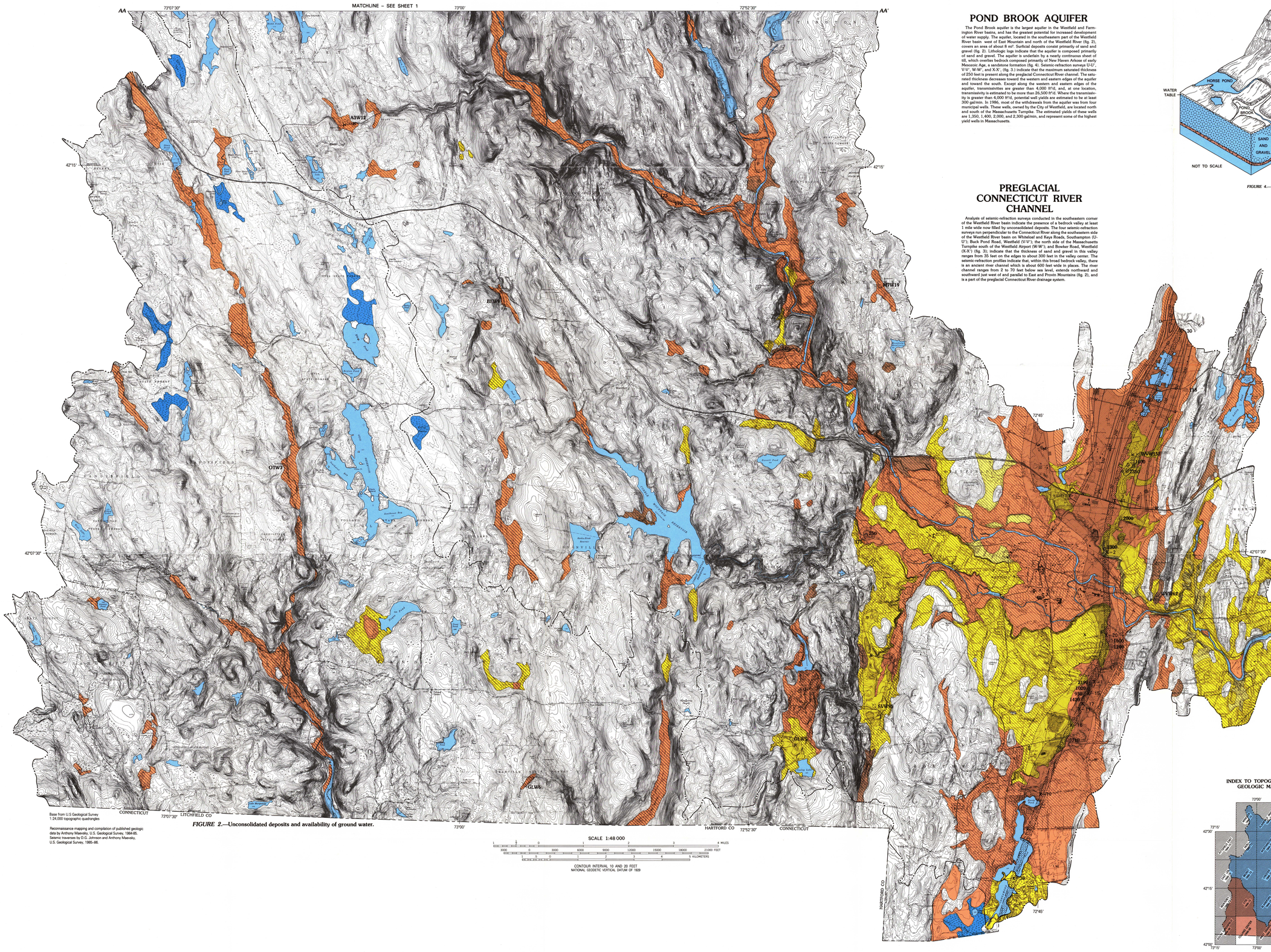
PREPARED IN COOPERATION WITH THE
COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF WATER RESOURCES
BOSTON, MASSACHUSETTS



POND BROOK AQUIFER

The Pond Brook aquifer is the largest aquifer in the Westfield and Farmington River basins, and has the greatest potential for increased development of water supply. The aquifer, located in the southeastern part of the Westfield River basin west of East Mountain and north of the Westfield River (fig. 2), covers an area of about 8 mi². Surficial deposits consist primarily of sand and gravel (fig. 2). Lithologic logs indicate that the aquifer is composed primarily of sand and gravel. The aquifer is underlain by a nearly continuous sheet of till, which overlies bedrock composed primarily of New Haven Arkose of early Mesozoic Age, a sandstone formation (fig. 4). Seismic-refraction surveys U-U', V-V', W-W', and X-X', (fig. 3.) indicate that the maximum saturated thickness of 250 feet is present along the preglacial Connecticut River channel. The saturated thickness decreases toward the western and eastern edges of the aquifer and toward the south. Except along the western and eastern edges of the aquifer, transmissivities are greater than 4,000 ft²/d, and, at one location, transmissivity is estimated to be more than 26,500 ft²/d. Where the transmissivity is greater than 4,000 ft²/d, potential well yields are estimated to be at least 300 gal/min. In 1986, most of the withdrawals from the aquifer was from four municipal wells. These wells, owned by the City of Westfield, are located north and south of the Massachusetts Turnpike. The estimated yields of these wells are 1,350, 1,400, 2,000, and 2,300 gal/min, and represent some of the highest yield wells in Massachusetts.

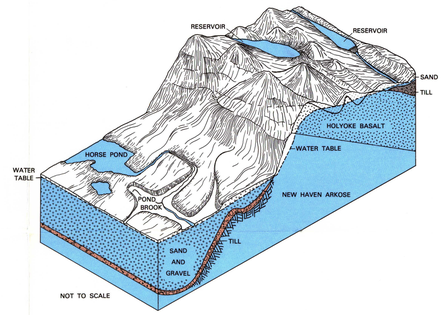


FIGURE 4.—Idealized section of the Pond Brook aquifer.

PREGLACIAL CONNECTICUT RIVER CHANNEL

Analysis of seismic-refraction surveys conducted in the southeastern corner of the Westfield River basin indicate the presence of a bedrock valley at least 1 mile wide now filled by unconsolidated deposits. The four seismic-refraction surveys run perpendicular to the Connecticut River along the southeastern side of the Westfield River basin on Whitelaof and Keys Roads, Southampton (U-U'); Buck Pond Road, Westfield (V-V'); the north side of the Massachusetts Turnpike south of the Westfield Airport (W-W'); and Bowker Road, Westfield (X-X') (fig. 3); indicate that the thickness of sand and gravel in this valley ranges from 35 feet on the edges to about 300 feet in the valley center. The seismic-refraction profiles indicate that, within this broad bedrock valley, there is an ancient river channel which is about 600 feet wide in places. The river channel ranges from 2 to 70 feet below sea level, extends northward and southward just west of and parallel to East and Provin Mountains (fig. 2), and is a part of the preglacial Connecticut River drainage system.

EXPLANATION

Surficial Geology

- GRAVEL – Well-sorted to poorly sorted stratified gravel; gravel, sand, and discontinuous lenses of fine sand
- SAND AND GRAVEL – Thinly layered, well-sorted sand and gravel; or pocket lenses of well-sorted to poorly sorted sand and gravel within the layered material
- SAND – Stratified sand with minor amounts of gravel and fine sand. Commonly well-sorted to poorly sorted
- FINE SAND, SILT, AND CLAY – Lacustrine deposits of stratified fine sand and discontinuous layers of silt and clay, contains scattered pebbles. Well-sorted very fine sand and silt locally alternates with well-sorted clay, or forms massive beds of very fine sand, silt, and clay. Thickness ranges from a few feet to more than 210 feet
- WETLAND DEPOSITS – Dark, decomposed organic matter (peat and muck) interbedded and intermixed in places with various amounts of sand, silt, clay, and scattered stones. Deposits generally are less than 5 feet thick but are as much as 25 feet thick locally
- TILL AND BEDROCK – Till is an unstratified, unsorted mixture of boulders, gravel, sand, silt, and clay. Two types of till are: (1) sandy, loose, very stony in places, and commonly less than 10 feet thick; and (2) silt- and clay-rich, with minor amounts of sand, few large stones, generally slightly to very compact, and a few feet to more than 205 feet thick. Where two types of till are found together, loose, sandy till invariably overlies finer, compact till. Bedrock is exposed at the land surface throughout the basins
- 118 PUBLIC-SUPPLY WELL – Number indicates estimated yield, in gallons per minute
- WVW162 GROUND-WATER OBSERVATION WELL – WVW 162 is the local well number, which consists of a three-character alphanumeric code indicating the town and a sequential number assigned by the U.S. Geological Survey for wells within that town
- BASIN BOUNDARY
- 60 BEDROCK CONTOUR – Shows altitude of bedrock surface. Contour interval 50 feet. National Geodetic Vertical Datum of 1929
- LOCATION OF PREGLACIAL CONNECTICUT RIVER CHANNEL
- LOCATION OF SEISMIC-REFRACTION SURVEY
- X – 41 KNOWN ALTITUDE OF BEDROCK, IN FEET BELOW SEA LEVEL

Transmissivity

Transmissivity of the sand and gravel was calculated by two methods: (1) from specific-capacity and lithologic logs of 20 wells, and (2) from hydraulic-conductivity and saturated-thickness values of 210 wells and borings in sand and gravel deposits. Transmissivity of glacial drift ranges from less than 4 ft²/d (feet squared per day) for thin silt, clay, and till, to more than 26,500 ft²/d for thick sand and gravel. The transmissivity estimates illustrated in figure 2 are:

- Transmissivity greater than 4,000 ft²/d (potential well yield greater than 300 gal/min)
- Transmissivity 1,400 to 4,000 ft²/d (potential well yield 100 to 300 gal/min)
- Transmissivity 100 to 1,400 ft²/d (potential well yield less than 100 gal/min)
- Transmissivity less than 100 ft²/d (potential well yield less than 10 gal/min)

Base from U.S Geological Survey
1:24,000 topographic quadrangles

Reconnaissance mapping and compilation of published geologic data by Anthony Maevsky, U.S. Geological Survey, 1984-85.
Seismic traverses by D.G. Johnson and Anthony Maevsky, U.S. Geological Survey, 1985–86.

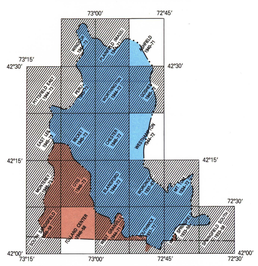
FIGURE 2.—Unconsolidated deposits and availability of ground water.

SCALE 1:48 000

1 0 1 2 3 4 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 FEET
1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 10 AND 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

INDEX TO TOPOGRAPHIC MAPS AND TO GEOLOGIC MAPS AND REPORTS



The surficial geology was based on the following geologic quadrangles and reports (indicated in patterns and shown above).

WATER RESOURCES OF THE WESTFIELD AND FARMINGTON RIVER BASINS, MASSACHUSETTS

By
Anthony Maevsky and David G. Johnson

1990

INTERIOR–GEOLOGICAL SURVEY, RESTON, VA.—1990