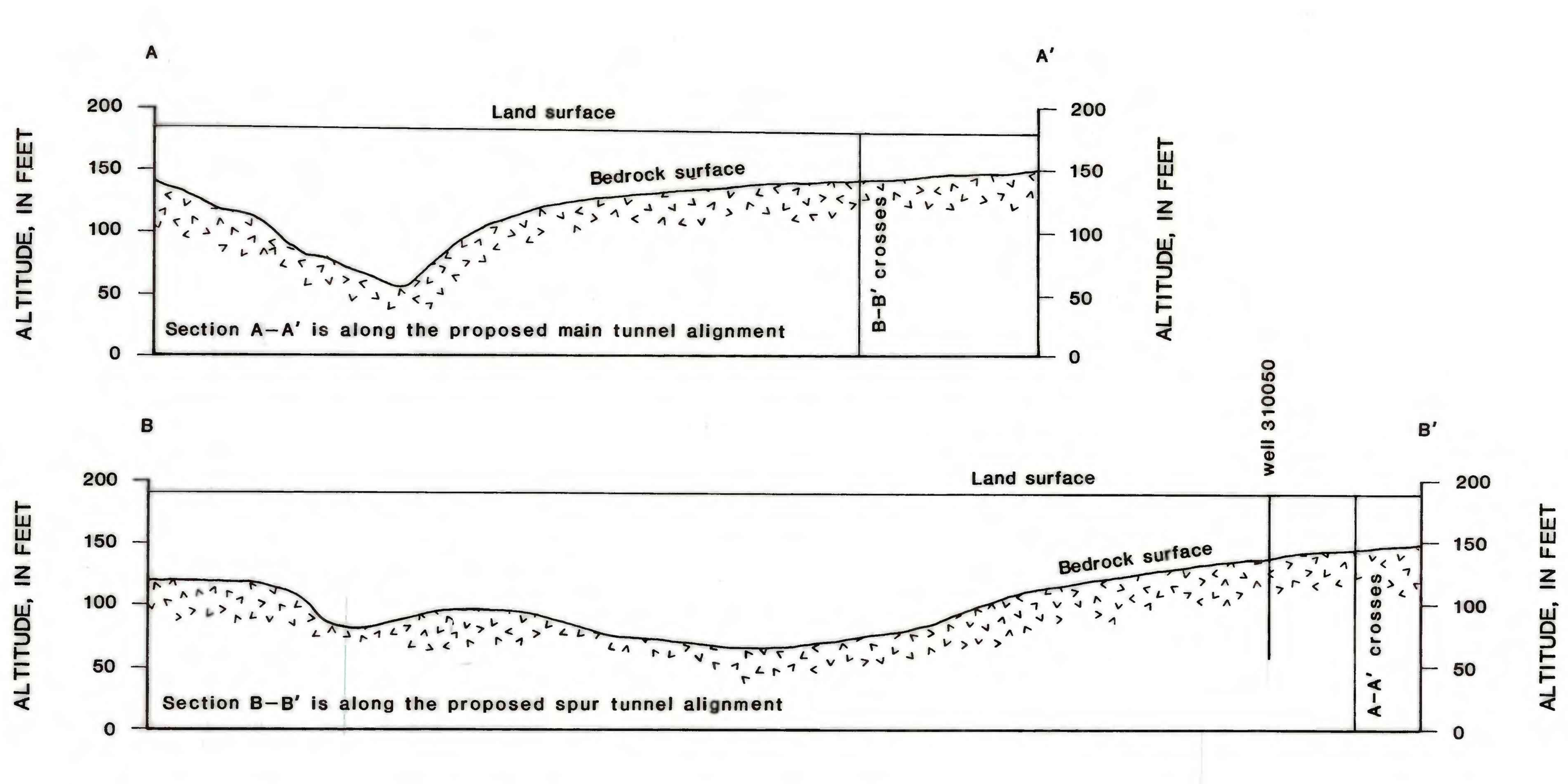

Figure 3.--Cross section showing land surface and bedrock-surface topography of the proposed tunnel alignments

EXPLANATION

65 65 — Location of seismic refraction traverse line; number is calculated altitude of the bedrock surface.

A —— A' — Cross section of surface and bedrock topography along approximate alignment of water diversion tunnel.

80 — — Bedrock contour--Altitude of bedrock surface in feet above sea level; dashed where approximately located; contour interval 10 feet.

● 37 / 82 — Well or borehole--Lower number is altitude of bedrock surface in feet above sea level. Upper number is abbreviated USGS well-identification number. 31-00 is omitted from each number.

INTRODUCTION

The U.S. Army Corps of Engineers has proposed the construction of a 13.5-mile long, 39-foot diameter diversion tunnel to control the periodic heavy flooding of the Passaic River in northeast New Jersey. The proposed tunnel will be constructed in the bedrock and will run from the confluence of the Ramapo and Pequannock Rivers south southeastward to the Passaic River, near Little Falls, and then southeastward to Nutley, where the outlet will be located (fig. 1). The construction of a 1.2-mile long, 22-foot diameter spur tunnel also is proposed. The inlet for the spur tunnel would be just downstream from the confluence of the Passaic and Pompton Rivers. The northern limit of the proposed route for the spur tunnel and an approximate location where the two tunnels would converge are shown in the bedrock-surface contour map (fig. 2).

The altitude of the bottom of the main diversion tunnel is planned to be near sea level in the study area. The U.S. Army Corps of Engineers requires at least 40 feet of bedrock above the top of both the main and spur tunnels for construction and engineering purposes. However, well and borehole data immediately west of the study area show that the bedrock surface is 10 feet below sea level in a buried valley (Nichols, 1968). Additional borehole data near the main tunnel alignment indicate that the bedrock could be quite deep, and, therefore, the U.S. Army Corps of Engineers required additional subsurface data to confirm the altitude of the bedrock surface in this area. If the buried valley west of the study area extends across the proposed alignment of the tunnels, then the U.S. Army Corps of Engineers would have to reconsider the tunnel location or design.

The purpose of this study, which was done in cooperation with the U.S. Army Corps of Engineers, was to collect and analyze subsurface data and to contour the altitude of the buried bedrock surface in parts of Passaic County, N.J., with particular emphasis on the bedrock surface along the two potential tunnel alignments south and east of the village of Mt. View (fig. 1).

DESCRIPTION OF THE STUDY AREA

The study area is bounded on the north by Packanack Mountain, on the west by the Pompton River, on the south by Interstate 80, and on the east by Riverview Drive and the main diversion tunnel alignment (see figs. 1 and 2). In the study area, the Preakness Basalt and the Hook Mountain Basalt of the Brunswick Group (Early Jurassic) form the Second Watchung and Packanack Mountains, respectively. These more resistant basalts form the bedrock of the valley sides, while the more easily eroded siltstone, sandstone and mudstone of the Towaco Formation of the Brunswick Group form the bedrock valley bottom between the Second Watchung and Packanack Mountains (Lyttle and Epstein, 1987).

The bedrock surface in the valley is overlain by glacial deposits of Pleistocene age that range in thickness from 0 to approximately 150 feet. The valley fill consists of kame deposits and glaciolacustrine deposits of fine-grained sand, silt, and clay (Carswell and Rooney, 1976).

PREVIOUS INVESTIGATIONS

Carswell and Rooney (1976) show subsurface data, wells, and the altitude of the bedrock surface in Passaic County. Nichols (1968) shows the altitude of the buried bedrock surface topography for eastern Morris and western Essex Counties. Henderson and others (1957, 1963) delineate the basalt units in aeromagnetic maps of the study area.

METHODS OF INVESTIGATION

Well logs from 16 wells in the study area and seismic-refraction data from 30 traverses were used to obtain information on the altitude of the bedrock surface. The well-log data were used as a primary control, and seismic-refraction data, collected in 1986, were analyzed and used as a secondary control. Seismic-refraction data were collected using a 12-channel seismograph, 8 and 50 hertz geophones, and various explosive seismic sound sources. The data were analyzed using the delay time (Scott and others, 1972), time intercept, and crossover-distance techniques (Haeni, 1986).

SUBSURFACE DATA AND DISCUSSION

Contouring of the bedrock surface is based on information obtained from well logs; bedrock outcrops north of the study area; modification of parts of Nichols' (1968) bedrock surface map, and Carswell and Rooney's (1976) thickness of unconsolidated sediment map; and seismic-refraction data. The well sites were field checked to insure that they are properly located on the map. The seismic data show that the seismic velocity of the unconsolidated sediments ranges from 3,940 to 6,370 ft/s (feet per second) with a mean of 4,990 ft/s; the seismic velocity of the bedrock ranges from 11,195 to 13,841 ft/s, with a mean of 12,614 ft/s.

The contoured bedrock-surface topography shows a narrow northeast-southwest trending bedrock valley that is approximately 0.5-mile wide. The narrow bedrock valley extends southwesterly to intersect a broad, northwest-southeast trending segment of a larger bedrock valley. It is interpreted that this narrow valley, with areas that are overdeepened (as is shown by the closed contours), was formed or modified by glacial erosion during the Pleistocene Epoch (Carswell and Rooney, 1976). The bottom of the narrow bedrock valley generally is about 65 feet above sea level, although locally it may have altitudes of about 40 feet above sea level (figs. 2 and 3). The bottom of the wide bedrock valley is generally about 75 feet above sea level (figs. 2 and 3). The bedrock-surface topography in the southwest part of the map may be interpreted in more than one way. The contour lines are dashed to reflect the variability in interpretation of this surface.

REFERENCES

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MAP OF BEDROCK-SURFACE TOPOGRAPHY IN PARTS OF THE PATERSON AND POMPTON PLAINS QUADRANGLES, NEW JERSEY

by

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