UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
COMMONWEALTH OF MASSACHUSETTS,
DEPARTMENT OF PUBLIC WORKS

WATER-SUPPLY PAPER 1826
PLATE 1


EXPLANATION
Qb
Beach and dune deposits
Stratified fine- to medium-grained sand. Yield small amounts of water from shallow lenses of fresh water overlying saline water; not a significant water-bearing unit in the mapped area
Qs
Swamp deposits
Peat and muck interbedded or intermixed in places with sand or silt; include fresh-water swamps and salt-water marshes; known thicknesses range from less than 1 foot to about 55 feet but generally are less than 5 feet; do not yield ground water to wells. Swamp deposits store large quantities of water, which are available as potential recharge; the deposits may impede the movement of water to the more permeable materials, such as outwash, that underlie the swamps in most of the area
Qm
Marine deposits
Stratified clay and silt, small amounts of sand and, locally, some gravel; underlie coastal lowlands and the valleys of the Ipswich River and its tributaries to a distance of about 8 miles inland from the present coastline; known thicknesses range from less than 1 foot to 77 feet. May yield small to moderate amounts of water to wells in areas where the deposits contain relatively large amounts of sand and gravel; at most places marine deposits impede the movement of ground water, and locally they may confine water in underlying coarse-grained deposits
Qo
Outwash deposits
Stratified sand and silt, small amounts of gravel and clay, and scattered boulders; crop out in lowlands in upstream parts of the basin, and underlie swamp deposits in much of the area; known thicknesses range from less than 1 foot to about 200 feet. Yield small to moderate quantities of water to wells, store large amounts of water, provide recharge to adjacent or subjacent ice-contact deposits, and furnish a large share of the water forming the base flow of streams
Qi
Ice-contact deposits
Stratified sand and gravel, small amounts of silt and clay; overlain at places by outwash and marine deposits; known thicknesses range from less than 1 foot to 78 feet. Yield small to large quantities of water to wells; individual deposits differ markedly from one another in composition, sorting, and permeability, and each deposit must be explored to find the more permeable zones
Qt
Till
Unstratified clay, silt, sand, pebbles, cobbles, and boulders; overlies bedrock; known thickness ranges from less than 1 foot to 208 feet but commonly is less than 20 feet. Yields small amounts of ground water (probably about a few gallons per minute) in its outcrop area; may confine water in underlying bedrock
Recent
Pleistocene
Wisconsin Glaciation
QUATERNARY
Bedrock
Chiefly igneous and metamorphic rocks. Generally yields small amounts of ground water to wells from joints and fractures
Area of numerous bedrock outcrops; surficial deposits are generally thin
PRE-QUATERNARY
Geologic contact
100 35 15
Seismic profile
Numerals are depths to bedrock below land surface inferred from the seismic data; in the Wilmington-Reading area only the maximum depth along each line is given
17
3R
Site of well or test hole reaching bedrock or refusal
Upper numeral is serial number of well or test hole in a separate series for each town; lower numeral is depth to bedrock or refusal (R) below land surface
13
Site and number of sample of rock material collected for analysis of physical and hydrologic properties
Boundary between Wilmington-Reading area and lower Ipswich River Basin
Boundary of Ipswich River drainage basin
INDEX TO GEOLOGIC MAPPING
GEORGETOWN
ROWLEY
ANDOVER
Andover
Ballardvale
Middleton
Reading
Wakefield
Danvers
Beverly
Manchester
Ipswich
Hydrology by E. A. Sammel
SEA LEVEL
VERTICAL EXAGGERATION
INFERRED GEOLOGIC SECTION ALONG LINE A–A′
0 200 400 600 800 1000 FEET
INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1966—W65427
APPROXIMATE MEAN DECLINATION, 1966

MAP AND SECTION SHOWING SURFICIAL GEOLOGY AND DEPTHS TO BEDROCK IN THE IPSWICH RIVER BASIN, MASSACHUSETTS

SCALE 1:31 680

1 ½ 0 1 MILE

1 .5 0 1 KILOMETER

Base map from U.S. Geological Survey topographic quadrangles: Ipswich, 1950; Georgetown, 1953; South Groveland, 1952; Lawrence, 1955 Wilmington, 1950; Reading, 1951; Salem, 1956; Marblehead North, 1956