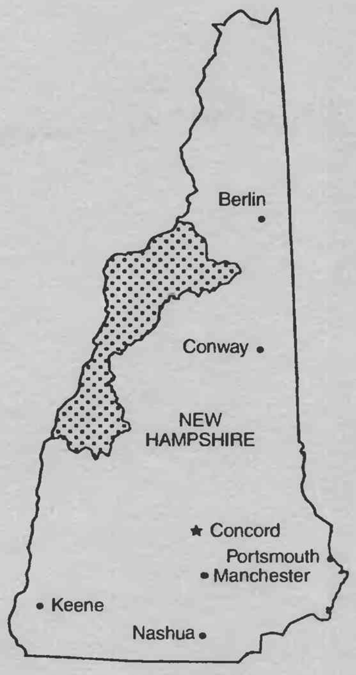
Geohydrology and Water Quality of Stratified-Drift Aquifers in the Middle Connecticut River Basin, West-Central New Hampshire

U.S. Geological Survey
Water-Resources Investigations Report 94-4181



Prepared in cooperation with the
STATE OF NEW HAMPSHIRE
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By SARAH M. FLANAGAN

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1996

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
	Length	
inch (in.)	25.4	millimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
	Area	
square mile (mi^2)	2.590	square kilometer
	Velocity and Flow	
foot per second (ft/s)	0.3048	meter per second
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
cubic foot per second per square mile [$(ft^3/s)/mi^2$)]	0.01093	cubic meter per second per square kilometer
gallon per minute (gal/min)	0.06309	liter per second
gallon per day (gal/d)	3.7854	liter per day
million gallons per day (Mgal/d)	0.04381	cubic meter per second
	Hydraulic Conductivity	
foot per day (ft/d)	0.3048	meter per day
	Transmissivity	
foot squared per day (ft^2/d)	0.09290	meter squared per day

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

Abbreviated Water-Quality Units Used in Report

In this report, chemical concentration in water is expressed in milligrams per liter (mg/L) or micrograms per liter (µg/L). Milligrams per liter is a unit expressing the concentration of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water; 1,000 µg/L (micrograms per liter) is equivalent to 1 mg/L (milligrams per liter). Water temperature in degrees Celsius (°C) can be converted to degrees Fahrenheit (°F) by use of the following equation:

$$^{o}F = 1.8(^{o}C)+32$$

Specific conductance of water is expressed in microsiemens per centimeter at 25 degrees Celsius (µS/cm). This unit is equivalent to micromhos per centimeter at 25 degrees Celsius (µmho/cm), formerly used by the U.S. Geological Survey.

Geohydrology and Water Quality of Stratified-Drift Aquifers in the Middle Connecticut River Basin, West-Central New Hampshire

By Sarah M. Flanagan

Abstract

A study was done by the U.S. Geological Survey, in cooperation with the New Hampshire Department of Environmental Services, Water Resources Division, to describe the geohydrology and water quality of stratified-drift aquifers in the Middle Connecticut River Basin, west-central New Hampshire. Stratified-drift aquifers discontinuously underlie 123 mi^2 (square miles) of the Middle Connecticut River Basin, which has a total drainage area of 987 mi^2. Saturated thicknesses of stratified drift in the study area are locally greater than 500 feet but generally are less than 100 feet. Aquifer transmissivity locally exceeds 4,000 ft^2/d (feet squared per day) but is generally less than 1,000 ft^2/d. In only 17.2 mi^2 of the study area are the aquifers identified as having a transmissivity greater than 1,000 ft^2/d. As of 1990, total ground-water withdrawals from stratified drift for municipal supply were about 1.5 Mgal/d (million gallons per day) in the study area. Many of the stratified-drift aquifers underlying the study area are not developed to their fullest potential.

The geohydrologic investigation of the stratified-drift aquifers focused on aquifer properties, including aquifer boundaries; recharge, discharge, and direction of ground-water flow; saturated thickness and storage; and transmissivity. Surficial-geologic mapping assisted in the determination of aquifer boundaries. Data from more than 1,000 wells, test borings, and springs were used to prepare maps of water-table altitude, saturated thickness, and transmissivity of stratified drift. More than 11 miles of seismic-refraction profiling at 95 sites was used in the preparation of the water-table-altitude and saturated-thickness maps. Seismic-reflection data collected along 1.6 miles of Mascoma Lake also were used in preparation of the saturated-thickness maps.

Four stratified-drift aquifers in the towns of Franconia, Haverhill, and Lisbon were analyzed to estimate the water availability on the basis of analytical ground-water-flow model simulation based on the Theis confined-flow equation adjusted to account for boundary effects commonly associated with stratified-drift aquifers. Conservative estimates of water availability during a 180-day period of no recharge were estimated to be 1.9 Mgal/d for the Meadow Brook aquifer; 1.8 Mgal/d for the Ham Branch Brook aquifer; 1.5 Mgal/d for the Salmon Hole aquifer; and 1.4 Mgal/d for the Haverhill-French Pond aquifer. Water-availability estimates would be higher if periods of recharge were accounted for and if less conservative boundary conditions were used in the model.

Results of analysis of water samples from 26 observation wells, 3 municipal water-supply wells, and 1 public-supply spring show that, with the exception of dissolved iron and manganese in some samples, water in the stratified-drift aquifers generally meets the U.S. Environmental Protection Agency's primary and secondary drinking-water standards.

INTRODUCTION

The population of the 987-square mile Middle Connecticut River Basin, which comprises all or part of 41 towns in west-central New Hampshire, increased by 9.4 percent between 1980 and 1990 (New Hampshire Office of State Planning, written commun., 1992). Although the White Mountain National Forest covers much of the northeastern part of the study area, the surrounding towns have seen an increase in second-family homes and the number of tourists that visit the area. In addition, large ski areas in the mountains rely heavily on local water resources for making snow to augment the natural snow cover.

This growth in population and tourism has steadily increased demands for water and has stressed the capacity of municipal water systems. Also, stricter U.S. Environmental Protection Agency (USEPA) primary and secondary drinking-water regulations on the treatment requirements of surface-water supplies have prompted municipalities to look more closely at their ground-water resources (U.S. Environmental Protection Agency, 1987).

Stratified-drift aquifers discontinuously underlie 123 mi^2, or 12.5 percent of the Middle Connecticut River Basin. As of 1990, total withdrawal from stratified-drift aquifers for municipal supply was about 1.5 Mgal/d (New Hampshire Department of Environmental Services, Water Management Bureau, written commun., 1991). Many of these aquifers may be capable of supplying additional water to meet domestic, community, and industrial water needs.

The U.S. Geological Survey (USGS), in cooperation with the New Hampshire Department of Environmental Services, Water Resources Division (NHDES-WRD), has done a series of ground-water investigations in New Hampshire that provide detailed geohydrologic information necessary for planning for optimal use of available water resources and for the development of new water supplies. The study described in this report encompasses the Middle Connecticut River Basin in west-central New Hampshire (fig. 1). For most of the studies, surface-water basin divides were selected as the study-area boundaries because they are the natural subdivision to the hydrologic system and because stratified-drift aquifers generally do not extend across major surface-water divides in New Hampshire. Completed studies and reports include the Nashua Regional Planning Commission area (Toppin, 1987); the Exeter, Lamprey, and Oyster River Basins (Moore, 1990; Moore, 1992); the Lower Merrimack and Coastal River Basins (Stekl and Flanagan, 1992; Flanagan and Stekl, 1990); the Bellamy, Cocheco, and Salmon Falls River Basins (Mack and Lawlor, 1992; Lawlor and Mack, 1992); the Lower Connecticut River Basin (Moore and others, 1994);the Middle Merrimack River Basin (Ayotte and Toppin, 1995); the Contoocook River Basin (Harte and Johnson, 1995); the Pemigewasset River Basin (Cotton and Olimpio, 1996); the Winnipesaukee River Basin (Ayotte, 1996); and the Saco and Ossipee River Basins (Moore and Medalie, 1995). Studies near completion include those basins of the the Upper Connecticut, Androscoggin, and the Upper Merrimack Rivers (J.R. Olimpio and P.J. Stekl, U.S.Geological Survey, written commun., 1994) (fig. 1).

Purpose and Scope

The purpose of this report is to (1) describe the geohydrologic characteristics of the stratified-drift aquifers in the Middle Connecticut River Basin, including areal extent of stratified-drift aquifers, ground-water altitudes, general directions of ground-water flow, saturated thicknesses, and transmissivities; (2) provide estimates of water available to aquifers on the basis of analytical techniques; and (3) describe the general quality of water in stratified-drift aquifers.

The study was limited to the collection, compilation, and evaluation of data from the stratified-drift aquifers in the study area. Water availability for selected stratified-drift aquifers was estimated by application of an analytical technique developed by Mazzaferro and others (1979).

Previous Investigations

Previous investigations include a reconnaissance of the availability of ground water in the Middle Connecticut River Basin in west-central New Hampshire (Cotton, 1976). A hydrologic investigation of the entire Connecticut River Basin in New England was completed by Cederstrom and Hodges (1967). A reconnaissance map of the surficial geology in the Canaan area includes parts of the Canaan, Enfield Center, and Mount Cardigan, New Hampshire quadrangles at a scale of 1:62,500 (Denny, 1958). Numerous other studies were done by private consultants for local concerns. These studies indicated that additional information was needed to improve the understanding of the ground-water flow systems, define aquifer boundaries, and evaluate ground-water quality in the study area.

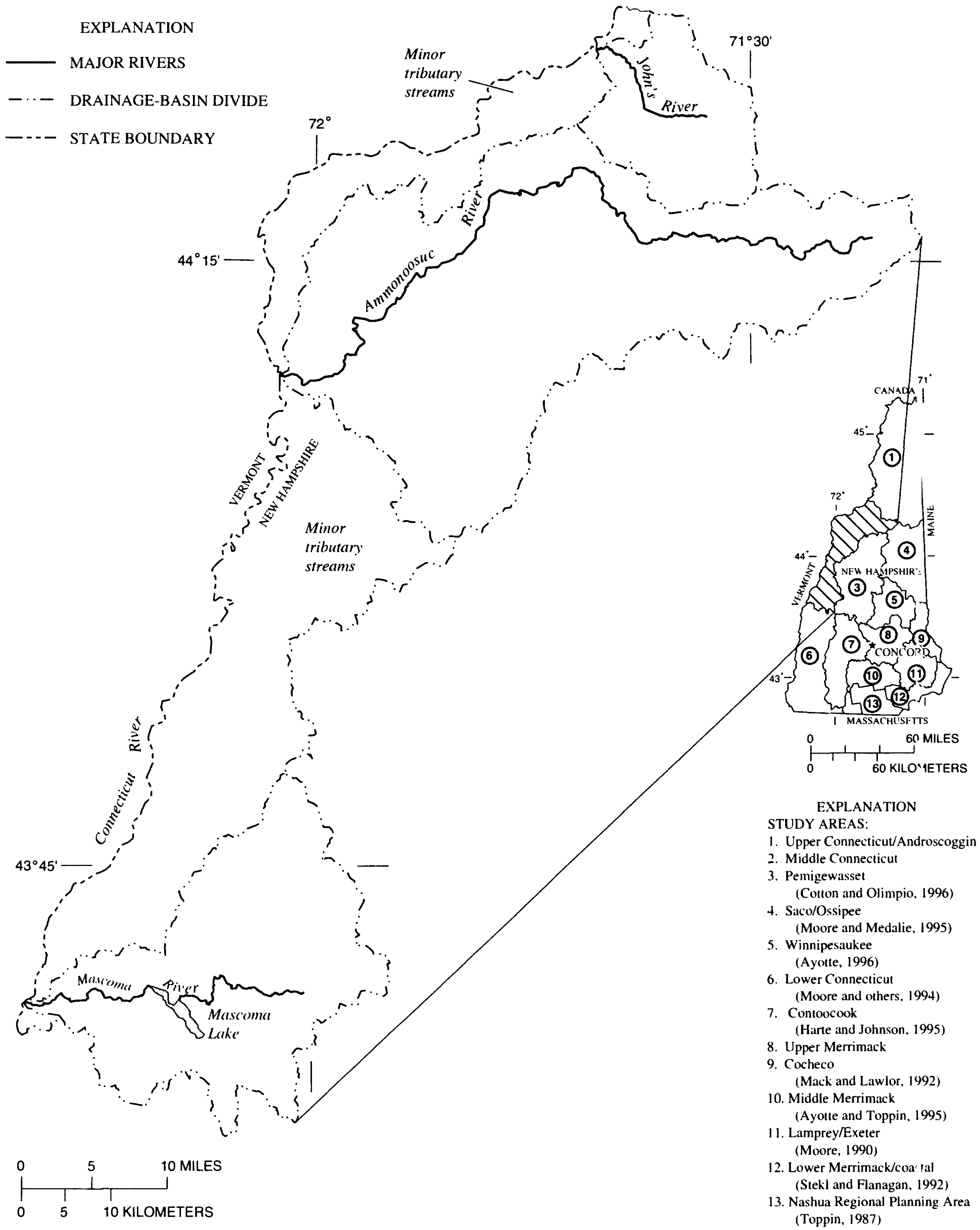

Figure 1. Locations of the Mascoma, Ammonoosuc, and John's River subbasins in the Middle Connecticut River Basin, west-central New Hampshire.

Description of Study Area

The study area encompasses 987 mi^2 in 41 towns in Coos, Grafton, and Sullivan Counties in west-central New Hampshire; it extends east from the west bank of the Connecticut River (which also defines the border between the states of New Hampshire and Vermont) to the peak of Mount Washington (altitude 6,288 ft) in the White Mountain National Forest (fig. 2). It is bounded on the west by the west bank of the Connecticut River and on the east by the surface-water drainage divide of the Pemigewassett River Basin. Its southern boundary is the surface-water drainage divide between the lower part of the Connecticut River and Mascoma River, and its northern boundary is the surface-water drainage divide between the upper part of the Connecticut River and the John's River.

Surface water drains to the Connecticut River, which flows southward along the western border of the study area. The three major tributaries are the Mascoma River, which flows westward from Orange, N.H., and joins the Connecticut River at Lebanon, N.H.; the Ammonoosuc River, which flows westward from the White Mountain National Forest and joins the Connecticut River at Woodsville, N.H.; and the John's River, which flows westward from Carroll, N.H., and joins the Connecticut River (fig. 1) at Dalton, N.H. Minor tributary streams to the Connecticut River include Mink Brook in Hanover; Clay, Hewes, and Grant Brooks in Lyme; Jacob's Brook in Orford; Eastman Brook in Piermont; Oliverian, Clark, and French Pond Brooks in Haverhill; Roaring and Smith Brooks in Monroe; and Bill Little Brook in Littleton (pls. 1-4).

Approach and Methods

The following approach and methods were used in this study:

1. Areal extent of the stratified-drift aquifers was mapped by use of soils maps (unpublished U.S. Soil Conservation Service data on file in the Woodsville, N.H., office). Surficial geology maps showing only aquifer boundaries were produced for the entire study area as part of this investigation.
2. Available subsurface data on ground-water levels, saturated thickness, and stratigraphy of the stratified-drift aquifers were obtained and compiled from unpublished sources of the USGS, the New Hampshire Department of Environmental Services, and the New Hampshire Department of Transportation. Additional data were obtained from municipalities, local residents, well-drilling contractors, and engineering consultants. The locations of wells, borings, and springs were plotted on base maps, and their locations were digitized. All latitudes and longitudes are referenced to the North American Datum of 1927. Pertinent data were added to the Ground-Water Site Inventory (GWSI) data base maintained by the USGS. Each data point is cross-referenced to a site-identification number and to any other pertinent information about the site.
3. Seismic-refraction surveying, a surface geophysical technique, was done at 95 locations in the study area to determine depths to the water table and depths to the bedrock surface. Locations of these profiles are shown on plates 1 through 4. The seismic data were interpreted with a time-delay, ray-tracing computer program developed by Scott and others (1972). Data from nearby wells and test holes were used to verify the results of the computer program. Haeni (1988b) has shown that the actual depths to the bedrock surface are generally within 10 percent of the estimates from seismic-refraction surveying. Till is not identified in these interpretations because it is generally thin and cannot be distinguished from stratified drift by use of seismic-refraction methods. Where till is present but is not identified in the interpretation, the computed depth to bedrock is less than the actual depth.
4. Seismic-reflection surveying, another surface geophysical method, was used to determine the thickness of sediments underlying a section line approximately 1.6 mi long in Mascoma Lake in the southern part of the study area. Locations of these profiles are shown on plate 1. Haeni (1986, 1988a) outlines methods for collecting seismic-reflection data. Seismic-reflection results differ from seismic-refraction results in that information about the texture of the subsurface can sometimes be inferred from the records produced during data collection.

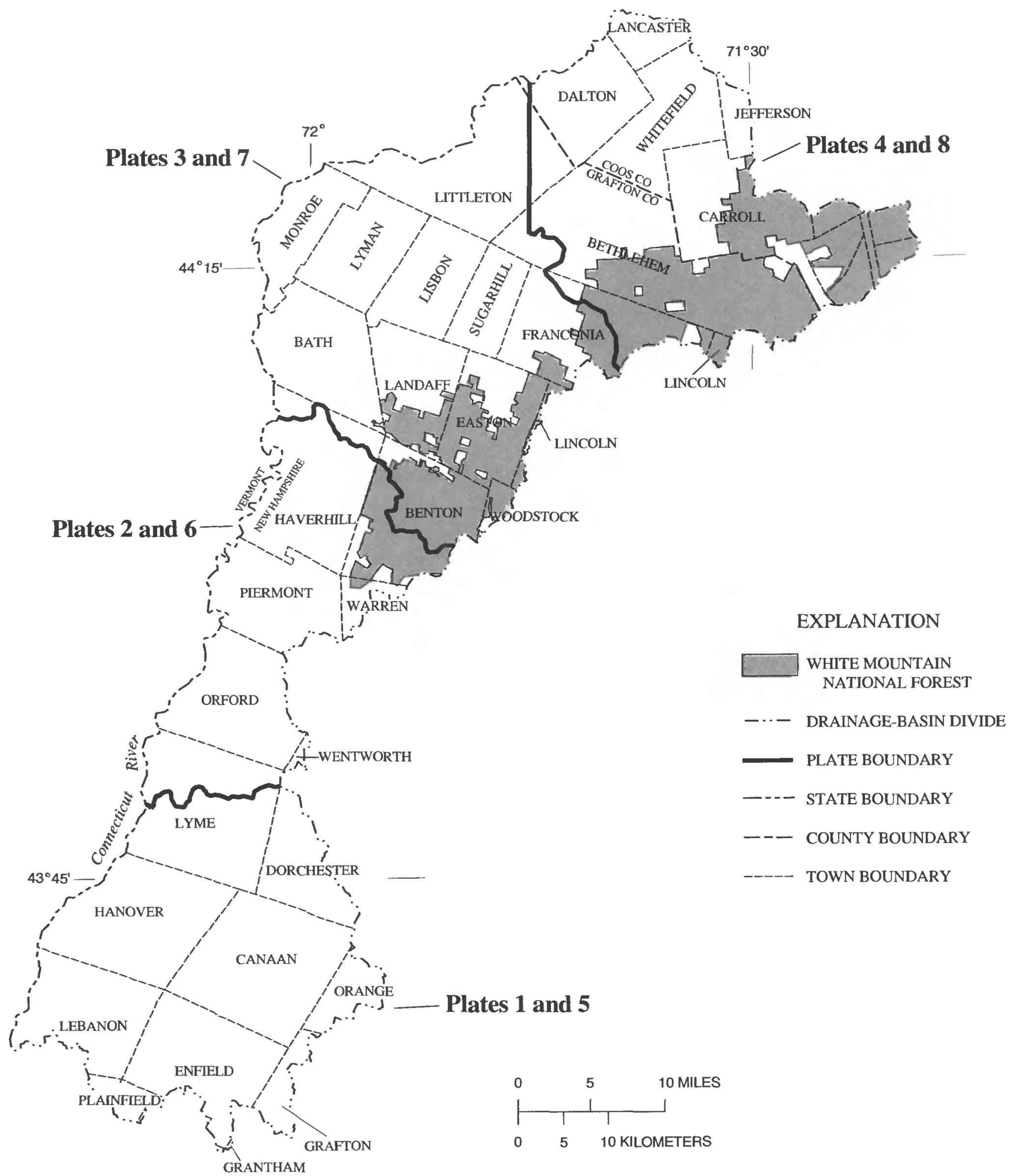

Figure 2. Locations of the towns on plates 1 through 8 in the Middle Connecticut River Basin, west-central New Hampshire.

5. Test borings were made at 47 locations to improve definition of the thickness and geohydrologic characteristics of the stratified-drift aquifers. Split-spoon samples of the subsurface sediments collected at specific intervals were used to determine the hydraulic properties at those depths and to determine the stratigraphic sequence of materials composing the aquifers. Twenty-seven test borings were finished as observation wells with 2-inch-inside-diameter polyvinyl chloride casings and slotted screens. Locations of these test borings and wells are shown on plates 1 through 4. Water levels were measured periodically at these wells, and water samples were collected at selected wells.

6. Data collected as described in items 2, 3, 4, and 5 were used to prepare maps showing the water-table altitudes and saturated thickness of the stratified-drift aquifers.

7. Hydraulic conductivities of aquifer materials were estimated from field descriptions of the grain-size distributions of samples from the test borings. In these determinations, 118 of the samples were analyzed by dry-sieve analysis at half-phi intervals for grain-size distribution. Results of these sieve analyses were also compared with those from previous ground-water studies in New Hampshire. Transmissivities were estimated from test-boring logs by calculating horizontal hydraulic conductivities for specific intervals, multiplying these values by the saturated thickness of the interval, and summing the results. Transmissivities reported by consultants were also obtained or values were calculated from unpublished aquifer-test data. Further discussion on the methods used to calculate transmissivity is given in the section on "Transmissivity." This information was used to prepare maps showing the transmissivity distribution of the stratified-drift aquifers (pls. 5-8).

8. The above maps were digitized from 1:24,000 and 1:25,000 scale-stable mylar USGS quadrangle maps and entered into a geographic information system (GIS) computer data base. The quadrangle maps then were merged into one studywide GIS coverage for each map feature. Coverages include well, test boring, and spring locations; seismic-refraction, and seismic-reflection-profile locations; geohydrologic section locations; water-table-altitude configurations; aquifer boundaries, saturated thickness; and estimated transmissivities of the stratified drift.

9. Low-flow streamflow measurements were made at 61 sites in the study area. Low streamflows were used to determine the distribution of ground-water recharge and discharge and the long-term water availability of aquifers in hydraulic contact with streams. Streamflow measurements, accurate to within 10 percent, were made with USGS current meters according to procedures described by Rantz and others (1982a, b).

10. Water availability was estimated for four aquifers by application of a simple analytical ground-water-flow model developed by Mazzaferro and others (1979). The model incorporates image-well theory (Ferris and others, 1962) and the Theis non-equilibrium formula to solve the two-dimensional ground-water-flow equation. The model requires assumptions of homogeneous and isotropic conditions and an initially flat water table. No-flow and recharge boundaries are incorporated by use of image-well theory. Estimates of maximum water availability are constrained by availability of induced infiltration from streams and lakes, ground-water recharge, allowable drawdown in the pumped well, and the size of the model area.

11. Samples of ground water from 26 observation wells, 3 municipal water-supply wells, and 1 public-supply spring were collected and analyzed. Field-measured properties (specific conductance, pH, dissolved oxygen, and temperature), common inorganic constituents, and selected trace metals were measured. The data provided by these analyses were used to assess the general quality of water from the stratified-drift aquifers.

Numbering System for Wells and Borings and Springs

Local numbers assigned to wells and borings consist of a two-letter town designation (table 1), a supplemental letter designation ("A" for borings done for hydrogeologic investigations, "B" for borings done primarily for bridge construction, "W" for all wells in which a casing was set, and "S" for springs), and a sequential number in each town. For example, the first well listed for the town of Bath is BDW-1. Towns in the study area for which data on wells, borings, or springs were not obtained are not listed in table 1. Two municipal wells just outside the study area—one in Norwich, Vt., and one in Fairlee, Vt.,—are included in the inventory because they provide important information on the geohydrology of two of the aquifers underlying the study area.

Acknowledgments

The author thanks the many private landowners who gave permission for the USGS to drill test holes and perform seismic activities on their lands. Without their cooperation, much of the data collected to describe the geohydrology of stratified-drift aquifers would not have been available. The author also thanks the U.S. Forest Service (for allowing access to the White Mountain National Forest); the U.S. Natural Resources Conservation Service; the New Hampshire Water Well Board; and the many State agencies, municipalities, residents, consulting firms, well-drilling companies, and private companies who provided data for this study.

Table 1. Two-letter town codes used as prefixes in the numbering system for wells, borings, and springs in west-central New Hampshire and eastern Vermont

Town	Code	Town	Code
NEW HAMPSHIRE		Lebanon	LH
Bath	BD	Lisbon	LL
Benton	BO	Littleton	LN
Bethlehem	BS	Lyman	LX
Canaan	CC	Lyme	LY
Carroll	CF	Monroe	MU
Dalton	DA	Orange	OR
Easton	EB	Orford	OS
Enfield	EN	Piermont	PD
Franconia	FD	Sugar Hill	SU
Hanover	HH	Whitefield	WL
Haverhill	HK	VERMONT	
Jefferson	JE	Fairlee	FL
Landaff	LF	Norwich	NR

GEOHYDROLOGIC SETTING

Three types of aquifer materials that are found underlying the study area are (1) stratified drift, which can be a major source of ground water for municipalities, (2) till, which locally can supply small amounts of water for domestic use, and (3) bedrock, which supplies some municipalities but more commonly provides water to households in the study area that are not connected to a municipal supply.

Stratified Drift

Coarse-grained stratified-drift deposits, the focus of this study, consists of stratified, sorted, mostly coarse-grained sediments (sands and gravels) deposited by glacial meltwater at the time of deglaciation. Hydrologic characteristics of stratified drift that affect ground-water storage and flow are related to the glaciofluvial or glaciolacustrine environment in which the sediments were deposited. Stratified-drift deposits are composed of distinct layers of sediments with different grain-size distributions, sorted according to depositional environment. For example, fast-moving meltwater streams deposit coarse-grained sediments with large pore spaces between grains. If saturated, these sediments store and transmit water readily. Fine-grained sediments (very fine sands, silts, and clays), deposited in slow-moving lacustrine environments or ponded meltwater, do not transmit water freely.

Deglaciation, and the location of glacial lakes during deglaciation, had a pronounced effect in determining the type of aquifer that was formed. Deglaciation of the study area is believed to have occurred by a systematic process of stagnation-zone retreat (Koteff and Pessl, 1981). During deglaciation, the active glacial ice receded to the north-northwest, leaving behind zones of stagnant ice in contact with the active ice margin. In the areas of previous ancient glacial lakes, the coarsest stratified-drift deposits formed were ice-contact deltas, some of which may have been fed by sediment in meltwater emanating from within or beneath the glacial ice. In some upland valleys, upgradient from glacial lakes, the deglaciation process resulted in the formation of eskers, kames, kame terraces, and outwash deposits, sometimes in contact with deltaic deposits. These deposits compose the stratified-drift aquifers of these areas and are referred to here as "fluvial-deltaic aquifers."

A study done by Spear (1989) on pollen and plant-macrofossil records from four small present-day lakes in the subalpine and alpine zone of the White Mountains in New Hampshire indicates that the White Mountain area was deglaciated by 13,000 years before present (BP) but that residual ice may have been in Franconia Notch until 11,000 BP. Deglaciation of the Connecticut River Valley was affected by one large glacial lake, glacial Lake Hitchcock, which accumulated significant thicknesses of fine-grained sediment while meltwater from the glacier was building fairly coarse-grained deltaic deposits within the same lacustrine environment. The elevations of former glacial-lake levels were projected from measured altitudes of the contact between topset and foreset beds within remnant deltas in the Connecticut River Valley. This contact represents the level of the glacial lake in that area at the time of deposition (Koteff and Larsen, 1989; Koteff and others, 1993).

The primary aquifers found in areas where glacial lakes were located in the study area consist of ice-contact deltas and numerous eskers. Eskers are long ridges of sand and gravel deposited either (1) in meltwater channels within the zone of ice stagnation during deglaciation or (2) at the ice margin where it retreats in contact with a standing water body. Retreat of the ice margin causes deposition at locations progressively further up the meltwater channel, thereby forming a ridge that follows the course of the previous channel. Eskers, or ridges of coarse-grained stratified drift, are found throughout the study area, but are most prominent along the main stem of the Connecticut River in Hanover, in the Ham Branch Brook subbasin in Easton and Franconia, and in the Ammonoosuc River subbasin in Carroll. Where saturated thickness is significant, eskers and other coarse-grained ice-channel deposits form productive aquifers. Similarly, where other coarse-grained stratified-drift deposits are confined beneath or within fine-grained lake-bottom sediments, such as subaqueous fans or distal ends of deltas, productive aquifers may be present. The locations of confined aquifers may be undetected in areas where subsurface data are lacking.

Glacial Lake Hitchcock

Glacial Lake Hitchcock occupied much of the Connecticut River Valley during deglaciation and probably early postglacial time. At its maximum, the lake extended as far north as Burke, Vt. more than 210 mi north of its outlet at New Britain, Conn. (Koteff and Larsen, 1989) (fig. 3). In the study area, the lake extended up the main stem of the Connecticut River as far north as Dalton, N.H. (and Gilman, Vt.); eastward up the Mascoma River Valley to Lebanon, and eastward up the Ammonoosuc River Valley to Littleton (fig. 4). Early in the lake's history, while the ice margin was still to the south in Connecticut and Massachusetts, the lake level lowered as its outlet channel eroded downward to resistant bedrock, after which relatively constant lake levels were maintained as the ice retreated northward (Koteff and Larsen, 1989).

A stabilized level of glacial Lake Hitchcock is indicated numerous ice-contact deltas that have not been modified by collapse and that have topset-foreset contacts that fall along a linear plane (fig. 3). Four of these unmodified ice-contact deltas surveyed by Koteff and Larsen (1989) are in the study area; the rest are to the south or in the Vermont part of the Connecticut River Valley. The plane defined by the topset-foreset contacts of these deltas represents the level of the lake before postglacial uplift. This plane now, after the postglacial uplift, dips about 4.8 ft/mi downward in the direction of about S. 21° E. (Koteff and Larsen, 1989). Eventually, lake levels in glacial Lake Hitchcock lowered, and deltas were formed farther out into the valley.

The mineralogy of glacial Lake Hitchcock lake-bottom sediments collected by Moore and others (1994) indicates that high-grade metamorphic rock was the main bedrock source providing the sediment that eventually filled in the lake. This finding is consistent with the type of bedrock found in northern Vermont, northern New Hampshire, and Canada. Principal minerals found were iron chlorite and muscovite, with lesser amounts of quartz. Minor minerals found in the silt fraction, in order of abundance, were garnet, hornblende, zircon, zoisite, andalusite, tourmaline, calcite, rutile, and kyanite.

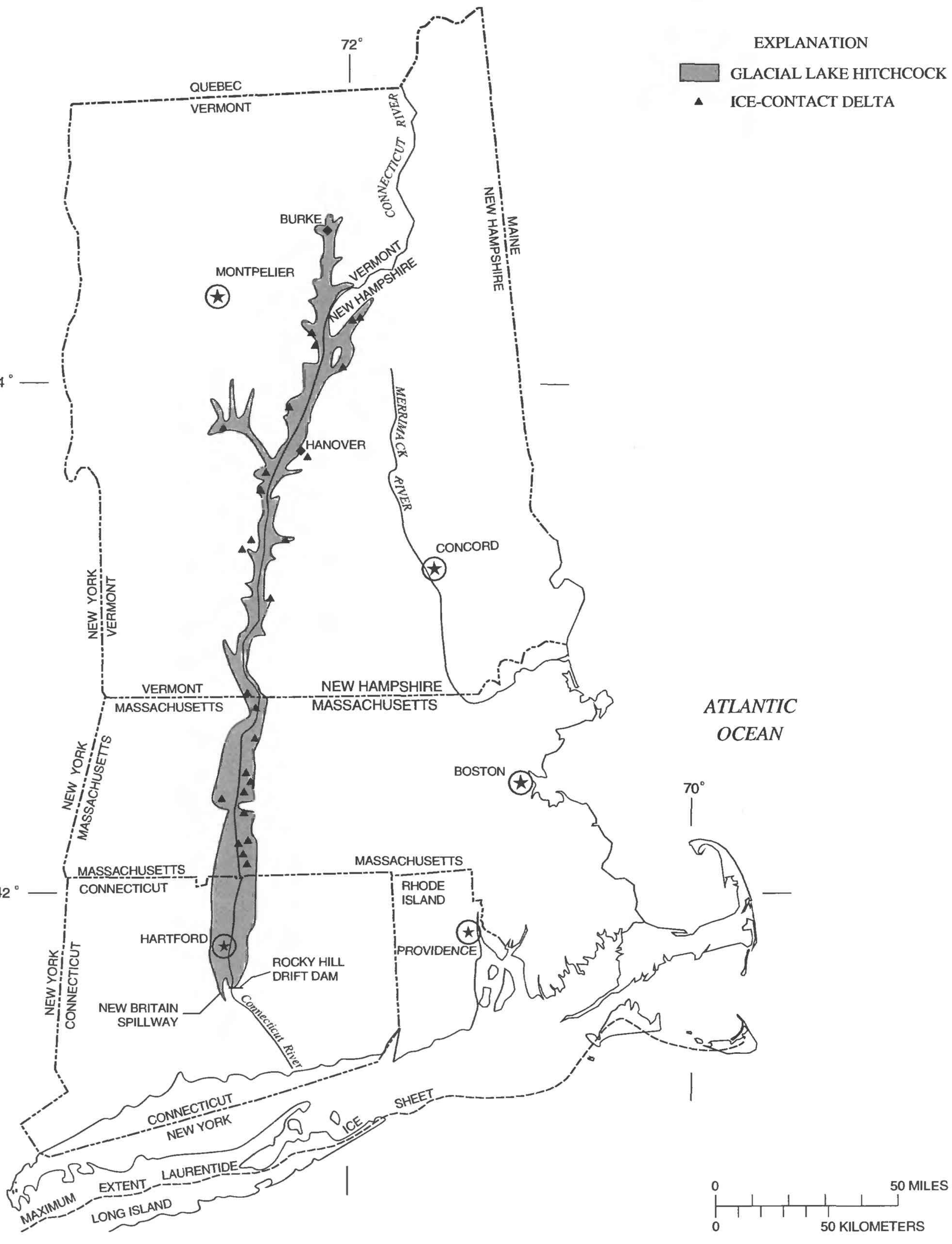

Figure 3. Maximum extent of former glacial Lake Hitchcock in New England (modified from Koteff and Larsen, 1989).

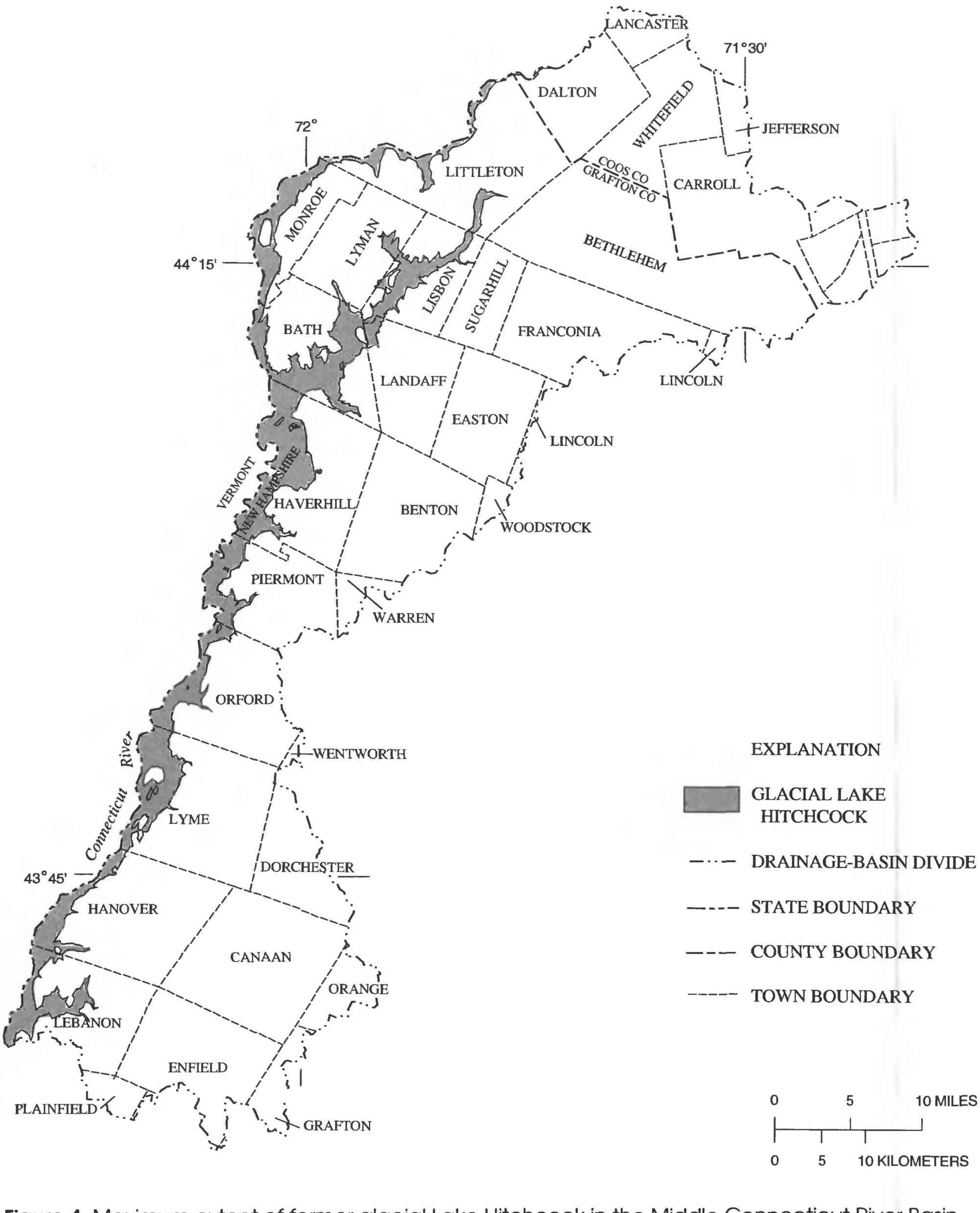

Figure 4. Maximum extent of former glacial Lake Hitchcock in the Middle Connecticut River Basin, west-central New Hampshire.

Glacial Lakes in Upland Valleys

Some small, short-lived glacial lakes were present during the period of deglaciation in upland valleys, at elevations higher than glacial Lake Hitchcock (fig. 5). The generally northwesterly retreat of the ice front in the mountainous terrain produced many ice-dammed lakes. The outlets of these lakes were first controlled by passes to the south and east of the lakes and were later controlled by channels around the ice margin as lower ground was uncovered toward the west, eventually allowing lake waters to escape toward the main stem of the Connecticut River Valley (Lougee, 1939). The largest of these upland glacial lakes in the study area, from south to north, were (1) glacial Lake Mascoma, in the upper Mascoma River subbasin in Canaan, Enfield and Lebanon, (2) glacial Lake Oliverian, in the Oliverian River subbasin in Benton and East Haverhill, (3) glacial Lake Wild Ammonoosuc, in the upper part of the Wild Ammonoosuc River subbasin in Easton, Landaff and Benton, (4) glacial Lake Franconia, in the Gale River subbasin in Easton and Franconia, (5) glacial Lake Ammonoosuc in the upper Ammonoosuc River subbasin in Carroll and Bethlehem, and (6) glacial Lake Whitefield in the John's River subbasin in Dalton and Whitefield (fig. 5) (Lougee, 1939). Much smaller glacial lakes, probably existing only a short time, occupied the valleys of Grant Brook and Jacob's Brook in Lyme and Orford, respectively. Today, Mascoma Lake in Enfield and Lebanon, is the only significant remnant of these glacial lakes. The disappearance of these glacial lakes and the once higher level of modern lakes (such as Mascoma Lake) can be explained by the removal of the glacial ice dams, erosion of glacial drift dams by outlet streams, or the gradual filling of these lakes over thousands of years by sediment and organic matter. A brief history of these glacial lakes and their relations among one another and with glacial Lake Hitchcock is given below. Arrows showing location and direction of glacial-lake spillways (outlet passes) are shown on plates 1 through 4.

Glacial Lake Mascoma

During deglaciation, the natural drainage to the west in the Mascoma River subbasin was obstructed by the ice margin, and a series of interconnecting lakes, called glacial Lake Mascoma was temporarily formed (fig. 5) (Lougee, 1939). At its maximum extent, glacial Lake Mascoma had a water-surface altitude 300 ft higher than that of present-day Mascoma Lake (1,048 ft or 319 m). This ice-dammed glacial lake was initially controlled by a pass west of the Mt. Cardigan Range (about 1 mi southwest of Tuttle Hill in Orange) across the drainage divide between the headwater area of Mirror Lake in Canaan and Smith River in Grafton (fig. 5, pl. 5). Waters from this glacial lake spilled southeastward into the Smith River Valley.

Glacial Lake Mascoma maintained a water level controlled by the Tuttle Hill pass until the next outlet was uncovered by the retreating ice at a pass across the drainage divide between Little Brook in Enfield and Bog Brook in Springfield (fig. 5, pl. 5). This new outlet allowed the lake to drain to an altitude of 1,023 ft (312 m). When the ice margin retreated north of the Crystal Lake Brook Valley at West Canaan and the Mascoma River Valley (where the Mascoma River drains into present-day Mascoma Lake), waters from the lake escaped through these valleys, spilling southward over the drainage divide and into the Bog Brook Valley. The glacial lake drained completely by way of marginal channels cut into Bass Hill approximately 2 mi southeast of Lebanon (pl. 5), finally allowing drainage to enter the Connecticut River Valley, and forming deltas in glacial Lake Hitchcock. Before the water surface of Mascoma Lake declined to its present level, it was controlled by a gorge of Mascoma River, now abandoned and 60 ft above the present channel of the river, about 1 mi southwest of Mascoma Village (Lougee, 1939).

Glacial Lake Oliverian

During deglaciation, the westerly drainage of the Oliverian Brook subbasin was obstructed by the ice margin, and glacial Lake Oliverian was temporarily formed (Lougee, 1939). During its initial stage, the lake had an outlet pass controlled by Oliverian Notch in Glencliff village (in Warren) at an altitude of 1,050 ft. Glacial lake waters spilled southeastward across the drainage divide into the valley of Berry Brook, a tributary to the Baker River.

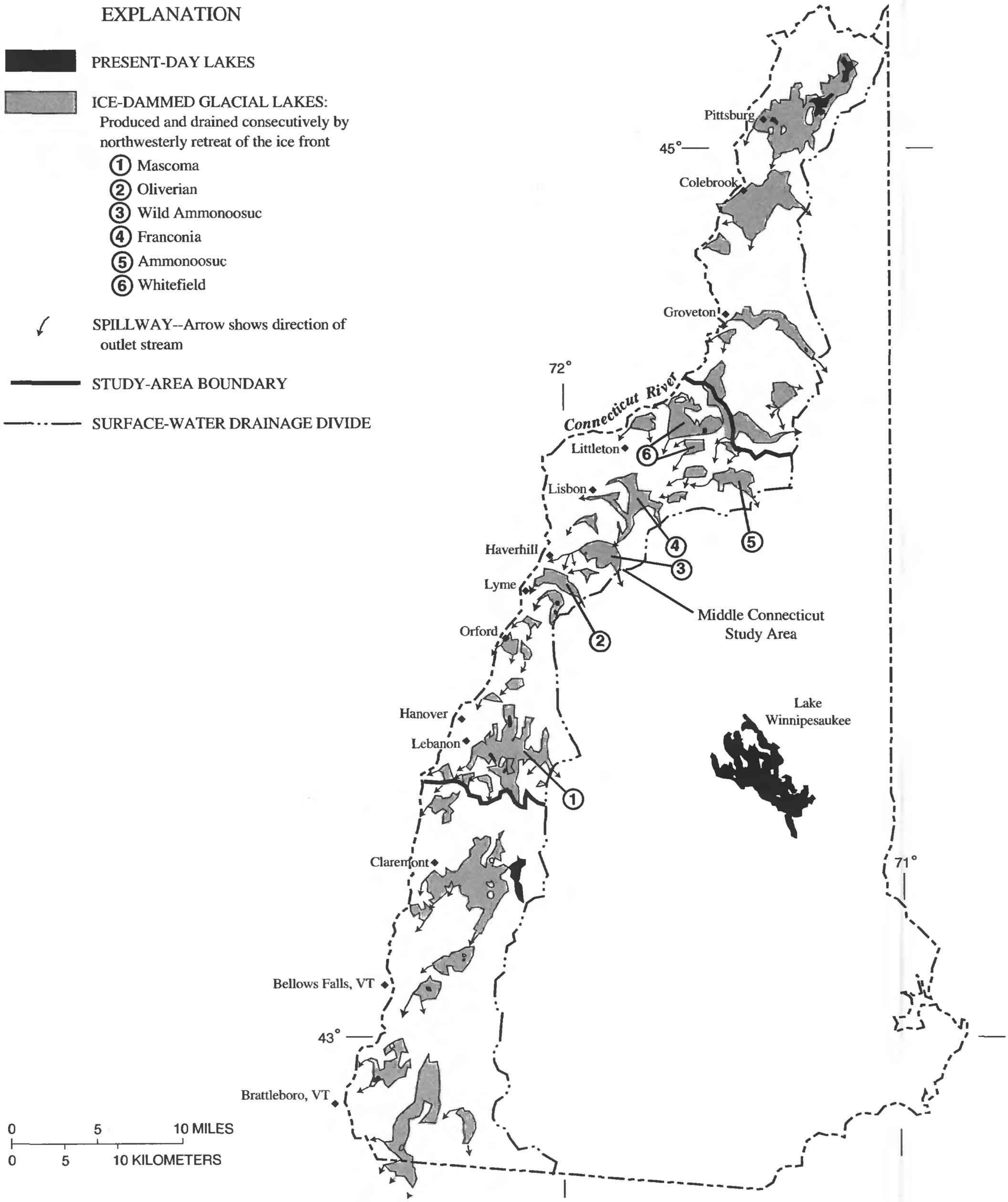

Figure 5. Approximate maximum extent of former glacial lakes in upland valleys in the Connecticut River Basin in New Hampshire. Only glacial lakes within the Middle Connecticut study area are identified; modified from Lougee, 1939)

When the ice margin retreated north of Catamount Ridge, an outlet was uncovered in the headwater areas of two unnamed tributary streams at an altitude of approximately 790 ft. The first stream is parallel to Brushwood Road and drains into Oliverian Brook; the second stream is south of Dean Memorial Airport in Haverhill and drains into Clark Brook (pl. 6). At this outlet, lake waters spilled northward over the pass and between two small hills, cutting channels into one of them before entering the Clark Brook subbasin and depositing sediment into glacial Lake Hitchcock, forming deltas. Eventually, ice retreated from the Oliverian Brook subbasin completely, allowing the lake to drain, and the brook began to follow its present-day course to the Connecticut River.

Glacial Lake Wild Ammonoosuc

During deglaciation, the westerly drainage of the upper Wild Ammonoosuc subbasin, on the northern side of Mt. Moosilauke, was obstructed by the ice margin, and glacial Lake Wild Ammonoosuc was temporarily formed (fig. 5) (Lougee, 1939). The initial outlet of this lake was to the south at the threshold of Kinsman Notch at an altitude of 1,820 ft (pl. 7). During this initial lake stage, waters flowed down the notch into the headwater area of Lost River, a tributary to the Pemigewassett River. Lougee (1939) believed that eskers and varved clays were deposited in water at depths of more than 500 ft. Evidence of unconsolidated deposits on the former lakebed has been found near the village of Wildwood (in Easton), on the northern flank of the valley, where a domestic well (EBW-24) penetrated 80 ft of sand and gravel before reaching bedrock.

When the northwest flanks of Black Mountain were uncovered, the lake drained away through a series of progressively lower outlet passes (just west of Little Black Mountain in Haverhill) at altitudes ranging from 1,720 to 1,300 ft (pl. 7). Deltas were formed at these elevations in the declining stages of glacial Lake Oliverian at East Haverhill through the North Branch Oliverian Brook Valley and in glacial Lake Hitchcock at Center Haverhill through the Clark Brook Valley. Stratified drift was deposited in the headwater area of Waterman Brook. During this time, the Ham Branch Brook Valley (which drains into the Gale River and is east of Black Mountain) was covered by ice; otherwise, lake waters would have escaped northward through an outlet pass in the headwater area of Ham Branch Brook at an altitude of 1,320 ft. Eventually, the ice retreated from the upper Wild Ammonoosuc River subbasin completely, draining the lake as the river began to follow its present-day course to the Ammonoosuc River Valley.

Glacial Lake Franconia

During deglaciation, the natural drainage to the north in the Ham Branch Brook subbasin in Easton and Franconia was blocked by the ice margin, and a series of interconnected lakes in the upper Gale River subbasin, called glacial Lake Franconia, began to form (fig. 5) (Lougee, 1939). The initial outlet of the lake, to the south was at the drainage divide between the headwater areas of Ham Branch Brook and a tributary to the Wild Ammonoosuc River at an approximate altitude of 1,320 ft (pl. 7). Waters from this glacial lake spilled southward into the Wild Ammonoosuc River Valley (by this time, glacial Lake Wild Ammonoosuc had probably completely drained).

The lake maintained this initial outlet until the next outlet was uncovered at a pass in the headwater area of Salmon Hole Brook (pl. 7). When the Salmon Hole Brook Valley (in Lisbon) was uncovered, the lake was drained to an altitude of 1,280 ft. During this stage, water spilling northeastward over the outlet pass drained into the Ammonoosuc River Valley at Salmon Hole (in Lisbon) and built a large delta almost 200 ft thick in the deep waters of glacial Lake Hitchcock. At about the same time, active ice occupied the Ham Branch Brook Valley and deposited an esker in the lake that today is parallel to New Hampshire Route 118 and just south of the Franconia Airport (pl. 7). Later, when the ice margin occupied the lower Gale River subbasin in Sugar Hill, the lake expanded as the northward drainage of Meadow Brook and westward drainage of the upper Gale River subbasin were blocked by the ice.

Glacial Lakes Ammonoosuc and Whitefield

During deglaciation, the natural drainage to the west in the Ammonoosuc River subbasin was obstructed by the ice margin, and a series of interconnected lakes in the upper part of the basin, called glacial Lake Ammonoosuc, was temporarily formed (fig. 5) (Goldthwait, 1916; Lougee, 1939, 1940; Davis and others, 1993). As the ice margin receded in a north-northwesterly direction, progressively lower lake outlets to the west were uncovered one by one and drained each successive stage of the lake to the level of each newly exposed outlet.

The initial lake stage of glacial Lake Ammonoosuc, approximately 1,870 ft (570 m), was controlled at Crawford Notch (pl. 8). During this stage, active ice occupied the valley and deposited eskers in the lake near Bretton Woods perpendicular to the mouth of the Zealand River near Twin Mountain Village, where New Hampshire Routes 3 and 302 intersect, and in the Deception Brook Valley. Lake water spilled southward over Crawford Notch (outlet 1) into the Saco River Valley.

The second and third lake stages were created when outlets were uncovered southwest of Twin Mountain Village in Bethlehem (pl. 4): outlet 2, south of New Hampshire Route 3 at an altitude of 1,575 ft (480 m); and outlet 3, parallel to New Hampshire Route 3 at an altitude of 1,475 ft (450 m) (Lougee, 1940; Davis and others, 1993). During these stages, lake water spilled southward over the passes into the headwaters of Gale River and built deltas into the declining stages of glacial Lake Franconia (fig. 5). When outlet 3 was the spillway for the lake, an ice-contact delta, known as the Carroll Delta, was built southward into the lake. Drainage from within the ice to the north contributed most of the water and sediment to the delta. The delta was graded to the elevation of outlet 3 (Davis and others, 1993).

Outlet 3 remained the spillway for the lake until the ice margin retreated 1 mi north to the next outlet (outlet 4) in the headwaters of a small tributary to Beaver Brook 1 mi east of Trudeau Road in Bethlehem (altitude 1,378 ft or 420 m). The bottom of the Carroll delta was eroded to the same elevation as outlet 4.

Approximately half a mile west of outlet 4, outlet 5 was uncovered at an altitude of 1,338 ft (408 m) when the ice margin was near present-day Pierce Bridge in Bethlehem. During lake stages 4 and 5, water continued to spill into the headwaters of Gale River through the Beaver Brook subbasin and deposited thick layers of stratified drift. Currently (1993), the area surrounding outlet 5 is used as a regional landfill.

Additional outlets in the Ammonoosuc River subbasin opened to the west as the ice retreated and small ponded areas formed near the ice margin. When the ice margin was positioned over Pine Knob (a small hill near the town boundary between Bethlehem and Whitefield), a pass opened in the drainage divide between Black Brook and Bog Brook (a tributary to John's River) at an altitude of approximately 1,280 ft (390 m) (pl. 8). This was the first outlet for the newly formed glacial Lake Whitefield, when Carroll Stream was blocked from draining into John's River by the ice sheet (fig. 5) (Lougee, 1939). For the first time, waters from this lake spilled southward over the pass and possibly contributed sediment to the stratified-drift deposits found in the Ammonoosuc River Valley near Pierce Bridge and Trudeau Road in Bethlehem. Waters draining glacial Lake Ammonoosuc were still controlled at outlet 5.

When the ice margin was near present-day Bethlehem Hollow (pl. 8), drainage of the Ammonoosuc River was temporarily diverted to the Gale River subbasin. The Ammonoosuc River flowed across the Barrett Brook Valley along the ice front, at an altitude of approximately 1,200 ft (266 m), before it reached an outlet through the Indian Brook Valley (outlet 6) at an altitude of 1,083 ft (330 m) in Littleton (pl. 8). Meltwater draining from the retreating ice and drainage from the Ammonoosuc River flowed southwestward through outlet 6 into the Gale River subbasin at Sugar Hill. Glacial Lake Whitefield expanded but was still controlled through the pass near Pine Knob. Lougee (1939) believed that the gravelly nature of the till between outlet 6 and the present-day course of the Ammonoosuc River (near Wing Road) indicates that the river had flowed to Littleton earlier but that the riverbed had been reworked and destroyed by ice readvancement.

The Ammonoosuc River flowed along the ice front when its margin was just south of Alderbrook, opening up outlets at altitudes of 1,083 ft (330 m) and 1,063 ft (324 m) west of Wing Road (pl. 8). Concurrently, a second outlet for glacial Lake Whitefield was uncovered in the headwater area of Burns Pond in Whitefield at an altitude of 1,063 ft (pl. 8). Waters draining southward from glacial Lake Whitefield during this stage deposited coarse-grained stratified drift to the Ammonoosuc River Valley near Wing Road and Hazen Drive.

Fluvial-Deltaic Deposits

A sectional diagram showing the formation of an ice-contact delta in a glacial-lake environment is shown in figure 6. The Carroll Delta, which formed in glacial Lake Ammonoosuc, is a good example of this type of deltaic deposit. A block diagram showing the formation of a fluvial-deltaic aquifer is shown in figure 7. The Haverhill-French Pond aquifer in Haverhill is a good example of this type (fluvial-deltaic) of stratified-drift deposit (pl. 7). Other fluvial-deltaic aquifers are found throughout the study area. Fluvial-deltaic aquifers in this area can be characterized by morphosequence deposition associated with stagnation-zone retreat of the ice margin, which commonly formed glacial lakes near the ice margin (Koteff and Pessl, 1981). The aquifers are coarse grained near the ice-contact margin and become progressively finer grained where the sediment-laden meltwater lost energy downstream of the ice margin and as it emptied into glacial-lake water.

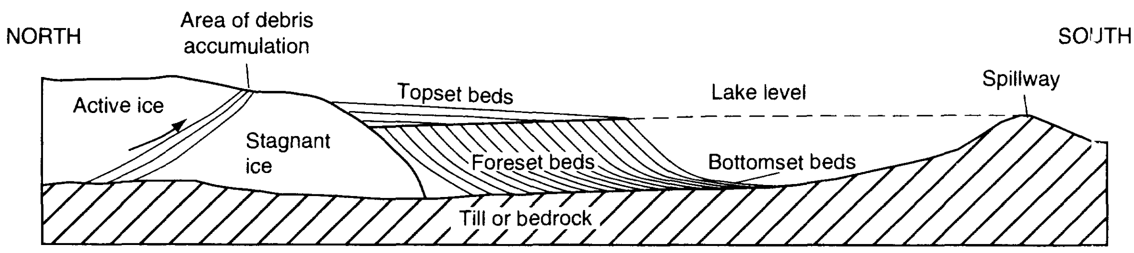

Figure 6. Sectional diagram of the formation of an ice-contact delta in a glacial-lake environment. (Modified from Koteff and Pessl, 1981.)

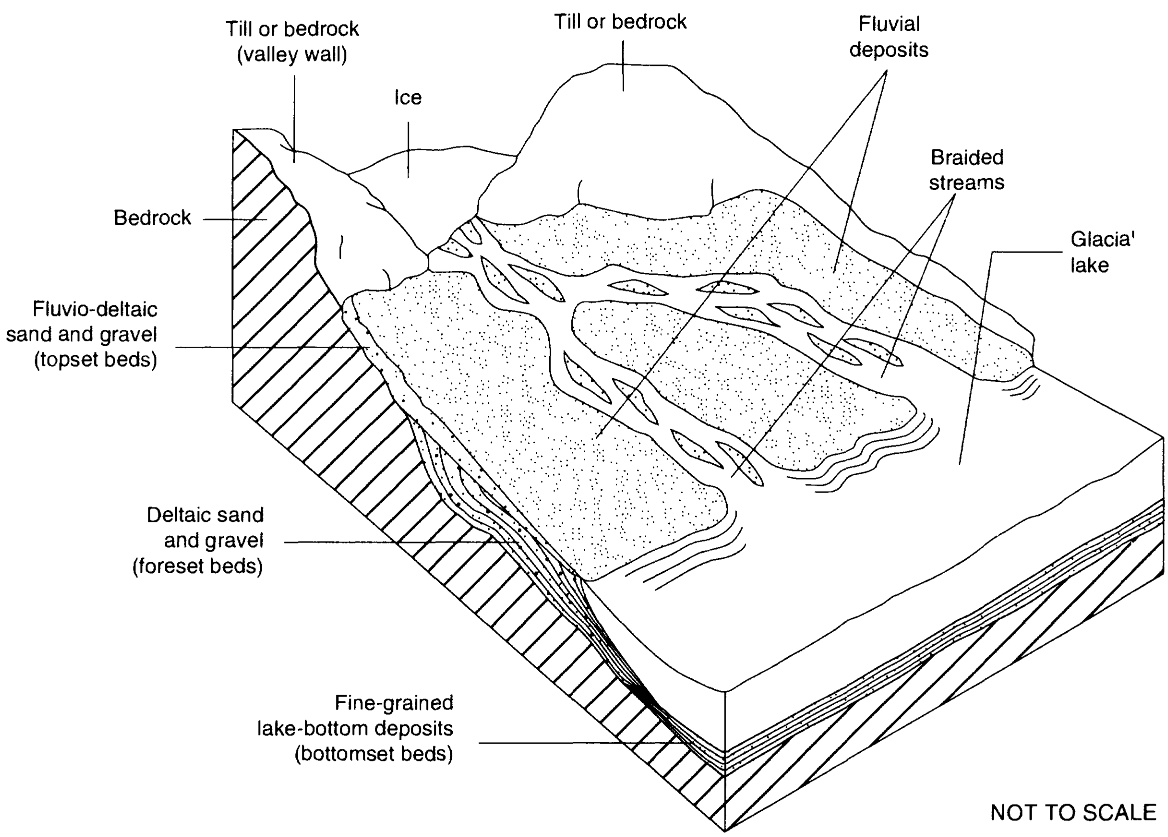

Figure 7. Block diagram of the formation of a fluvial-deltaic aquifer (from Ayotte and Toppin, 1995).

Till

Glacial till, commonly referred to as "hardpan," is an unsorted mixture of clay, silt, sand, gravel, and boulders that was deposited directly by glacial ice. In the study area, till lies discontinuously on the bedrock surface and is generally thin. The types of till common to this study area are brownish till (presumably oxidized) overlying a compact, grayish till. The upper brownish till in many localities is an ablation till composed of loosely consolidated rock debris once carried by glacial ice. Ablation tills accumulated in place as stagnant glacial ice melted. The lower, compact till in many localities is a lodgement till, originally deposited beneath the flowing glacial ice. The thickest sequences of till are composed of lodgement till in drumlins. In New Hampshire, till generally lies directly over bedrock; however, till overlies stratified drift at numerous locations in Bethlehem and Monroe. The deposition of one, and possibly more, of these pockets of stratified drift buried beneath till is from localized readvancement of glacial ice (Crosby, 1934; Lougee, 1934). Till-derived colluvium is a likely source for other stratified deposits buried beneath till-like material.

Till generally is considered to be a minor source of ground water because of its low transmissivity. Large-diameter (usually 36 in.) dug wells in till can provide small (generally less than 3 gal/min) amounts of water for domestic use; however, water-level fluctuations in till can be quite large, and dug wells sometimes dry up during the summer. Ablation tills containing lenses of stratified sand and gravel are the most productive till deposits. Because sorted stratified drift and ablation tills may grade into one another, the distinction between the two material types is not always clear.

Bedrock

The Middle Connecticut River Basin is underlain by layered sedimentary and volcanic rocks that have been metamorphosed. These metasediments and metavolcanic rocks include phyllite, schist, quartzite, and greenstone. The metasedimentary and metavolcanic rocks have been folded and intruded by plutonic rocks of different ages. The predominant bedrock formations underlying the study area are the Ammonoosuc Volcanics of Upper and Middle Ordovician age, the Littleton Formation of Lower Devonian age, and the Perry Mountain Formation of Silurian age in the western Connecticut River Valley.

Ground water from wells completed in bedrock enters the wells through fractures that are intersected by the well. The yields of these wells depend on the number, size, and degree of interconnection of the fractures. Wells that penetrate bedrock commonly yield only small quantities of water suitable for drinking and other domestic uses. Yields for the 2,050 bedrock wells inventoried for this study ranged from 0 to 425 gal/min; the median was 6 gal/min. Bedrock wells are capable of yields sufficient for municipal supply where fractures are large and numerous (Daniel, 1987). (For example, well LNW-1 (pl. 3) once supplied the town of Littleton with an average yield of 425 gal/min.)

GEOHYDROLOGY OF STRATIFIED-DRIFT AQUIFERS

The geohydrology of the stratified-drift aquifers was described by identifying (1) aquifer boundaries, (2) direction of ground-water flow from recharge to discharge areas, (3) aquifer thickness and storage, and (4) aquifer transmissivity. Data sources in this investigation included surficial geologic maps; records of wells, test borings, and springs, and seismic-refraction and seismic-reflection data. Results of the geohydrologic investigation are shown on plates 1 through 8. Plates 1, 2, 5, and 6 depict the southern and central parts of the study area, and plates 3, 4, 7, and 8 depict the northwestern and northeastern parts of the study area (fig. 2).

Delineation of Aquifer Boundaries and Water Table

Stratified-drift aquifers in the study area are composed of fine- to coarse-grained sands and gravels deposited by glacial meltwaters as glaciolacustrine or glaciofluvial deposits. Lateral aquifer boundaries are defined by the contact between the stratified drift and till and (or) bedrock. The position of this contact was determined from soil maps, test-boring logs, and field mapping done specifically for this study. Bottom boundaries, the contacts between the stratified drift and the surface of the till or bedrock, were determined by use of data from seismic refraction and seismic reflection and from test borings. The upper boundary is the water table. Water-table altitudes were determined from wells, surface-water bodies, and geophysical data.

Areal Extent of Stratified-Drift Aquifers

The areal extent of the stratified-drift aquifers is shown on plates 1 through 8. Because of the regional scale of this investigation, aquifer boundaries are approximate. Coarse-grained stratified-drift deposits may underlie lacustrine deposits, but are not delineated on the plates because of the complexity of the stratigraphy and the lack of subsurface data for adequate definition. Available data for coarse sediment underlying fine-grained sediment are addressed in the section "Description of Selected Stratified-Drift Aquifers." Although the lacustrine sediments (very fine sands, silt, and clay) generally are not capable of supplying adequate amounts of water for domestic and community use, the coarse-grained deposits that may lie below could be productive aquifers.

Available data on the areal extent of the stratified-drift aquifers in the study area were limited to one reconnaissance map of the surficial geology of the Canaan area in parts of the Canaan, Enfield Center, and Mount Cardigan quadrangles, at a scale of 1:62,500 (Denny, 1958). Aquifer boundaries for the entire study area were specifically mapped or remapped as part of this study at a scale of 1:24,000 or 1:25,000.

Most aquifer boundaries delineated on plates 1 through 4 are shown as solid lines. In the explanation on the plates, solid lines are defined as "approximately located" because the boundary locations, which they represent, cannot be ensured with great accuracy. A solid line on a 1:25,000 scale map implies a horizontal accuracy of $\pm$ 80-ft . In most areas, the solid-line boundaries are nearly this accurate. Dashed lines represent "inferred" boundaries, and dotted lines represent "concealed" boundaries (usually beneath swamps or other surface-water bodies).

Stratigraphic Position of Geohydrologic Units

Stratigraphic data for the geohydrologic units in the study area were obtained from records of subsurface exploration. Additional test drilling and surface-geophysical exploration (seismic refraction and marine seismic reflection) were done to better define the position and the type of geohydrologic units of stratified-drift aquifers.

Ground-Water Site Inventory

Subsurface data from wells, test borings, and springs were inventoried, and sites within or near the stratified-drift aquifers are plotted on plates 1 through 4. Geohydrologic data for approximately 2,770 sites were added to the USGS computerized Ground-Water Site Inventory (GWSI) data base and then checked for accuracy. Sixty-four percent of the data are for domestic wells and were transferred to GWSI from the New Hampshire Water Management Bureau data base. Approximately 1,100 sites of the 2,770 total sites added are in or near areas where the stratified-drift aquifers are present. Appendix A contains selected data from the GWSI data base for wells, borings, and springs in the stratified-drift-aquifer areas that were used to prepare the accompanying plates. These data include an identification number for the well, latitude and longitude, depth of the well, water level, and yield of the well. Stratigraphic logs of selected wells and borings in stratified drift are in appendix B. These data were used primarily for estimating the transmissivity of the aquifers where no aquifer-test data or grain-size data were available.

The following sections of this report present the methods applied in data acquisition and interpretation. Point data and contoured interpretive information can be transferred digitally to other GIS data bases and the data analyzed relative to other geographic features. Applications of the USGS GWSI data base are discussed by Mercer and Morgan (1981).

Seismic Refraction

Seismic-refraction surveys were completed at 95 locations (totaling more than 11 mi) to determine depths to the water table and depths to the bedrock surface. Survey locations are shown on plates 1 through 4. A 12-channel, signal-enhancing seismograph was used to record arrival times of compressional wave energy generated by a sound source. The data were collected and interpreted according to methods described by Haeni (1988b). Interpretive results determined with the aid of a computer program by Scott and others (1972), are shown in appendix C.

Seismic velocities calculated for the materials under investigation and used in the seismic interpretations range from 500 to 1,500 ft/s for unsaturated stratified drift, are approximately 5,000 ft/s for saturated stratified drift, and range from 10,000 to 20,000 ft/s for bedrock. Interpreted seismic-refraction profiles in this report show (1) the top of the profile, which represents land surface in feet above sea level, (2) an estimate of altitude of the water table in unconsolidated deposits at the time the seismic data were collected, and (3) an estimate of altitude of the bedrock surface. The relative altitudes of each geophone and sound source were determined in the field by leveling if altitude differences greater than 5 ft between geophones were observed. The actual altitudes, relative to sea level, were estimated from USGS topographic maps and are assumed to be accurate to half a contour interval, or about 10 to 20 ft. Estimated depths to the water table and to the bedrock surface generally compare well with control data, such as nearby well or boring logs and water-table and bedrock-outcrop observations. Actual depths to the bedrock surface have been shown to be within 10 percent of the estimates from seismic-refraction profiles (Haeni, 1988b). Till is not accounted for in these interpretations because it is usually thin (less than 10 ft) and cannot be detected with seismic-refraction methods. Where till is present in thicknesses greater than 10 ft and is not accounted for in the interpretation of seismic data, the computed depth to the bedrock is less than the actual depth. Additional error results if the relief of the bedrock surface differs considerably over distances less than the 50- or 100-foot geophone spacing used in the profiling.

Seismic Reflection

High-resolution, continuous, marine, seismic-reflection data were collected along approximately 1.6 mi of Mascoma Lake shoreline. The continuous surveys were done according to methods described by Haeni (1988a). Survey data were used to map depths to the bedrock surface along the shoreline. During data collection, an array of receivers was towed behind a boat that traveled slowly along the lake shoreline. Compressional waves, generated from a sound source, penetrated the lake bottom and were reflected back to the surface in response to the physical differences in the underlying geologic strata. The reflected sound waves were received at the water surface and converted to an electrical signal that was displayed on a graphic recorder. Data-collection results were often obscured by strong reflectors at the water bottom. [A more complete discussion of this technique is given by Haeni (1988a) and by Morrissey and others (1985)].

Locations of seismic-reflection surveys along Mascoma Lake are shown on plate 1. Seismic-reflection records and interpreted hydrogeology from the two surveys are shown in figures 8 and 9. The lake bottom, till and (or) bedrock surface and the type of unconsolidated deposits are indicated.

Altitude of Water Table

The altitude of the water table in the stratified drift is shown on plates 1 through 4. These maps were prepared from (1) altitudes of streams, ponds, and lakes as shown on 1:24,000- or 1:25,000-scale USGS topographic maps; (2) ground-water-level data from wells screened in the stratified drift; and (3) analysis of seismic-refraction profiles. Water-table altitudes were mapped for only unconfined aquifers in the stratified drift. The altitude of the water table is controlled locally by the stratigraphy, which differs from place to place. Accordingly, in areas where sands and gravels overlie glaciolacustrine silts and clays, the water-table gradient is steep. Saturated coarse-grained stratified drift confined below fine-grained material may indicate the location of potentiometric surfaces in confined aquifers, but the data are insufficient to contour.

Water-table contours generally indicate areas of recharge to and discharge from aquifers. A water-table contour that intersects a gaining stream (a stream that receives ground-water discharge) forms a "V" whose narrow end points upstream. A water-table contour that intersects a losing stream (a stream that recharges ground water) forms a "V" that points downstream.

Water-level measurements were made periodically at 26 observation wells in the study area from June 1990 through October 1991. Hydrographs for 19 wells are shown in appendix D. Long-term water-level measurements at wells in other parts of New Hampshire support the conclusion that natural water-level fluctuations in coarse-grained stratified drift are usually less than 5 ft but can be as much as 10 ft (Cotton, 1987; Toppin, 1987; Moore, 1990; Mack and Lawlor, 1992; Stekl and Flanagan, 1992; Moore and others, 1994; Harte and Johnson, 1995). Therefore, a 20- or 40-foot contour interval for water-table altitudes under natural conditions is reasonable when preparing a generalized water-table map from water-level measurements made at different times.

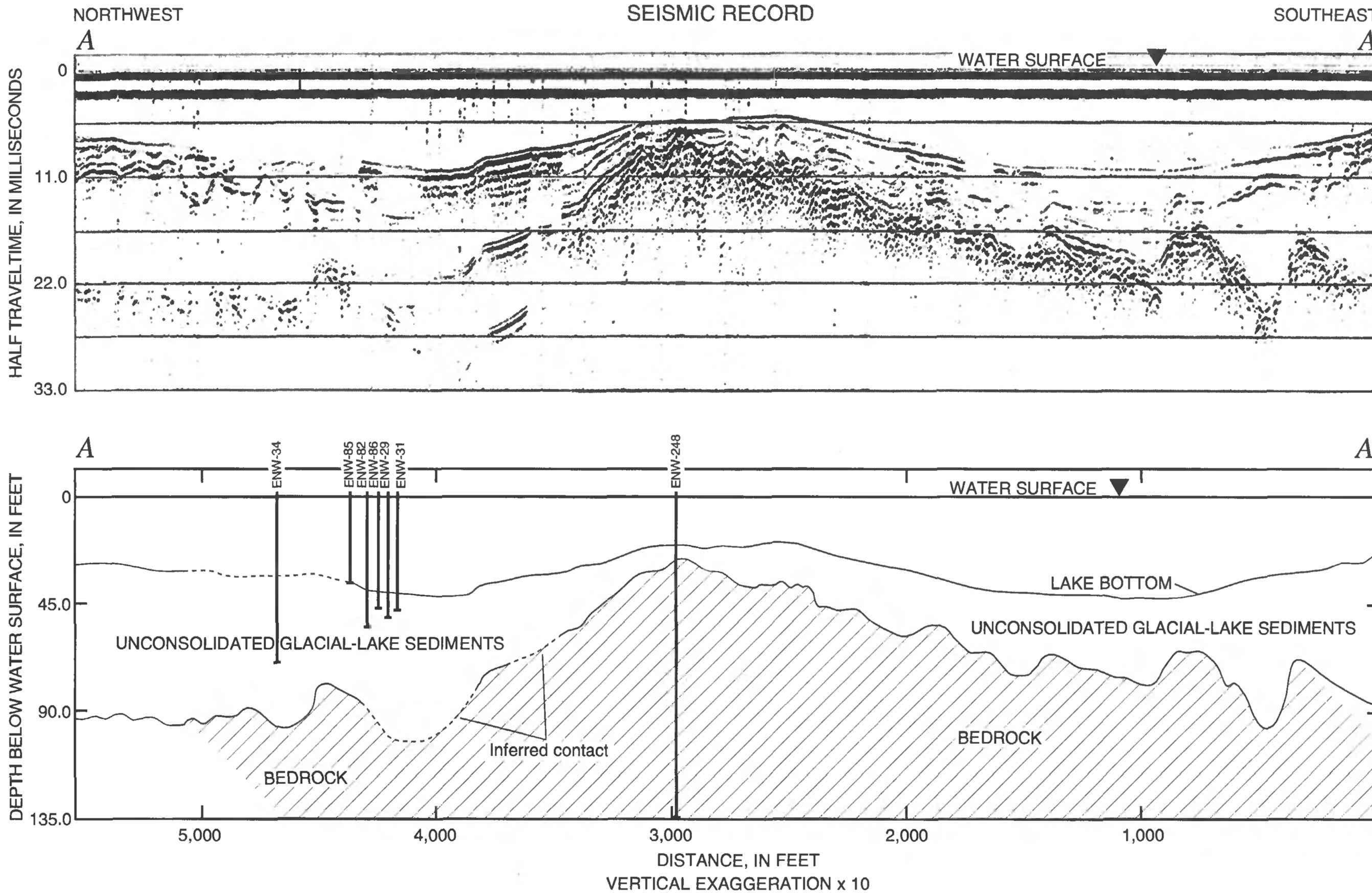

Figure 8. Seismic-reflection profile and cross section A-A' of Mascoma Lake, Enfield, west-central New Hampshire, interpreted from seismic-reflection data.

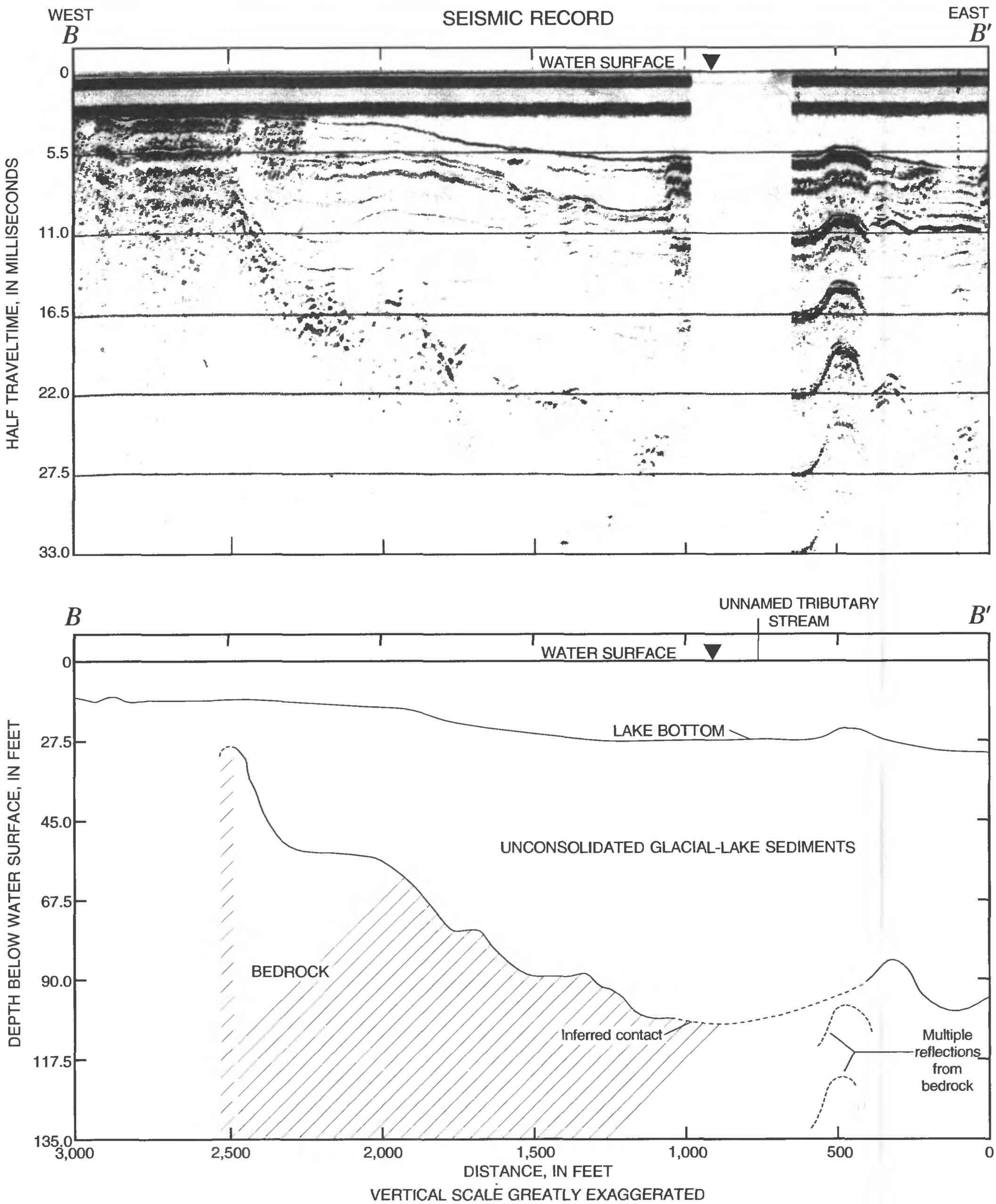

Figure 9. Seismic-reflection profile and cross section B-B' of Mascoma Lake, Enfield, west-central New Hampshire, interpreted from seismic-reflection data.

Recharge, Discharge, and Direction of Ground-Water Flow

Ground-water recharge includes natural recharge from precipitation that falls directly on the aquifer at the surface and infiltrates the water table, lateral inflow from adjacent till and bedrock areas, and, in some areas, leakage from streams that traverse the aquifer. Natural recharge to an aquifer is the difference between precipitation and the amount of water lost to evapotranspiration and to runoff. Most of the recharge in the study area occurs in late fall and early spring, when precipitation is greatest. Estimates of ground-water recharge to stratified-drift aquifers is approximately half of the annual precipitation in glaciated areas of eastern Massachusetts (Knott and Olimpio, 1986) and in southern Maine (Morrissey, 1983). Ground-water discharge at low streamflow was used to approximate recharge to an aquifer. Streamflow data collected during a period of low flow indicated that approximately half of the annual precipitation was being discharged to the streams. Therefore, recharge to aquifers was considered to be equal to approximately half of the annual precipitation.

Recharge to stratified-drift aquifers from upland areas not drained by streams can be estimated by measuring ground-water discharge from till and (or) bedrock uplands that are drained by streams. Long-term streamflow data (1963 to present) from Stony Brook Tributary near Temple, N.H., indicate that the average discharge from till uplands with small drainage areas (3.60 mi^2 for Stony Brook) can be as high as 1.95 $(ft^3/s)/mi^2$ (Ayotte and Toppin, 1995). For a similar stream in Maine, the estimated average annual lateral inflow of ground water from upland areas to a stratified-drift aquifer was 0.5 $(ft^3/s)/mi^2$ (Morrissey, 1983). Average annual precipitation, however, in the White Mountains area is approximately 15 to 20 in. more than in the lower lying areas of New Hampshire (Knox and Nordenson, 1955). Therefore, the upland till/bedrock areas in the study area could possibly contribute more water to stratified-drift aquifers than upland areas described in the above studies.

Recharge to stratified-drift aquifers from losing streams emanating from till/bedrock uplands was documented by Randall (1978) and by Morrissey and others (1989). This type of recharge is common where the tributary streams flow over aquifers with a deep water table relative to streambed altitude (D.J. Morrissey, U.S. Geological Survey, written commun., 1989). For example, a small tributary stream 2.7 mi northeast of the town of Lisbon drains Perch Pond (pl. 3) and all water is lost to deltaic stratified-drift deposits before reaching the Ammonoosuc River.

Ground-water discharge includes natural discharge from the aquifer through seepage into streams, lakes, and wetlands; evapotranspiration; and withdrawal from wells. During periods of low streamflow, usually in late summer and early fall and after extended periods without rainfall, streamflow consists almost entirely of ground-water discharge. Sixty-one streamflow measurements were made during low flow (streamflow approximated 90-percent flow duration) in September 1990 and July 1991 (appendix E). These measurements can be used to estimate recharge to aquifers in the study area. Further discussion of these measurements is found in "Description of Selected Stratified-Drift Aquifers."

Artificial sources of recharge to or discharge from an aquifer complicate the preparation of water-table maps that are intended to represent natural conditions. Large withdrawals of ground water affect the direction and slope of ground-water flow in several aquifers in the study area. Artificial recharge is not found in the study area.

Direction of ground-water flow in aquifers is from areas of higher ground-water levels, or higher hydraulic head, to areas of lower ground-water levels or lower hydraulic head, and is perpendicular to the contours of equal head. Arrows drawn at right angles to the water-table contour lines are shown on plates 1 through 4 to indicate the approximate direction of the horizontal component of ground-water flow. In general, ground water flows from the uplands towards the Connecticut River and its tributaries. Water-table gradients in fine-grained stratified drift commonly exceeded 5 percent in areas of high topographic relief. Water-table gradients in coarse-grained stratified drift in areas of low topographic relief were less than 0.1 percent. Potentiometric surfaces within aquifers under confined conditions (coarse-grained deposits beneath fine-grained deposits) were not contoured because of insufficient data. Altitudes of the water table and direction of ground-water flow shown on plates 1 through 4 must be considered regional in nature, and local conditions may differ.

Aquifer Characteristics

The geohydrology of stratified-drift aquifers shown on plates 5 through 8 is based partly on aquifer characteristics that include saturated thickness, storage, and hydraulic conductivity. Estimates of saturated thickness and hydraulic conductivity were used to calculate transmissivity (pls. 5-8). These characteristics can be used to assess the water-supply potential of stratified-drift aquifers.

Saturated Thickness and Storage

Saturated thickness of a stratified-drift aquifer is the vertical distance between the water table and the base of the aquifer. Saturated-thickness contours were prepared from test-boring and well data and seismic-refraction and seismic-reflection profiles. For many stratified-drift aquifers, the base of the aquifer is the till or bedrock surface; for some aquifers, however, the base is the contact between the upper coarse-grained deposits and the underlying fine-grained lacustrine deposits. Thicknesses of the fine-grained lacustrine deposits are generally unknown, so the saturated thicknesses depicted on plates 5 through 8 include these fine-grained deposits where present. The saturated thickness multiplied by the specific yield of an unconfined aquifer determines the amount of ground water in storage.

The storage coefficient of an aquifer is defined as the volume of water released from or taken into storage per unit surface area of aquifer per unit change in head (Heath, 1983). In unconfined aquifers, the storage coefficient is approximately equal to the specific yield—the amount of water released by gravity drainage from a unit volume of aquifer per unit decrease in hydraulic head. A value of 0.2 is commonly used for specific yield for stratified-drift aquifers in New England (Moore, 1990) and for unconsolidated deposits in other areas (Freeze and Cherry, 1979). Specific yields of 13 samples from southern New Hampshire ranged from 0.14 to 0.34 and averaged 0.26 (Weigle and Kranes, 1966).

Water released from storage in confined aquifers results from expansion of water and compression of the aquifer as hydraulic head declines. Storage coefficients for confined aquifers, which are significantly smaller than specific yields for unconfined aquifers, range from 0.00005 to 0.005. Smaller storage coefficients indicate that the amount of water derived from expansion and aquifer compression is much less than that from dewatering by gravity drainage.

Saturated-thickness maps can be used to estimate the amount of ground water stored in an aquifer. The saturated volume of an unconfined aquifer is approximately equal to the sum of the products of the areas between successive pairs of saturated-thickness contours multiplied by the average saturated thickness for each area. The volume of ground water stored in the aquifer is the product of the saturated volume multiplied by the porosity.

Saturated-thickness maps (pls. 5-8) were prepared by use of data from surficial geologic maps, seismic-refraction and seismic-reflection profiles, and data entered and stored in the GWSI data base. A 40-foot contour interval was used to show saturated thicknesses of stratified-drift aquifers in most locations. Where data were available, a 20-foot contour interval was added. The values calculated for saturated thicknesses included the thickness of all stratified-drift regardless of grain size. Layers of fine sand, clay, and silt that overlie, underlie, or are interlayered with the aquifer deposits are included in the thicknesses depicted on plates 5 through 8. This inclusion is important to note where glacial Lake Hitchcock and other glacial-lake deposits are present along the Connecticut River and associated tributaries. Saturated thicknesses composed primarily of fine-grained sediments are greater than 500 ft in some of the central part of the Connecticut River Valley in Haverhill and Orford.

Seismic-refraction profiles (appendix C) show the depths to the water table and depths to bedrock, but do not show thickness of the till deposits. For the purpose of preparing the saturated-thickness maps for the study area, till was assumed to be thin (less than 10 ft) unless there was available data.

Transmissivity and Hydraulic Conductivity

Transmissivity is defined as the rate at which water can be transmitted through a unit width of an aquifer under a unit hydraulic gradient (Heath, 1983). The transmissivity (T) of an aquifer is equal to the horizontal hydraulic conductivity of the aquifer (K) in feet per day, multiplied by the saturated thickness (b, in ft) and is expressed in units of feet squared per day; thus:

$$T = K(b). \quad (1)$$

Hydraulic conductivity was estimated from grain-size distributions of sediment samples determined by use of the regression equation developed by Olney (1983). In this relation, an effective grain size (D_{10}, in Phi units) was used to estimate hydraulic conductivity (K) with the following equation:

$$K = 2{,}100 \times 10^{-0.655(D_{10})}. \quad (2)$$

The effective grain size (D_{10}) is a controlling factor in the hydraulic conductivity of stratified-drift aquifers and is defined as that grain size where 10 percent of the sample consists of finer grains and 90 percent consists of coarser grains. Olney (1983) developed this relation from results of permeameter tests of stratified-drift samples from Massachusetts. Moore (1990) found that this relation yielded results that fall within the range of results from methods of Krumbein and Monk (1946), Bedinger (1961), and Masch and Denney (1966). Comparisons with aquifer-test data, however, indicate that application of equation 2 may not give accurate results for very coarse-grained sand and (or) gravel. Estimates of hydraulic conductivity for aquifers consisting of coarse sands and gravels in this study were, in part, based on comparisons with aquifer-test data for similar deposits.

Grain-size distribution and the effective grain size were determined for 454 samples of stratified drift from southern New Hampshire. Hydraulic conductivity was calculated for each of the 454 samples. The samples were collected in the Exeter and Lamprey River Basins (Moore, 1990), in the seacoast area and the Lower Merrimack River Basin (Flanagan and Stekl, 1990), in the Bellamy, Cocheco, Salmon Falls River Basins (Lawlor and Mack, 1992), in the Lower Connecticut River Basin (Moore and others, 1994), in the Contoocook River Basin (Harte and Johnson, 1995), in the Middle Merrimack River Basin (Ayotte and Toppin, 1995), and for this study.

Hydraulic conductivities calculated from equation 2 were plotted against median grain size in phi groups, and the resulting plot was divided into three categories of degree of sorting (fig. 10). These categories are used to describe the types of stratified-drift aquifer deposits

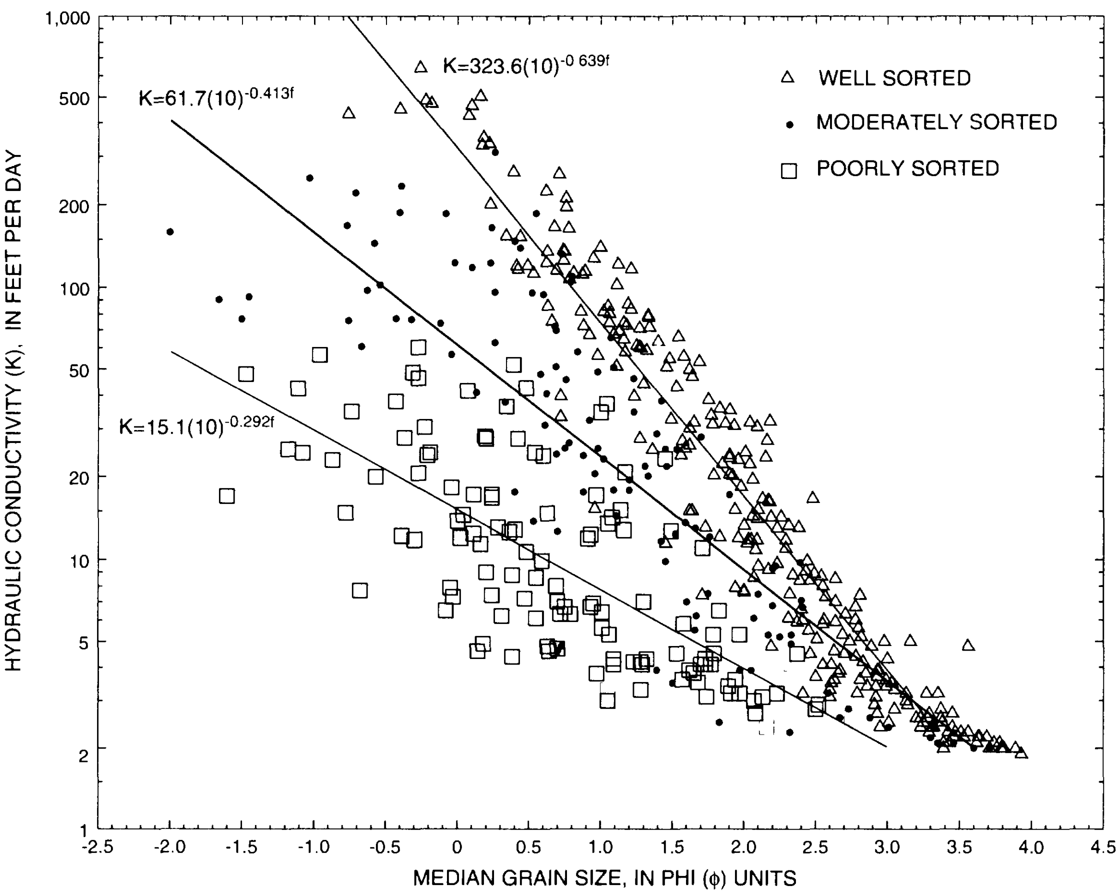

Figure 10. Relations among estimated hydraulic conductivity, median grain size, and degree of sorting for 454 samples of stratified drift in southern New Hampshire. (From Ayotte and Toppin, 1995.)

found in New Hampshire. The degree of sorting was based on the standard deviation of the individual samples. If standard deviations were large (greater than 1.75 phi), the samples were considered poorly sorted; if standard deviations were intermediate (1.25 phi to 1.75 phi), the samples were considered moderately sorted; and if standard deviations were small (less than 1.25 phi), the samples were considered well sorted. A regression equation was developed for each of the three categories to determine the relation between hydraulic conductivity and median grain size. The coefficient of determination (R^2) was 0.93 for the well sorted samples, 0.72 for the moderately sorted samples, and 0.54 for the poorly sorted samples (fig. 10).

The calculated hydraulic conductivites, grouped by ranges of median grain size and by ranges of standard deviation (degree of sorting), are listed in table 2. Hydraulic conductivities were calculated for each median phi group and were averaged to determine a mean hydraulic conductivity per group. For example, mean hydraulic conductivity of sediment samples whose mean grain size was defined as medium and well sorted was 38 ft/d (table 2).

The hydraulic conductivities in table 2 were used to estimate hydraulic conductivities for lithologic descriptions given in test borings and well logs. For example, from a lithologic description of 10 ft of moderately sorted coarse sand overlying 20 ft of well sorted fine sand overlying bedrock, the horizontal hydraulic conductivities assigned would be 39 ft/d and 9 ft/d, respectively. The estimate of transmissivity, based on the same description, would be (10 ft x 39 ft/d) + (20 ft x 9 ft/d), or 570 ft^2/d. Hydraulic conductivities were not calculated from grain-size distribution of very fine sand, silt, and clay deposits in the study area because these values are less than 4 ft/d and are considered insignificant (Todd, 1980).

Estimates of hydraulic conductivity and transmissivity determined from aquifer-test data for 10 municipal wells completed in stratified drift are reported in table 3. Values in table 3 are from a variety of sources and were determined by several analytical methods (Theis, 1935; Jacob, 1940; Neuman, 1974). Values reported in table 3 may not accurately represent the hydraulic characteristics of the stratified-drift aquifers; pumping may have caused induced surface-water infiltration, which would have increased estimated transmissivities. Aquifer tests performed with small diameter wells may have resulted in low transmissivities. Transmissivities reported from aquifer tests ranged from 1,400 ft^2/d to 36,800 ft^2/d in the study area (table 3). The areal distribution of transmissivities reported from aquifer tests generally agree with transmissivities from grain-size analyses (shown on pls. 5-8) where induced recharge was not affected by a surface-water body.

Table 2. Relation of mean hydraulic conductivity to median grain size and degree of sorting of stratified drift in southern New Hampshire

[<, actual value is less than value shown; >, actual value is greater than value shown; --, no data. Data from Ayotte and Toppin, 1995]

Median grain size (phi units)	Median grain description	Well sorted (standard deviation <1.25 phi)	Moderately sorted (standard deviation 1.25 phi to 1.75 phi)	Poorly sorted (standard deviation >1.75 phi)
		Mean hydraulic conductivity (K), in feet per day[1]		
-1.75	Granules	--	320	49
-1.25	Granules	--	200	35
-.75	Very coarse sand	970	120	25
-.25	Very coarse sand	470	78	18
.25	Coarse sand	220	48	13
.75	Coarse sand	110	30	9
1.25	Medium sand	51	19	7
1.75	Medium sand	25	12	5
2.25	Fine sand	12	7	3
2.75	Fine sand	6	4	2
3.25	Very fine sand	3	3	--
3.75	Very fine sand	2	2	--

[1] Hydraulic conductivity calculated by use of methods described by Olney (1983).

Table 3. Estimates of transmissivity and hydraulic conductivity for stratified-drift from unpublished data and published reports, west-central New Hampshire and eastern Vermont

[gal/min, gallons per minute; ft, feet; ft²/d, foot squared per day; ft/d, foot per day]

Pumped well(s) and town location	Pumping rate (gal/min)	Drawdown (ft)	Transmissivity (ft²/d)	Hydraulic conductivity (ft/d)
NEW HAMPSHIRE				
CFW-6 (Carroll)[1]	322	15.56	7,000	180
CFW-44 (Carroll)[1]	150 - 200	3.83	3,000 - 4,700	150 - 235
ENW-29 (Enfield)[1]	90 - 115	3.12	3,900 - 4,500	115 - 132
FDW-7 and FDW-8 (Franconia)[2]	240	4.4 - 5.72	6,700 - 7,400	110 - 120
LLW-2 (Lisbon)[1]	703	10.6	9,000 - 16,000	210 - 380
LNW-2 (Littleton)[3]	412	8.2	27,000 - 32,000	346 - 410
MUW-1 (Monroe)[1]	32	.88	2,400	73
WLW-6 (Whitefield)[4]	210 - 250	20.81	1,400 - 1,700	20 - 24
VERMONT				
FLW-1 (Fairlee)[1]	75	0.5	13,200	200
NRW-42 (Norwich)[5]	975	3.4	36,800	360

[1] Unpublished data on file in the Pembroke, N.H., office of the U.S. Geological Survey.
[2] Gary Smith, D.L. Maher Co, written commun., 1989.
[3] D.L. Maher Co., (1989).
[4] Gary Smith, D.L. Maher Co, written commun., 1990.
[5] Caswell (1990).

Description of Selected Stratified-Drift Aquifers

Stratified-drift aquifers found in valleys throughout the Middle Connecticut River Basin underlie 123 mi², or 12.5 percent of the study area. The most extensive and productive (or potentially productive) aquifers are described in this section (fig. 11). Each area is referred to by the following major units: the Connecticut River Valley, Mascoma River subbasin, Ammonoosuc River subbasin, and John's River subbasin. Underlying aquifers present in each area are discussed from south to north or west to east. Aquifer boundaries, data-collection locations, and altitudes of ground-water tables are shown on plates 1 through 4. Aquifer boundaries, saturated thickness, and transmissivity of stratified-drift aquifers are shown on plates 5 through 8. Brief discussions of information shown on the plates are included in the following section.

Connecticut River Valley Aquifers

Major stratified-drift aquifers along the main stem of the Connecticut River in the study area extend north from Lebanon to Littleton and underlie 43 mi². Other towns with underlying stratified-drift aquifers in the Connecticut River Valley are, from south to north, Hanover, Lyme, Orford, Piermont, Haverhill, Bath, and Monroe (fig. 11). Aquifers underlying areas drained by Oliverian Brook, Clark Brook, and other minor tributary streams also are included in this section.

Connecticut Valley Esker Aquifers

Hitchcock (1878) was the first to describe a long and narrow, south-trending esker ridge, known as the Connecticut River Valley esker, that formed beneath glacial ice along the floor of the Connecticut River Valley. Hitchcock (1878) and Lougee (1939) believed that the esker formed as a 24-mile-long continuous deposit from Windsor, Vt., to Lyme, N.H., and that much of the esker is either buried beneath fine-grained lake-bottom deposits or partly eroded away by the Connecticut River. More recently, Koteff and Pessl (1981) have postulated that this esker formed as part of the systematic process of stagnation-zone retreat. Two aquifers (one in Lebanon and the other in Hanover) that are part of the Connecticut River Valley esker are described below.

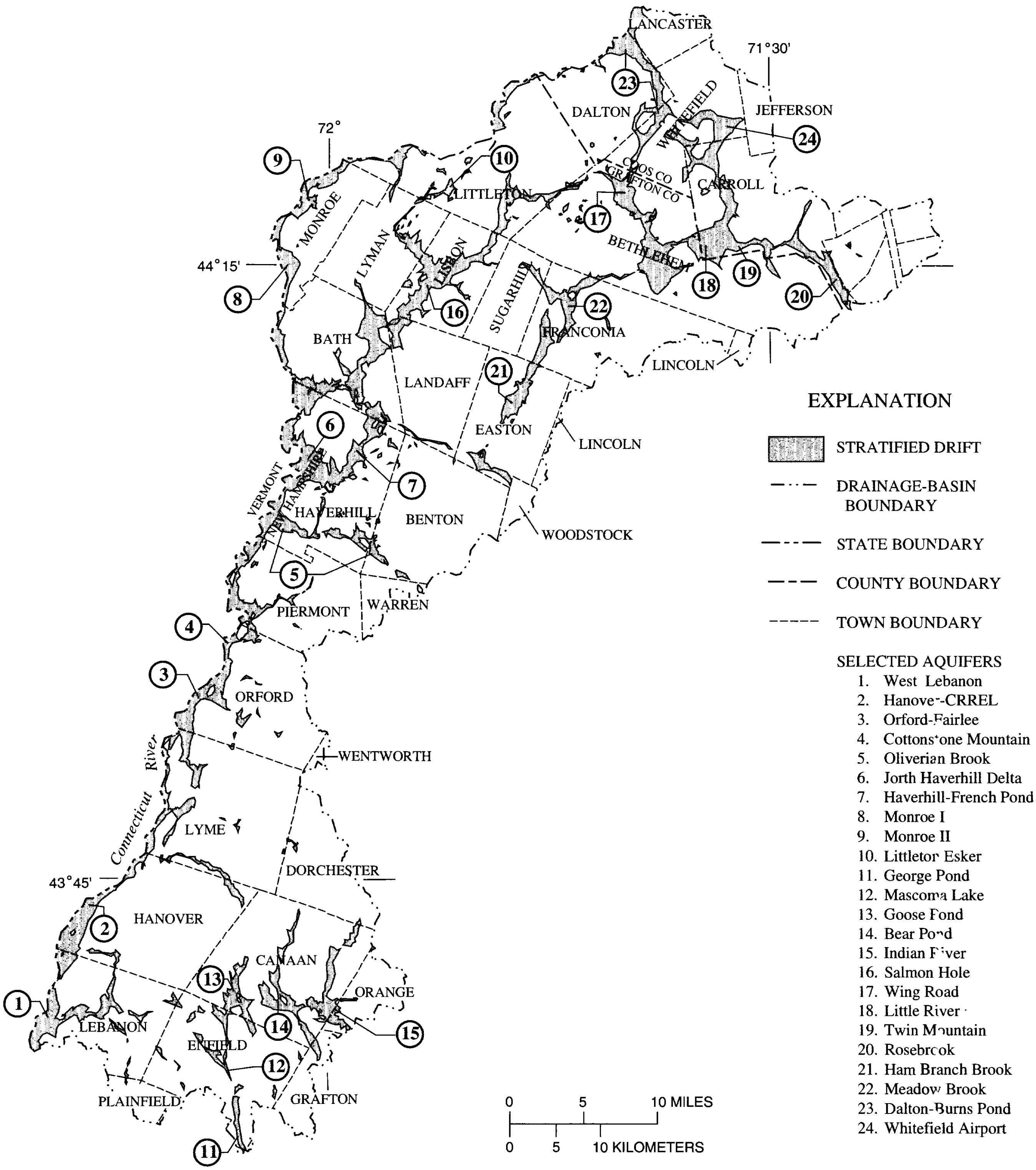

Figure 11. General locations of selected stratified-drift aquifers in the Middle Connecticut River Basin, west-central New Hampshire.

West Lebanon Aquifer

The southernmost aquifer originally deposited in glacial Lake Hitchcock along the main stem of the Connecticut River as part of the Connecticut River Valley esker is west of New Hampshire Route 12A in the southwestern corner of Lebanon (fig. 11, pl. 5). Much of this stratified drift consists of fine-grained lake-bottom deposits either overlain by, or interlayered with, coarse-grained fluvial-deltaic material. Coarse-grained aquifer material underlies the northern part of the aquifer and may be part of the Connecticut River Valley esker that is buried beneath younger lake-bottom deposits. Bridge boring LHB-1 penetrated 65 ft of saturated coarse sand and gravel, overlain by 15 ft of fine sand and silt; the boring did not reach bedrock (pl. 1, appendix B). The esker continues north of boring LHB-1 and is exposed at the surface near the confluence of the Mascoma and Connecticut Rivers. Bridge boring LHB-4 penetrated the esker segment 6,000 ft northeast of boring LHB-1. The stratigraphic log from boring LHB-4 (appendix B) shows that the esker contains 33 ft of medium sand and gravel overlain by 29 ft of fine to medium sand; here also, the boring did not reach bedrock. Surface features shown on the Hanover, N.H.-Vt., USGS 7.5 by 7.5 minute quadrangle map (pl. 1) indicate that the esker continues south of boring LHB-1 across the Conneccut River into Hartford, Vt.

Saturated thickness in the West Lebanon aquifer exceeds 80 ft in some sections. Transmissivity generally is less than 4,000 ft^2/d. Potential for ground-water production is considerable, especially if production were close to the Connecticut River where recharge can be induced from the river. However, because of the proximity of the aquifer to the town landfill, the town wastewater treatment plant (at the confluence of the Mascoma and Connecticut Rivers), and urbanization, water quality may be of concern.

Hanover-CRREL Aquifer

This aquifer is located in western Hanover, immediately west of the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) (fig. 11, pl. 5). The aquifer is hydraulically connected with the Connecticut River. Near CRREL, the esker is overlain by approximately 90 ft of silt and clay lake-bottom sediments. Some of the wells drilled into the aquifer penetrated the full thickness of the esker and reached bedrock. At observation well HHW-28, bedrock is 65 ft below land surface. Industrial well HHW-5 penetrated 88 ft of saturated coarse-grained material and refusal was reached on bedrock at 167 ft. Four other industrial wells (HHW-2, HHW-3, HHW-4, and HHW-6) and Hanover Water Works municipal well HHW-1 (located 1,000 ft north of the industrial wells) penetrated the esker. Although the esker segment is long (at least 4 mi), it is very narrow, probably 1,000 ft wide or less. The contact between the esker and surrounding lake sediments is fairly abrupt and steep. Test well HHW-27, which penetrated 139 ft of fine sands, silt, and clay, is less than 600 ft east of industrial well HHW-4, which penetrated 42 ft of coarse-grained aquifer material (appendix B).

Information on the hydraulic characteristics of the aquifer is available from a study of the Norwich, Vt., Fire District municipal well NRW-42, 4,300 ft northeast of well HHW-1 on the opposite side of the Connecticut River (pl. 1). Well NRW-42 yields nearly 1,000 gal/min from this highly permeable esker, and similar hydraulic conditions are at the industrial wells and Hanover municipal well (Shoop and Gatto, 1992). Based on results from aquifer tests on well NRW-42, transmissivity is 36,800 ft^2/d and average hydraulic conductivity is 360 ft/d (table 3) (Caswell, 1990). This transmissivity, however, represents the effect of a recharge boundary (the Connecticut River), which increases availability of water to the aquifer; hence, this transmissivity is not representative of the hydraulic characteristics of the aquifer.

Currently (1993), water is withdrawn from this aquifer at a rate of 2.9 to 3.5 Mgal/d. CRREL uses the aquifer as a source of industrial water for its refrigeration system; the combined yield for CRREL's four industrial wells is 1,500 to 1,900 gal/min (2.2 to 2.8 Mgal/d). Hanover Water Works used to pump from the aquifer during the summer months to augment the town's three surface-water reservoirs; well HHW-1 had a yield of 500 gal/min (0.63 Mgal/d). The Norwich (Vt.) Fire and Water District withdraws from the aquifer as its primary source of drinking water. Although the District's well (NRW-42) is capable of yields of 725 gal/min or 1.04 Mgal/d (Caswell, 1990), it currently (1993) yields only 70 gal/min or 0.1 Mgal/d (Brian McMullen, Norwich Fire and Water District, oral commun., 1993).

Ground-water levels reported for observation wells HHW-25, HHW-26, and HHW-27 (appendix A) reflect nearby pumping conditions from the industrial wells. These water levels do not match the altitudes of the water table shown on plate 1, which are estimates of natural or nonpumping conditions. The actual direction of ground-water flow—not shown on plate 1—is from the Connecticut River to the industrial wells, in response to induced infiltration from the river.

Additional water-supply wells could be developed south or north of the current wells; however, trichloroethylene (TCE) was detected in November 1990 in three of the CRREL industrial wells screened in the stratified-drift aquifers and in the underlying bedrock (Shoop and Gatto, 1992). Hanover well HHW-1, used only intermittently for drinking water, has not been contaminated with TCE; however, it was shut down in 1991 because of its proximity to the contaminated wells. Water from well HHW-1 also contained high concentrations of iron and did not mix well with chlorinated surface water (Ed Brown, Hanover Water Works, oral commun., 1993). Water from the industrial wells continues to be used for cooling purposes only. The Norwich (Vt.) Fire District municipal well is sampled regularly for water quality and is presently (1993) still in use.

Orford-Fairlee Aquifer

The Orford-Fairlee aquifer is in the western part of Orford just north of Reeds Marsh (fig. 11, pl. 6). The most productive part of the aquifer is where Jacob's Brook once drained into glacial Lake Hitchcock. Here, coarse-grained deltaic deposits overlie fine-grained lake-bottom deposits. The aquifer is hydraulically connected to the Connecticut River. Seismic-refraction profiles (Orford a-a', pl. 2, appendix C.29) show the saturated thickness to be 200 to 340 ft at the southern end of the aquifer near Reeds Marsh and 170 to 210 ft at the confluence of Jacob's Brook and the Connecticut River (Orford e-e', pl. 2, appendix C.31). Orford domestic well OSW-47 (pl. 2), at the southern end of seismic-refraction line Orford e-e', penetrated 83 ft of sand; the well did not reach bedrock (appendix B). USGS observation well OSW-2 (pl. 2), at the western end of seismic-refraction line Orford a-a', penetrated alternating layers of coarse-grained aquifer material and fine-grained lake-bottom deposits (fig. 12) (appendix B).

Although the aquifer remains undeveloped on the New Hampshire side, it presently provides municipal water across the State border in Fairlee, Vt. Across the river from Orford in Fairlee, Vermont (pl. 2), water is withdrawn from municipal well FLW-1 at a rate of only 70 gal/min (0.1 Mgal/d), but it is capable of yielding as much as 1.0 Mgal/d (Lance Colby, Fairlee Water Department, oral commun., 1993). Transmissivity calculated from aquifer-test data for well FLW-1 is approximately 13,200 ft^2/d, and average hydraulic conductivity is about 200 ft/d (table 3). Water from this well has high concentrations of iron and manganese. The town of Orford currently withdraws from a dug well (OSW-1) to supply water to a few homes. A campground on the banks of the Connecticut River withdraws from dug well (OSW-40) to supply water to campsites. The most productive location on the New Hampshire side of the aquifer may be at the northern end where Jacob's Brooks enters the Connecticut River on the floodplain.

Cottonstone Mountain Aquifer

The Cottonstone Mountain aquifer is west of Cottonstone Mountain and adjacent to the Connecticut River in western Orford (fig. 11, pl. 6). The Connecticut River Valley at this locality is narrow with very steep valley walls; glacial Lake Hitchcock was more than 600 ft deep here. A seismic-refraction line (Orford d-d', pl. 2, appendix C.30) 3,000 ft north of the Cottonstone Mountain aquifer shows the saturated thickness to be at least 600 ft, yet bedrock is exposed only a few hundred feet away at the valley wall across the river in Fairlee, Vt. About 800 ft southeast of seismic-refraction line Orford d-d', a homeowner attempted to have a well installed in bedrock but abandoned the project after the borehole was still in clay at 365 ft below land surface (OSA-1) (appendix A).

The Cottonstone Mountain aquifer consists of coarse-grained stratified drift with saturated thicknesses greater than 215 ft (pl. 6) and may be associated with a previous (pre-glacial) drainage channel of the Connecticut River. Two well drillers, attempting to install wells in bedrock, penetrated 215 ft of permeable sand and coarse gravel deposits at domestic well OSW-51 and 10 ft of sand and gravel deposits buried beneath 80 ft of fine-grained deposits at domestic

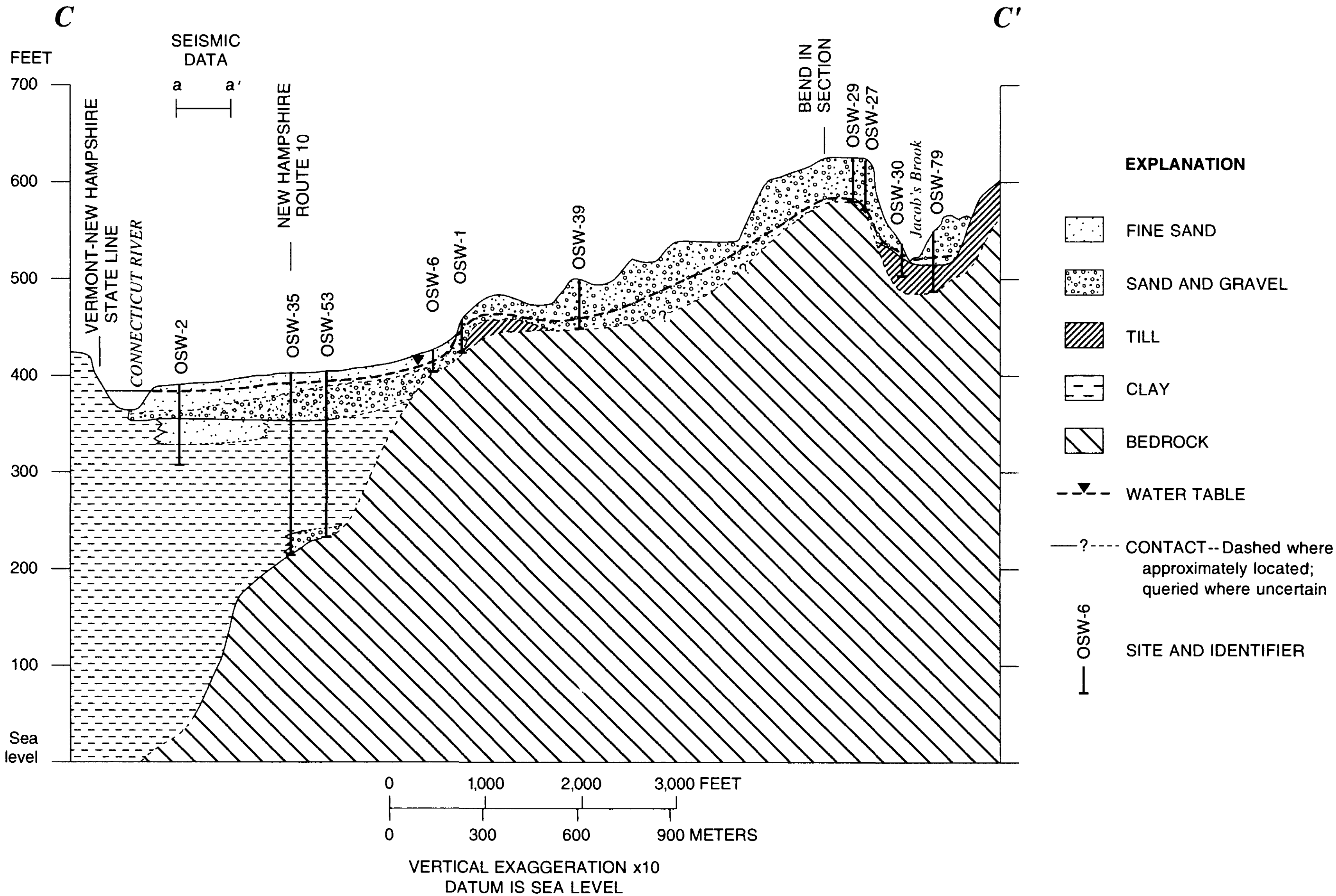

Figure 12. Geohydrologic section through the Orford-Fairlee aquifer in Orford, west-central New Hampshire.

well OSW-64 (appendix B). Neither well reached bedrock. Aquifer transmissivity, estimated from drillers' logs, is probably greater than 4,000 ft^2/d. If the aquifer is hydraulically connected to the Connecticut River, ground-water withdrawals could induce flow from the river to the aquifer.

Oliverian Brook Aquifers

The Oliverian Brook aquifers are in the Oliverian Brook Valley, one of the smaller tributaries to the Connecticut River in the study area (fig. 11, pl. 6). These aquifers are dominated by fine-grained lake-bottom sediments deposited in glacial Lake Hitchcock (fig. 4) and glacial Lake Oliverian (fig. 5). Saturated stratified-drift deposits along the Oliverian Brook Valley near Ladd Street Cemetery east of New Hampshire Route 10 are generally less than 40 ft thick. Bedrock crops out at the intersection of Oliverian Brook and New Hampshire Route 10. Aquifer transmissivity ranges from 1,000-2,000 ft^2/d. Although the thickness of the saturated stratified drift along the main stem of the Connecticut River near the mouth of Oliverian Brook exceeds 400 ft (seismic-refraction line Haverhill a-a'; pl. 2, appendix C.21), most of the drift is probably fine-grained lake-bottom deposits.

Further up Oliverian Brook, towards East Haverhill and Benton, the valley widens into a broad flood plain (pl. 6). At this locality, thick deposits of fine-grained lake-bottom sediments were formed. At observation well BOW-3 (pl. 2), coarse-grained aquifer material grades at 12 ft into fine sand, silt, and clay; till is present at 47 ft (appendix B). Coarse sand and gravel deposits have been observed at the surface on the northern flanks of the valley near Limekiln Road and the White Mountain National Forest boundary, but the thickness of these coarse-grained deposits is unknown. Potential ground-water production is limited at this locality by the lack of thick saturated, coarse-grained aquifer material.

North Haverhill Delta Aquifer

A large delta formed in North Haverhill where drainage of the lower Ammonoosuc River was blocked by glacial ice near the present-day village of Swiftwater (in southeastern Bath). Sediment-laden meltwater from the Clark Brook Valley (in present-day Center Haverhill) entered glacial Lake Hitchcock, forming the delta (fig. 11, pl. 6). Additional sources of sediment deposited in the delta may have been waters draining glacial Lake Wild Ammonoosuc, as discussed in the section on "Geohydrologic Setting."

Saturated thickness of the stratified drift in the North Haverhill delta aquifer increases considerably toward the main stem of the Connecticut River (fig. 13). Seismic-refraction profiles (Haverhill c-c', pl. 3, appendix C.22) show that saturated thickness is 260 to 380 ft in the main stem of the river and 70 ft (Haverhill k-k'; pl. 3, appendix C.24) to 100 ft (Haverhill l-l'; pl. 3, appendix C.25) at Dean Memorial Airport. Because these sediments are predominantly fine grained, aquifer transmissivity generally is less than 1,000 ft^2/d. Haverhill Spring HKS-1, also known as Cold Springs, is in transmissive material above till and bedrock (fig. 13, pl. 3). The spring supplies North Haverhill Water District at a constant rate of 70 gal/min (0.09 Mgal/d) but is capable of yielding as much as 300 gal/min (0.43 Mgal/d) (Howard Hatch, North Haverhill Water District, oral commun., 1991).

Haverhill-French Pond Aquifer

The Haverhill-French Pond aquifer, north of Center Haverhill and south of French Pond (fig. 11, pl. 6), is a typical fluvial-deltaic aquifer. Fast-moving, sediment-laden meltwater draining the retreating ice first deposited large boulders at Swiftwater, then cobbles and coarse gravel south of French Pond and parallel to French Pond Road. Evidence of these deposits at the surface is the extensive network of rock walls built by farmers using uniform, rounded, water-washed cobbles and small boulders. A gravel-pit west of French Pond Road and south of French Pond has exposed gravel, cobbles, and small boulders that are currently (1993) mined to depths greater than 20 ft below the water table. Progressively finer sediment was deposited southward in the valley. Presently, the aquifer is drained by French Pond Brook and Clark Brook and is connected to the North Haverhill delta aquifer at its southernmost end (pl. 6).

Aquifer thickness is greatest in the center of the valley (parallel to French Pond Road), where the thickness of the saturated zone averages about 40 ft and locally exceeds 80 ft. Domestic bedrock well HKW-23 (pl. 2) penetrated 115 ft of sand and gravel before reaching bedrock. Transmissivity in areas where saturated thicknesses are greater than 80 ft exceeds

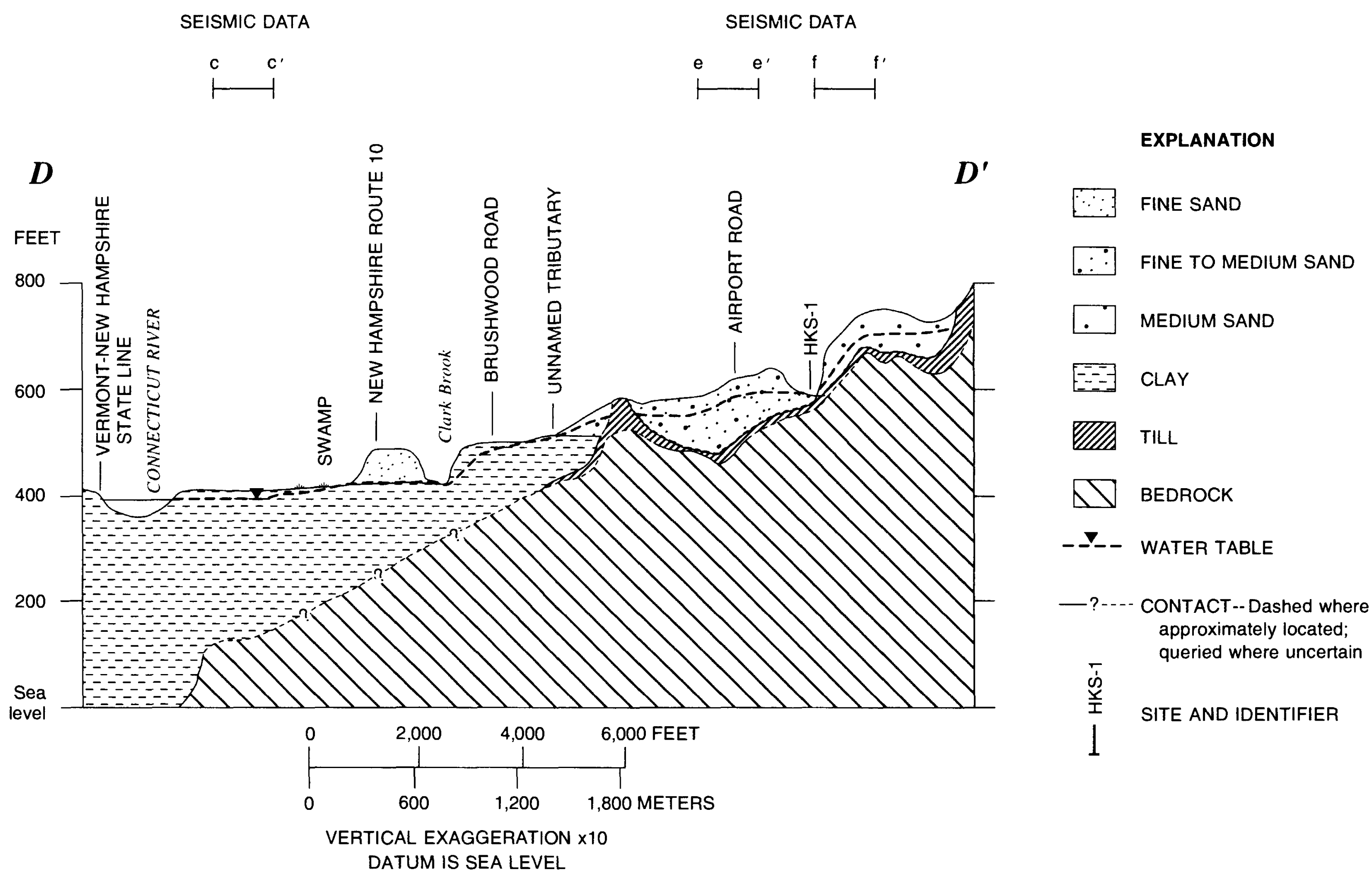

Figure 13. Geohydrologic section through the North Haverhil delta aquifer in Haverhill, west-central New Hampshire.

4,000 ft^2/d. At the southern end of the aquifer, USGS observation well HKW-22 (pl. 2) penetrated 52 ft of silty, coarse-grained aquifer material before reaching till (appendix B). Transmissivity, in this area, calculated from the grain-size distribution analysis of sediment collected during test drilling, is less than 2,000 ft^2/d. Bedrock crops out in the western and eastern valley walls.

Currently (1993), water from this aquifer is used to supply domestic dug wells; however, the aquifer can potentially supply water to larger water-supply wells. This aquifer was selected to demonstrate how water availability can be evaluated by use of the analytical ground-water flow model discussed in the section on "Estimation of Water Availability for Selected Aquifers."

Monroe I Aquifer

Two aquifers flank the main stem of the Connecticut River in western Monroe. Monroe I, east of the McIndoe Falls Hydroelectric Dam and less than 1,000 ft west of Hunt Mountain Road, is part of a broad kame terrace about 140 ft above the Connecticut River (fig. 11, pl. 7). At this locality, two municipal wells—MUW-1 and MUW-2 (pl. 3)—are screened in the coarse-grained aquifer material that overlie the thick, fine-grained lake-bottom deposits that formed in glacial Lake Hitchcock.

Saturated thicknesses shown on plate 7 include coarse- and fine-grained stratified-drift deposits and locally exceed 120 ft. Although the aquifer is high above the Connecticut River, static ground-water levels are relatively shallow, from 10 to 12 ft below land surface (appendix A). The saturated thicknesses of the coarse-grained aquifer material in this area range from 17 ft at test boring MUA-1 to 33 ft at municipal well MUW-1 (appendix B). At this locality, no additional coarse-grained deposits are likely to be buried beneath the fine-grained lake deposits. Test boring MUA-1 penetrated 83 ft of blue clay before reaching refusal on a boulder or bedrock.

Transmissivity of the aquifer estimated from an 8-hour aquifer test on municipal well MUW-1, is 2,400 ft^2/d and the average hydraulic conductivity is 73 ft/d (table 3). Currently (1993), the town of Monroe withdraws water from this aquifer at a rate of 0.034 Mgal/d from wells MUW-1 and MUW-2.

Monroe II Aquifer

The Monroe II aquifer is in the small Roaring Brook Valley, which enters the Connecticut River at Stevens Island and extends beneath the main stem of the Connecticut River (fig. 11, pl. 7). The geohydrology of this aquifer is complicated, possibly as a result of local ice readvancement near Comerford Dam and near the junction of the Passumpsic and Connecticut Rivers in Vermont (Crosby, 1934; Lougee, 1934). At this locality, 2.3 mi northeast of the aquifer, Crosby (1934) and Lougee (1934) made detailed measurements of two distinct till sheets. The lower till, described by Lougee (1934) as "blue boulder clay," is overlain in places by a layer of "fine, silty sand to coarse sand and gravel" as much as 34 ft thick. Overlying the lower till and, where present, the sand and gravel layer is an upper till described as "somewhat sandier and containing a smaller portion of cobbles and boulders." The upper till is overlain by lacustrine clay and, above that, by an upper layer of sand. According to Crosby (1934), ice readvanced into glacial Lake Hitchcock from the Passumpsic and Connecticut Valleys, passed over stratified-drift deposits composed mainly of sand, and mixed an unusually large proportion of sand into the upper till layer. Ice readvancing down the two valleys also may have blocked the Connecticut River channel, forcing meltwater from the ice to carve another channel east of its present location down the Roaring Brook Valley. As the ice receded, the Connecticut River reclaimed its old channel and abandoned the Roaring Brook channel, which was filled by coarse-grained aquifer material overlying lake-bottom deposits (fig 14).

The aquifer consists of fluvial-deltaic aquifer material overlying lacustrine clay deposits. Saturated thicknesses of the stratified-drift material shown on plate 7 include coarse- and fine-grained deposits and range from 40 to 120 ft in the Roaring Brook Valley (pl. 7). A 1,100-foot seismic-refraction survey (Monroe line a-a'; pl. 3, appendix C.29), completed in the main-stem area of the Connecticut River just north of the Monroe II aquifer, indicated that the saturated zone is 50 to 177 ft thick. These seismic data indicate a deeper bedrock channel east of the present Connecticut River channel. No test-drilling data are available to indicate whether any coarse-grained aquifer material is located here.

In the Monroe II aquifer area, coarse-grained aquifer material is also buried beneath lacustrine clay deposits. Domestic well MUW-19 penetrated 6 ft of

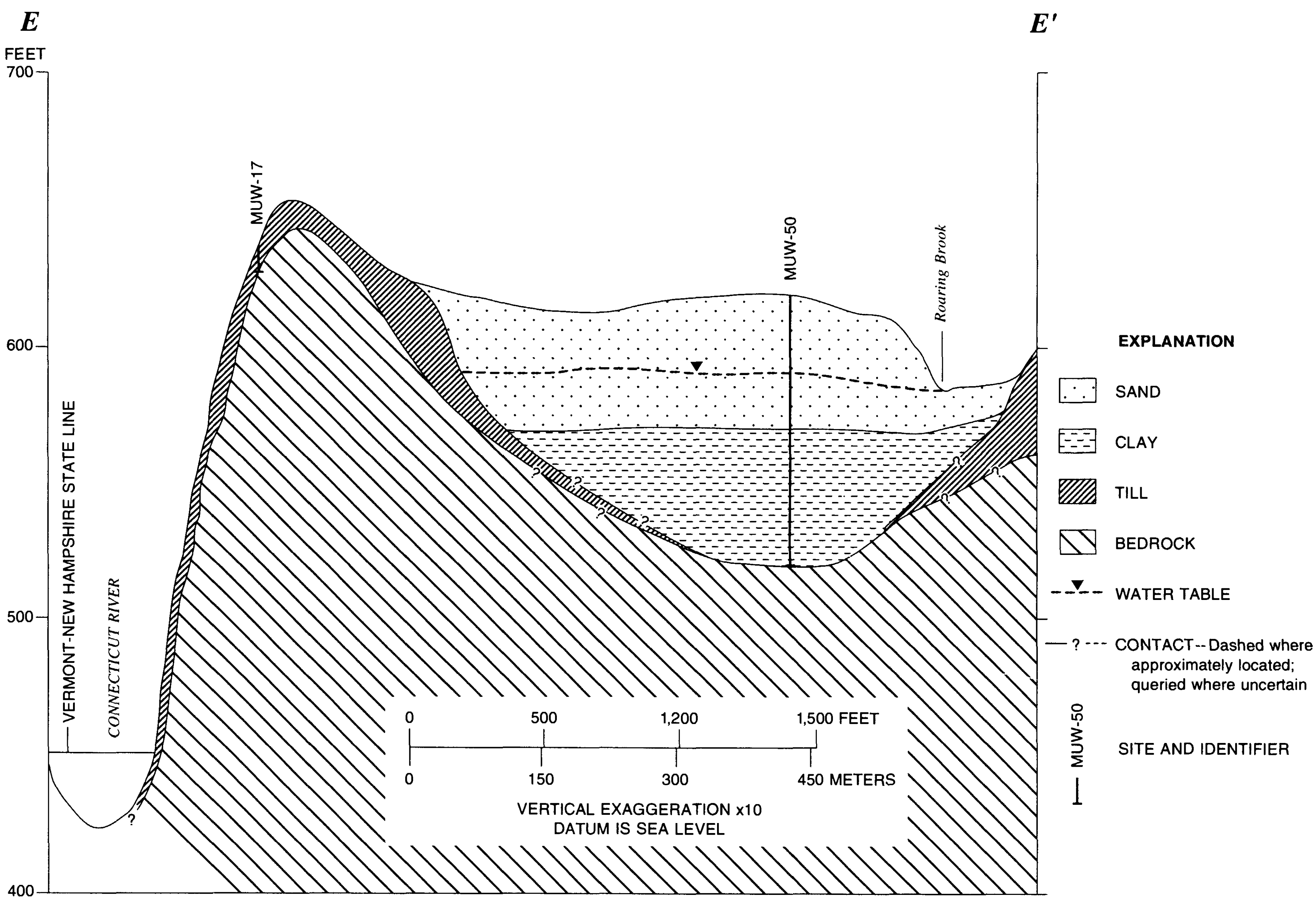

Figure 14. Geohydrologic section through the Monroe II aquifer in Monroe, west-central New Hampshire.

sand and gravel from 137 to 143 ft below land surface (the bottom of this sand and gravel layer was not reached during the drilling of this well) (appendix B). Well MUW-19 is reported to yield 25 gal/min (appendix A). It is not known whether this aquifer is hydraulically connected to the Connecticut River. Transmissivity in the Monroe II aquifer, as estimated from drillers' logs, is greatest in the coarse, buried aquifer material at about 4,000 ft^2/d (pl. 7). Currently (1993), the aquifer area is generally sparsely settled; land use includes rural residential and farming. Most homes with domestic wells in the aquifer area use water from the underlying bedrock aquifer.

Littleton Esker Aquifer

The Littleton esker aquifer is on an island at the southernmost end of Moore Reservoir and just north of New Hampshire Routes 18 and 135 (fig. 11, pl. 7). The aquifer consists of a coarse-grained ice-contact esker deposit surrounded by lake-bottom deposits. The south-trending esker was formed within a meltwater ice tunnel by the northwestward retreating ice sheet in the Partridge Lake drainage system. Additional storage in this aquifer was created when the reservoir flooded the area where the esker is located.

Results from test drilling in the esker as part of a study by a private consultant for the town of Littleton indicate saturated thickness is potentially adequate for large water-supply wells (D.L. Maher Co., 1988). Test well LNW-2 penetrated 78 ft of saturated, coarse-grained aquifer material; neither till nor bedrock was reached during drilling. Test well LNW-4 penetrated 70 ft of saturated, coarse-grained aquifer material; till was found at 92 ft below land surface. Bridge boring LNB-12, 700 ft north of well LNW-2, penetrated 68 ft of coarse-grained aquifer material underlying 2 ft of fine sand and silt; bedrock was reached at 70 ft. The saturated zone may be as thin as 48 ft when the water level of Moore Reservoir is lowered (D.L. Maher Co., 1988).

The Littleton esker aquifer is not extensive. Test boring LNA-1, 1,500 ft southwest of well LNW-4, penetrated 40 ft of saturated, fine sand and silt before reaching refusal at 52 ft. Bridge boring LNB-14, 700 ft northeast of LNW-2, reached till at 4 ft and bedrock at 12.5 ft. Bedrock crops out along the Moore Reservoir shoreline.

Transmissivity calculated from aquifer test data for test well LNW-2 ranges from 27,000 to 32,000 ft^2/d, and average hydraulic conductivity ranges from 346 to 410 ft/d (table 3) (D.L. Maher Co., 1988). This transmissivity, however, represents the effect of a recharge boundary (Moore Reservoir), which increases availability of water to the aquifer; hence, this calculated transmissivity is not representative of the intrinsic transmissivity or hydraulic conductivity of the aquifer. Currently (1993), the town is considering installing water-supply wells at this locality. The hydrogeologic study completed by the private consultant indicates that 2.28 Mgal/d or 1,590 gal/min for two gravel-packed wells could be withdrawn from the aquifer during minimum water stages in the reservoir and 4.0 Mgal/d during maximum water stages (D.L. Maher Co., 1988).

Mascoma River Subbasin Aquifers

The Mascoma River subbasin contains discontinuous stratified-drift aquifers underlying a 15.9 mi^2 area. Five selected aquifers are discussed below. The sediments composing the aquifers were most likely deposited during separate and isolated glacial depositional periods, yet each were affected by glacial Lake Mascoma (fig. 5).

George Pond Aquifer

The George Pond aquifer is south of George Pond in southern Enfield in the Little Brook Valley (fig. 11, pl. 5) and underlies a 0.83 mi^2 area. The aquifer, 3 mi long and about 1,500 ft wide, discharges to Little Brook, a tributary stream to Knox River. The part of the aquifer with the most potential for developing large water supplies is where Little Brook drains into George Pond; here the aquifer consists of coarse-grained, glaciofluvial material overlain by thin layers (generally less than 10 ft) of fine-grained lake-bottom deposits.

Seismic-refraction data (Enfield b-b', pl. 1, appendix C.17) indicates that the saturated thickness in the center of the valley just south of George Pond ranges from 44 to 85 ft. No lithologic data are available on aquifer material at this locality. Further south in the aquifer area, the saturated zone is less than 40 ft thick. USGS observation wells ENW-32 and ENW-33 penetrated 17 and 38 ft of predominantly fine to coarse sand and gravel, respectively. Test boring ENA-3, 3,000 ft southeast of well ENW-32, penetrated dry, medium to coarse sand before reaching till at 18.5 ft. Transmissivity of the aquifer in this area, as estimated from grain-size distribution of sediment samples collected during test drilling, is greater than 4,000 ft^2/d near George Pond and generally less than 2,000 ft^2/d elsewhere. It is unknown whether the aquifer is hydraulically connected to George Pond. Low-streamflow measurements of Knox River, 1,000 ft downstream from George Pond (pl. 1), in September 1990, indicate that ground-water discharge was about 2.6 ft^3/s (1.7 Mgal/d) (Table E1, site 60).

Mascoma Lake Aquifers

Three aquifers are adjacent to the southern, southwestern, and northern shoreline of Mascoma Lake in Enfield and Lebanon (fig. 11, pl. 5). The first aquifer, underlying Knox River where it drains into the southern end of Mascoma Lake, covers 0.6 mi^2. The most potentially productive and thickest part of the aquifer, consisting of coarse-grained aquifer material overlying lake-bottom deposits, is in the center of the valley and close to the shoreline of the lake. The extent of these stratified-drift deposits beneath the lake is not known.

Seismic-refraction results (Enfield c-c', pl. 1, appendix C.18) indicate that the saturated zone is 50 to 68 ft thick (including till) in the center of the valley but that thickness of the aquifer generally is less than 40 ft. USGS observation well ENW-30, drilled at the western end of the seismic line, penetrated 34 ft of silty sand and gravel that changed at 50 ft to silt and clay lake-bottom sediments overlying till. Aquifer transmissivity in this area, estimated from the grain-size distribution of sediment samples collected during test drilling, is less than 2,000 ft^2/d. Most of this area is highly developed with summer and year-round homes with individual wells and septic systems. Most people living in the area obtain drinking water from the underlying bedrock aquifer.

The second aquifer is on the southwestern shoreline of Mascoma Lake near Lower Shaker Village. This relatively small aquifer area is currently (1993) pumped for public-water supply for Shaker Village (pl. 5). Public-supply well ENW-29 (pl. 1) is close to the shoreline of the lake and most likely induces water from the lake.

Seismic-reflection profiling along the shoreline of the lake near the second aquifer area indicated that saturated thickness exceeds 90 ft in places (fig. 8). None of the wells drilled during the siting of the new water-supply well reached refusal on till or bedrock. Public supply well ENW-29 penetrated 40 ft of silty sand and gravel; the proportion of silt in the sediments increased with depth. Transmissivity calculated from aquifer-test data for well ENW-29 ranged from 3,900 to 4,500 ft^2/d, and average hydraulic conductivity ranged from 115 to 132 ft/d (table 3) (Hydrogroup Inc., written commun., 1985).

Little data is available for the third aquifer, which underlies the northern end of Mascoma Lake near Mascoma Village (pl. 5). Seismic-reflection profiling along the shoreline of the lake near the aquifer indicated that the saturated zone is greater than 90 ft at the eastern end of the aquifer area (fig. 9). A domestic bedrock well (LHW-217) penetrated 30 ft of sand and gravel overlying 57 ft of clay deposits; bedrock was reached at 87 ft. Some of the other domestic wells in the area are shallow dug wells that tap the permeable sands and gravels overlying the lake-bottom sediments for drinking water. Aquifer transmissivity is probably less than 2,000 ft^2/d. If the aquifer is hydraulically connected to the lake, water-supply wells drilled near the lake could potentially increase yields by inducing recharge to the aquifer; however, dense residential land use in the area limits potential of the aquifer for production of drinking water because of possible water-quality concerns.

Goose Pond Aquifer

Goose Pond aquifer, formed in glacial Lake Mascoma, is in West Canaan (fig. 11, pl. 5) and underlies a 3.1 mi^2 area. The most potentially productive part of the aquifer area consists of glaciofluvial aquifer material confined beneath clay and peat deposits that formed in glacial Lake Mascoma.

In one area of the Goose Pond aquifer, the saturated thickness of the confined, coarse-grained aquifer material is 27 ft (USGS observation well CCW-7; pl. 1, appendix B). USGS test boring CCA-3 penetrated multiple layers of coarse-grained aquifer material interlayered with lacustrine silt; glacial till was reached at 65 ft. Seismic-refraction data in the area (Canaan lines a-a', b-b', c-c', d-d'; pl. 1, appendixes. C.4-C.5) indicate that the saturated zone in the Goose Pond Brook Valley ranges from 47 to 84 ft (the shallowest part is toward the eastern end of the valley). At the southern end of the aquifer near Herbert Webster Wildlife Management Area and New Hampshire Route 4, aquifer thickness exceeds 80 ft; however, the sediments there are predominantly fine grained (Canaan bridge boring CCB-1; pl. 1, appendix B).

Transmissivity, estimated from grain-size distribution of sediment samples collected during test drilling, is less than 2,000 ft^2/d. Available test-drilling data are insufficient to determine the areal extent of the buried coarse-grained aquifer material and whether these deposits are hydraulically connected to either Goose Pond Brook or Mascoma River. Potential ground-water availability is greatest near well CCW-7 and is limited elsewhere in the aquifer area.

Bear Pond Aquifer

Bear Pond aquifer, formed in glacial Lake Mascoma, is in several interconnected valleys south of Canaan Center (fig. 11, pl. 5) and underlies a 3.2 mi^2 area. The aquifer area is drained in the northern valley by a branch of Mascoma River and in the southern valley by Haines Brook. At the western end of the aquifer area, the Mascoma and Indian Rivers join to form the main stem of Mascoma River. Stratified drift in the Haines Brook Valley may have resulted from the draining of a small glacial lake that once was present near Spectacle Pond in Enfield (fig. 5) (Lougee, 1939).

Seismic-refraction data near the confluence of the Mascoma and Indian Rivers and New Hampshire Route 4 (Canaan lines f-f' and j-j'; pl. 1, appendixes C.6-C.7) indicate that the saturated zone is 67 to 100 ft thick. USGS observation well CCW-5 penetrated 28 ft of fine to coarse sand overlying 44 ft of progressively finer lacustrine deposits; till was reached at 72 ft. Further east in the valley, domestic bedrock well CCW-95 penetrated 132 ft of sand before reaching bedrock. Transmissivity, estimated from grain-size distribution of sediment samples collected during test drilling and estimated from driller's logs, may be as much as 4,000 ft^2/d near well CCW-95 but generally is less than 2,000 ft^2/d elsewhere in the aquifer area. Because of the generally fine-grained stratified-drift deposits, potential availability from the aquifer is limited at this locality.

Indian River Aquifer

Indian River aquifer, formed in glacial Lake Mascoma, is in the Indian River and Orange Brook Valleys in eastern Canaan and western Orange (fig. 11, pl. 5) and underlies 3.0 mi^2. Much of the stratified drift consists of relatively thick, fine-grained lake-bottom deposits, either overlain by or interlayered with relatively thin, coarse-grained aquifer deposits.

Saturated thickness of the aquifer is generally less than 40 ft. The greatest thickness was found along seismic-refraction line Canaan i-i', where almost 100 ft was indicated at the eastern end. Little stratigraphic information is available on the sediments that make up the aquifer in the main valley. Canaan observation wells CCW-30 and CCW-31 penetrated only 12 ft of aquifer material. The best stratigraphic data is from bridge boring CCB-2, at the intersection of New Hampshire Route 4A and Indian River, where 55 ft of fine to coarse sand and gravel was penetrated before refusal on bedrock was reached.

Saturated thickness in the northern part of the aquifer area in the Indian River Valley was also generally less than 40 ft. USGS observation well CCW-3 penetrated a layer of medium to coarse sand from 48.6 to 54 ft below land surface. This layer is confined beneath 41 ft of very fine sand and clay lacustrine deposits (pl. 1, appendix B). Water from well CCW-3 flows over the casing, which indicates an aquifer under confined conditions at this locality. USGS observation well CCW-6, 4,000 ft north of well CCW-3 in the New Hampshire Department of Transportation (NHDOT) gravel pit, penetrated 13 ft of coarse-grained aquifer material overlying fine sand and clay lacustrine deposits before reaching till at 41 ft (pl. 1, appendix B). USGS observation well CCW-4, 2,000 ft north of well CCW-6, penetrated 24 ft of alternating layers of fine- and coarse-grained stratified drift overlying 69 ft of till; refusal was reached at 83.7 ft (pl. 1, appendix B).

Stratigraphic logs from the USGS observation wells and nine domestic bedrock wells drilled in the Indian River Valley (pl. 1) show that, overall, the predominantly fine-grained stratified drift overlying thick till deposits (in places) limits potential ground-water pumpage. The most productive part of the aquifer is near Canaan Fairgrounds, near the intersection of New Hampshire Routes 4 and 118 and Mirror Lake. Aquifer transmissivity at this locality may be as much as 4,000 ft^2/d. Based on low streamflow measurements of Indian River in September 1990, ground-water discharge was about 11.1 ft^3/s (7.2 Mgal/d). In 1991, the town constructed a new wastewater treatment plant and sewage lagoons constructed in this area could affect ground-water quality in the aquifer.

Ammonoosuc River Subbasin Aquifers

Much of the stratified drift deposited in the Ammonoosuc River subbasin is in interconnected valleys, forming several large aquifer systems (pls. 7-8) underlying 44 mi^2. Downstream from Littleton, in the main valley of the Ammonoosuc River, stratified drift is part of the glacial Lake Hitchcock deposits. Most of the remaining stratified drift upstream from Littleton in the main valley formed in glacial Lake Ammonoosuc. In the Gale River subbasin, most of the drift formed in glacial Lake Franconia, and in the Wild Ammonoosuc River subbasin, most formed in glacial Lake Wild Ammonoosuc (fig. 5).

In the main valley of the lower Ammonoosuc River subbasin in Woodsville Village and Bath, stratified drift consists almost exclusively of silt and clay lake-bottom material deposited in glacial Lake Hitchcock. South of Gilman Hill Road and east of Pettyboro Brook (pl. 7) in Bath, the wide floodplain has thick deposits of fine-grained stratified drift. USGS test boring BDA-15, drilled in the center of the valley, penetrated 17.5 ft of fine to medium sand overlying 54 ft of silt and clay; the boring reached till at 71 ft (pl. 3, appendix B). Bedrock crops out throughout the valley near this locality. Overall, potential ground-water pumpage is limited not only here but also down the valley to where a delta was built in glacial Lake Hitchcock at the confluence of the Ammonoosuc and Connecticut Rivers.

Salmon Hole Aquifer

The Salmon Hole aquifer is in the main valley of the lower Ammonoosuc subbasin in Lisbon and consists of coarse-grained stratified drift deposited in glacial Lake Hitchcock (fig. 11, pl. 7). The aquifer is hydraulically connected to permeable stratified-drift deposits along Ogontz Brook in Lyman (pl. 7). Large exposures of bedrock can be seen at the valley walls and in the river channel. The southeastern flanks of the aquifer area at the confluence of Salmon Hole Brook and the Ammonoosuc River contain thick deltaic sequences deposited into glacial Lake Hitchcock by waters draining glacial Lake Franconia through the Salmon Hole Valley. The underlying aquifer near the confluence of Ogontz Brook and the Ammonoosuc River also contain thick deltaic deposits that formed in glacial Lake Hitchcock, possibly by active ice occupying Ogontz Valley in Lyman. Here, long, very narrow eskers were deposited in ice channels in Partridge Lake and south to Dodge Pond (possibly in the same glacial environment that deposited the Littleton esker aquifer described earlier) and from sediment-laden meltwater flowing from the surface of the ice and forming deltas as it entered the glacial lake. Numerous small kettles can be seen at the surface of these deltaic deposits. Domestic wells LLW-36 and LLW-24, drilled on top of one of these deltas (pl. 3) penetrated 190 and 235 ft, respectively, of sand and gravel before reaching bedrock. USGS observation well LLW-19, drilled in the same deposit (pl. 3), penetrated 119 ft of progressively finer lacustrine deposits (drilling was stopped before the bottom of these deposits were reached) (appendix B).

Aquifer thickness is greatest in the center of the Ammonoosuc and Ogontz Valleys, where thickness of the saturated zone averages 60 ft and locally exceeds 160 ft. Transmissivity of the aquifer near municipal well LLW-2, as estimated from aquifer-test data, ranges from 9,000 to 16,000 ft^2/d; average hydraulic conductivity ranges from 210 to 380 ft/d (table 3). Because the well is only 100 ft from the Ammonoosuc River, induced recharge from the river to the well may have caused the calculated transmissivity to be artificially high in this area.

The aquifer is currently (1993) used by Lisbon for municipal water supply. Lisbon municipal well LLW-2, in the southern part of the aquifer area, withdraws only 175 gal/min (0.25 Mgal/d) but is capable of yielding 700 gal/min (1.0 Mgal/d) (Raymond Pineo, Lisbon Water Department, oral commun., 1991). Municipal well LLW-1, 200 ft from well LLW-2, was installed in October 1991 as a backup supply if well LLW-2 fails. This aquifer was selected to demonstrate how aquifer yield can be evaluated by use of the analytical ground-water flow model discussed in the section on "Estimation of Water Availability for Selected Aquifers."

Glacial Lake Ammonoosuc Aquifers

Much of the stratified drift deposited in glacial Lake Ammonoosuc in Bethlehem and Carroll is in interconnected valleys underlying 17.5 mi^2 (pl. 8). Four areas in this stratified-drift deposit contain significant coarse-grained aquifer material and are described below.

Wing Road Aquifer

The westernmost part of the four areas, called the Wing Road aquifer, is in the Ammonoosuc Valley in Bethlehem near Hazens and Wing Roads (fig. 11, pl. 8). This aquifer is unusual in that it is in an area where localized readvancement of the ice margin may have happened (Lougee, 1939). Field investigations done during this study indicate that the surface deposits resemble partially washed, bouldery till; yet, wells drilled in the aquifer area indicate that coarse-grained aquifer material is present.

During the mid-1980's, more than 20 new wells were drilled to provide domestic water supplies to newly constructed homes in the aquifer area. Well drillers, intending to install wells in bedrock, repeatedly found saturated, coarse sand and gravel deposits overlying the bedrock and, in many cases, left the well casing open (unscreened) in the unconsolidated layer. For example, near the intersection of Hazens and Wing Roads, four domestic wells are clustered together; wells BSW-43 and BSW-44 penetrated 80 and 73 ft of gravel, respectively, (the bottom of the aquifer was not reached during the drilling of these wells); BSW-111 penetrated 90 ft of sand underlain by 5 ft of gravel (the well was left open in the gravel layer); and well BSW-49, drilled in bedrock, penetrated 150 ft of sand and gravel before reaching bedrock (pl. 4). Bedrock crops out only 300 ft west of well BSW-49, on the opposite side of the river, indicating a preglacial river channel deeply scoured and later filled in by coarse-grained stratified drift. Transmissivity of the aquifer, estimated from drillers' logs, exceeds 4,000 ft^2/d in the thickest sections of the aquifer. Overlying the northern part of the aquifer, where most of the houses were built, is potentially the most productive area. It is possible that productivity would be sufficient for water-supply wells in the southern part of the aquifer area near Bethlehem Hollow, where, few homes are located, but data are insufficient to determine aquifer productivity.

Little River Aquifer

The Little River aquifer is in western Carroll, south of the Ammonoosuc River (fig. 11, pl. 8). The area is partly drained by the Little River. Stratified-drift material composing this aquifer is uniquely different from material found elsewhere in the study area. The aquifer consists of coarse-grained aquifer material overlying clay lacustrine material and buried beneath thin layers of sand, gravel, and cobbles that were derived from alluvial fan deposits (fig. 15). Alluvial fan deposits are not uncommon in New Hampshire, but few are as well formed and extensive as the one in the aquifer area. An alluvial fan forms where loose alluvium is deposited by a stream emerging from the till uplands under flood conditions upon a plain or broad valley.

Soon after the Twin Mountain Range (in Franconia and Lincoln) was uncovered by the retreating ice, glacial debris was washed northward, down the steep Little River Valley, where it now interfingers with or overlies fluvial-deltaic deposits that formed in glacial Lake Ammonoosuc. As the glacial lake drained to lower outlets, the subaqueous delta built further outward in the valley, and each new shoreline of the delta graded to the altitude of progressively lower outlets.

Thickness of the aquifer ranges from 0 to greater than 120 ft (pl. 8). The best data on stratigraphy comes from USGS test boring CFA-27 (pl. 4). This boring, drilled in the center of the valley in a gravel pit off New Hampshire Route 3, penetrated layers of fine-grained lacustrine deposits generally overlying coarse-grained aquifer material. Sediment collected from 30 to 35 ft indicates that partially washed ablation till (or poorly washed stratified-drift material) may have been deposited here. Domestic well CFW-2 (pl. 4), completed in the most productive part of the aquifer, penetrated 100 ft of sand and gravel (the bottom of the aquifer was not reached during drilling). Low-streamflow measurements of the Ammonoosuc River in July 1991 showed that ground-water discharge was about 50.6 ft^3/s (32.7 Mgal/d) (site 8, appendix E). Aquifer transmissivity is greater than 4,000 ft^2/d in some areas.

Twin Mountain Aquifer

Twin Mountain aquifer is in the Ammonoosuc River Valley in Carroll (near Twin Mountain village) near the confluence of Tuttle Brook and the Ammonoosuc River (fig. 11, pl. 8). The aquifer consists of a predominantly coarse-grained esker deposit in contact with and partly buried beneath fine-grained deltaic deposits; the aquifer is hydraulically connected to Tuttle Brook and the Ammonoosuc River.

In 1988, the town of Carroll installed its first well in the aquifer (CFW-44) on town-owned land (pl. 4) to provide water for municipal use. It was soon

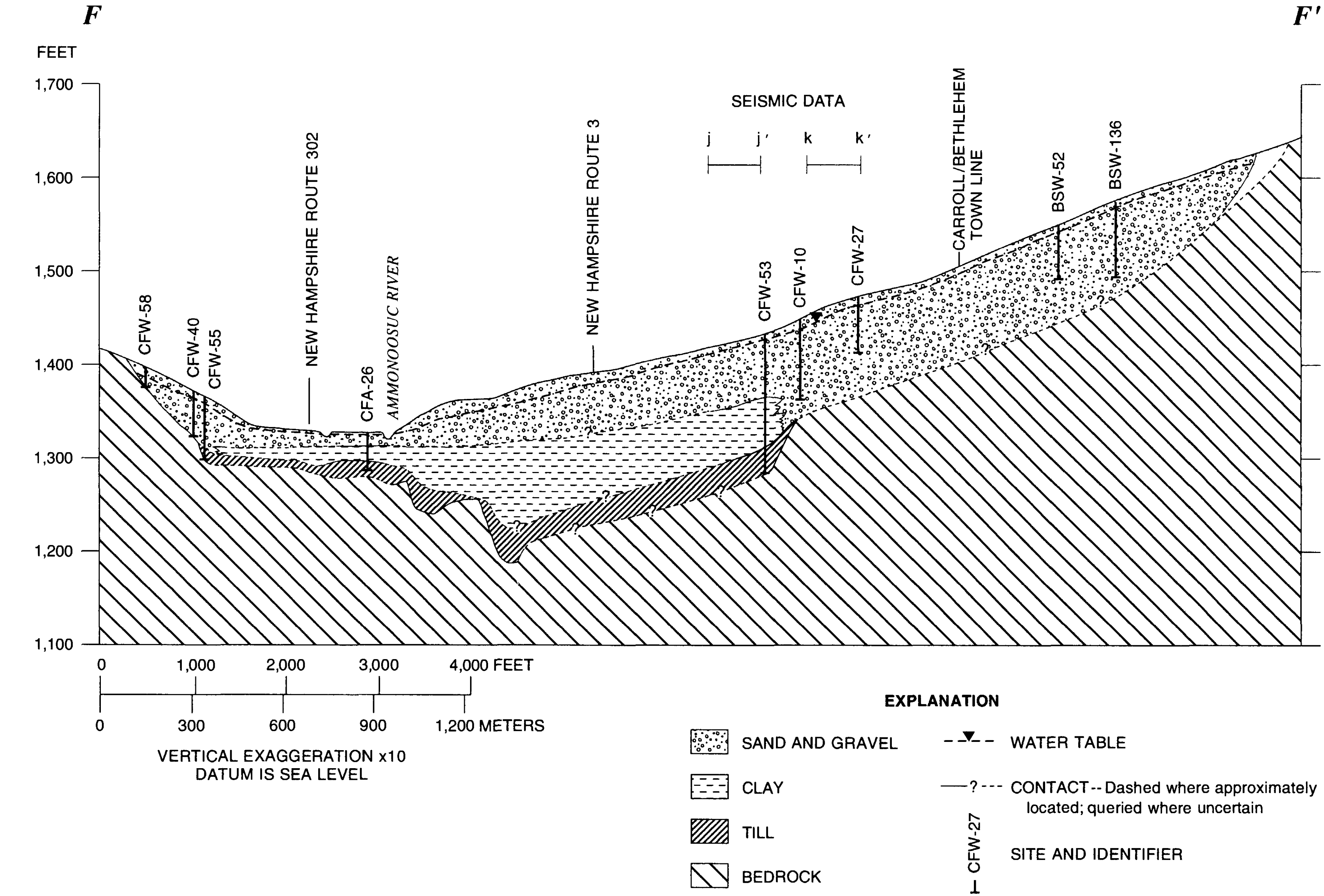

Figure 15. Geohydrologic section through the Little River aquifer in Carroll, west-central New Hampshire.

discovered, however, that the well was not screened in the most productive zone in the aquifer. The static water level for well CFW-44 is 41 ft below land surface, with only 3 to 4 ft remaining between the water table and the top of the screened interval of the well (appendix A). An aquifer test at this site resulted in 2.25 ft of drawdown for a pumping rate of 175 gal/min. Therefore, in July 1993, five new wells (CFW-60 to CFW-64) (pl. 4) were drilled at lower altitudes alongside the river and Tuttle Brook in the center of the Ammonoosuc River Valley, where saturated thicknesses exceed 40 ft. An 8-inch test well, CFW-60, is located where a new water-supply well was later installed to provide drinking water to the town (the town presently pumps from a surface-water reservoir to provide municipal water). Well CFW-60 penetrated 33 ft of coarse sand and gravel buried beneath 12 ft of fine sand and silt deltaic deposits; refusal was reached at 45 ft. During a 6-hour aquifer test, 1.0 ft of drawdown was observed in well CFW-60 for a pumping rate of 100 gal/min, resulting in a specific capacity of 100 (gal/min)/ft of drawdown. In early December 1993, an 18-inch water-supply well was installed near well CFW-60 and a 4-day aquifer test was performed (Gary Smith, D.L. Maher Co., oral commun., 1994). This well presently (1994) provides the municipal water supply for the town. Low-streamflow measurements of Tuttle Brook, at the confluence of the brook and the Connecticut River (pl. 4), in July 1991 indicate that ground-water discharge from the aquifer area drained by Tuttle Brook was about 0.5 ft^3/s (0.32 Mgal/d) (site 7, appendix E).

Rosebrook Aquifer

Rosebrook aquifer, in southeastern Carroll, is in the Ammonoosuc River Valley near the villages of Fabyan and Bretton Woods (fig. 11, pl. 8). The aquifer, formed in the first stage of glacial Lake Ammonoosuc, consists of coarse-grained glaciofluvial deposits overlying and surrounded by fine-grained lacustrine deposits. A gravel-packed water-supply well, CFW-6 (also known as the Rosebrook well) (pl. 4), provides drinking water to a privately owned development company and is capable of yielding more than 300 gal/min.

Aquifer thickness ranges from 0 to greater than 80 ft and is greatest in the center of the valley. Well CFW-6 penetrated 43 ft of medium to coarse sand and gravel (the bottom of the aquifer was not reached). Transmissivity of the aquifer, calculated from an aquifer test at well CFW-6, is approximately 7,000 ft^2/d; average hydraulic conductivity is 180 ft/d (table 3).

Approximately 4,000 ft northwest of water-supply well CFW-6, bridge borings CFB-4 and CFB-5 penetrated 44 ft and 56 ft, respectively, of medium to coarse sand and gravel esker deposits (pl. 4). However, just 1,000 ft to the south in the center of the valley, USGS test boring CFA-25 penetrated 18 ft of coarse-grained aquifer material overlying 44 ft of fine sand and silt lacustrine deposits before reaching refusal at 63 ft (pl. 4) (appendix B). This difference indicates that the stratigraphy can change significantly within short distances in the aquifer area. Low-streamflow measurements of the Ammonoosuc River, 1,000 ft downstream of the intersection between Cherry Mountain Road and New Hampshire Route 302 (pl. 4), showed that ground-water discharge was about 23.4 ft^3/s (15 Mgal/d) (site 5, appendix E).

Gale River Subbasin Aquifers

Stratified drift deposited in glacial Lake Franconia in the Gale River subbasin in Easton, Franconia, and Sugar Hill compose two relatively thick and extensive aquifers. Both are discussed briefly below.

Ham Branch Brook Aquifer

The Ham Branch Brook aquifer underlies 3.8 mi^2 of the narrow Ham Branch Brook Valley in Easton and Franconia and is long relative to its width (almost 7 mi long and less than 1 mi wide) (fig. 11, pl. 7). The mode of deposition is not well defined, but at least three distinct sequences of deposits have been identified in the aquifer. Thick, fine-grained lake-bottom deposits compose the southern end of the aquifer west of New Hampshire Route 116. Here, the aquifer is drained by Reel and Slide Brooks (pl. 7). These deposits formed in the waters of glacial Lake Franconia when the ice margin occupied most of the Ham Branch Brook Valley. USGS observation well EBW-1 penetrated 68 ft of progressively finer lake-bottom deposits beneath ice-contact glaciofluvial deposits. Many of the domestic wells in this area are shallow dug wells that derive water from the coarse-grained aquifer material overlying the lake-bottom sediments (pl. 3).

At some time in the glacial history of the aquifer area, ice entered the Ham Branch Brook Valley from the south and, while stationary near present-day Easton Village, a northward-trending moraine was deposited consisting of thick stratified-drift deposits at the southeastern end of the valley (pl. 7). Coarse-grained material consisting of glaciofluvial deposits formed in glacial Lake Franconia at the northern end of the aquifer area. This is the most productive part of the Ham Branch Brook aquifer.

Saturated thickness is greatest in the center of the valley, exceeding 80 ft at the northern end and exceeding 120 ft at the southern end of the aquifer area (pl. 7). USGS observation wells FDW-3 and FDW-4 were drilled in the northern end of the area (pl. 3). Each well penetrated 68 ft of coarse-grained aquifer material overlying thin (4 to 8 ft) very fine to medium-grained lacustrine deposits. Transmissivity, estimated from grain-size distribution of aquifer materials collected during test drilling was 12,000 ft^2/d for well FDW-3 and 6,000 ft^2/d for well FDW-4. Currently (1993), the aquifer is not used for public supply; however, the aquifer has high potential to yield water and was selected to demonstrate how water availability can be evaluated by use of the analytical ground-water-flow model discussed in the section on "Estimation of Water Availability for Selected Aquifers."

Meadow Brook Aquifer

The Meadow Brook aquifer underlies 3.43 mi^2 in interconnecting valleys of Gale River and Meadow Brook in Franconia and Sugar Hill (fig. 11, pl. 7) . The only area of the aquifer in Sugar Hill potentially capable of yielding large quantities of water is along the Gale River flood plain near Coffin Pond (pl. 7). The aquifer in this area consists of predominantly coarse-grained aquifer material. USGS observation well SUW-2, drilled in the thickest section of the saturated zone, penetrated 53 ft of fine to coarse sand and gravel before reaching till (pl. 3) (appendix B).

The area in the valley drained by Meadow and Beaver Brooks in Franconia is the other potentially productive zone in the aquifer. This part of the aquifer, formed in glacial Lake Franconia, consists of coarse-grained glaciofluvial deposits interlayered with fine-grained lacustrine deposits. Test drilling as part of a geohydrologic study performed by a private consultant showed that saturated thickness and transmissivity are adequate to supply high-capacity water-supply wells. Franconia test wells FDW-7 and FDW-8 (pl. 3), drilled 200 ft apart on the western side of the valley near the contact between stratified drift and till (pl. 3), penetrated 76 ft of coarse sand, gravel, cobbles, and a few boulders interlayered with sandy lacustrine deposits. Neither bedrock nor till was reached during the drilling of wells FDW-7 or FDW-8 (appendix B) (D.L. Maher Co., written commun., 1989).

Aquifer thickness in the center of the valley (an area for which little information is available) probably exceeds 80 ft. Transmissivity of the aquifer, calculated from aquifer-test data at wells FDW-7 and FDW-8, ranges from 6,700 to 7,400 ft^2/d, and hydraulic conductivity averages 110 to 120 ft/d (table 3) (D.L. Maher Co., written commun., 1989). Because the aquifer materials are predominantly coarse grained, this aquifer was selected to demonstrate how water availability can be evaluated by use of the analytical ground-water-flow model discussed in the section on "Estimation of Water Availability for Selected Aquifers."

John's River Subbasin Aquifers

Stratified drift underlies 11.6 mi^2 in the John's River subbasin and in the main-stem area of the Connecticut River Valley in Dalton and Lancaster. These stratified-drift deposits consist of lake-bottom deposits formed in either glacial Lake Whitefield (in the upper John's River Valley) or in a glacial lake environment not associated with glacial Lake Hitchcock, which did not extend this far north in the Connecticut River Valley (Koteff and Larsen, 1989). Aquifers, contained in two large aquifer systems in the subbasin, are primarily composed of ice-contact deltaic deposits formed in these glacial-lake environments.

Dalton-Burns Pond Aquifer

The Dalton-Burns Pond aquifer underlies 6.5 mi^2 along the main-stem area of the Connecticut River, extending east through the lower John's River Valley in Dalton and Whitefield center and south to Burns Pond in southern Whitefield (fig. 11, pl. 8). Seismic-refraction data (Dalton line f-f'; pl. 4, appendix C.16) along New Hampshire Route 135 in the main valley of the Connecticut River indicate that saturated thickness is about 140 ft. Thickness of stratified drift in the lower John's River Valley generally is less than 80 ft but locally exceeds 120 ft.

Approximately 2,000 ft northeast of the intersection of John's River and New Hampshire Route 135, two domestic wells, DAW-17 and DAW-38, were completed in sand and gravel deposits (pl. 4). Dalton well DAW-17 penetrated 45 ft of sand and gravel buried beneath 30 ft of clay (the bottom of the aquifer was not reached during drilling) (appendix B). Dalton well DAW-38 penetrated 5 ft of sand and gravel underlying 75 ft of sand (the bottom of the aquifer was not reached during drilling). The areal extent of this coarse-grained aquifer material, either beneath or overlying the predominantly fine-grained lacustrine deposits, is not known.

The most potentially productive area of the aquifer in the lower John's River Valley is near bedrock well DAW-23. Dalton well DAW-23 penetrated 110 ft of sand and gravel before reaching bedrock (appendix B). Elsewhere in the lower valley, stratified drift is shallow and mostly fine-grained. USGS observation wells DAW-1 and DAW-2, drilled at the northern and southern ends of seismic-refraction line Dalton c-c', respectively, (pl. 4, appendix C.15) penetrated shallow (less than 12 ft), coarse-grained stratified drift overlying progressively finer lake-bottom deposits. Well DAW-1 reached till at 35 ft, and well DAW-2 reached till at 65 ft. Overall, the potential for ground-water productivity in the lower John's River Valley is limited.

Another productive zone in the Dalton-Burns Pond aquifer is just north of Burns Pond and east of Parker Road in southwestern Whitefield. For many years, the town of Whitefield obtained its municipal water supply from five bedrock wells 5 mi away in Jefferson (JEW-1 to JEW-5, pl. 4), from two springs and four bedrock wells (WLW-22 to WLW-25) off Bray Hill Road in Whitefield, and from three bedrock wells in a gravel pit (WLW-3, also known as the Dodge Well) (pl. 4). Increasing maintenance and electrical costs from use of these wells and springs have forced the town to look at ground-water resources nearer the town's water-distribution system.

Test drilling in 1991 as part of a geohydrologic study by a private consultant indicated a significant saturated zone of coarse sand and gravel overlain by denser, somewhat impermeable, sand and gravel deposits on the eastern side of the Burns Pond Valley (D.L. Maher Co., written commun., 1991). Seismic-refraction work done by the consultant in this area showed that seismic velocities for the unconsolidated material ranged from 7,100 to 7,300 ft/s, which may indicate till. Whitefield test well WLW-6, drilled where the new gravel-packed well was later installed, penetrated 55 ft of silty sand, gravel, cobbles, and a few boulders (the bottom of this deposit was not reached during drilling).

The new water-supply well, in use since January 1993, yields 275 gal/min (or 0.41 Mgal/d) (William Johnson, Whitefield Water Dept., oral commun., 1993). Overall, saturated thickness of the unconsolidated deposits exceeds 120 ft in the center of the valley and probably into Burns Pond. Transmissivity, calculated from aquifer-test data at test well WLW-6, ranges from 1,400 to 1,700 ft^2/d, and hydraulic conductivity averages 20 to 24 ft/d (table 3).

Whitefield Airport Aquifer

The Whitefield airport is built on lake-bottom deposits formed in glacial Lake Whitefield. The aquifer at this locality, underlying 5.1 mi^2 in southeastern Whitefield, consists primarily of ice-contact deltaic deposits built into the lake while it was being drained at the Burns Pond outlet (pl. 8, fig. 11). The tops of these partially eroded deltas are graded to this outlet at an approximate altitude of 1,053 ft (321 m). The aquifer area is drained by the upper John's River, whose tributaries include Carroll Stream and Ayling, Bear, and Leonard Brooks.

Test drilling near Hazens Pond (west of the airport) as part of a geohydrologic study performed by private consultants for the town of Whitefield did not find an adequate site for a water-supply well (Donnelly, Conklin, Phipps, and Buzzell, Inc., written commun., 1982). Another geohydrologic study done for a private electric company in the southern part of the aquifer area near Bear Brook resulted in locating a productive zone capable of supplying large quantities of water to a well (Haley and Aldrich, Inc. written commun., 1986). Whitefield industrial well WLW-26, a gravel-packed well owned by the electric company, penetrated 71.5 ft of generally fine to coarse sand and gravel interlayered with many thin layers of silt and clay lacustrine deposits (the bottom of this deposit was not reached during drilling). The well currently yields 75 gal/min (appendix A). More recently, bedrock wells have been drilled to provide additional water for industrial use to the electric plant.

Aquifer thickness averages 40 ft but generally exceeds 80 ft in the center of the valley. Aquifer transmissivity, as estimated from drillers' logs, is generally less than 4,000 ft^2/d. Low-streamflow measurements of John's River at Hazen's Road in July 1991 showed that ground-water discharge was about 4.7 ft^3/s (or 3.0 Mgal/d) (site 1; pl. 1, appendix E). The center of the aquifer area is the most promising locality where water could be obtained. Here, shallow wells could be installed in the coarse-grained aquifer material overlying lake-bottom sediments that formed in glacial Lake Whitefield, but further test drilling would be needed to verify the productivity of aquifer materials.

Estimation of Water Availability for Selected Aquifers

Selected areas where conditions seem favorable for ground-water development were evaluated by use of analytical simulations of ground-water withdrawal from pumped wells. Water-availability estimates were based on hydraulic properties of the aquifer (saturated thickness, transmissivity, and storage coefficient), characteristics of the hypothetical withdrawal wells (percentage of saturated thickness the screen intersects, the screen radius, and the pumping duration), effects of nearby withdrawal wells, and hydraulic boundaries (either impermeable or recharge). Aquifers were selected based on the following criteria:

1. Transmissivity—area-weighted average greater than 2,000 ft^2/day.
2. Saturated thickness—greater than 40 ft.
3. Aquifer materials—grain sizes suitable for installation of wells.
4. Recharge—streams or lakes capable of supplying recharge by induced infiltration.

Four aquifers were selected for analysis. Other areas of stratified drift may have potential for development but were not analyzed because information on subsurface material was inadequate, the areas were close to known contamination sites, or the geohydrology was too complex to be simulated with a one-layer aquifer analytical model.

The method used to estimate the water availability at each of the four selected aquifers determines the amount of ground water potentially available over a long-term period (steady-state condition) and calculates, by use of a mathematical model, the maximum amount of water that can be withdrawn from the aquifer based on the distribution of the hypothetical well arrangement. Other well distributions may give different results. The amount of water available over a long-term period is assumed to be equal to natural recharge plus recharge from induced infiltration. Natural recharge is assumed to be 50 percent of average annual precipitation, or 21 in. annually, multiplied by the total area of stratified drift within the surface-water drainage divide of the modeled area, in million gallons per day. The amount of recharge from infiltration of streamflow draining adjacent upland areas was not considered because of the potential variability of this source. Maximum potential withdrawal from the aquifer, as determined from an analytical model, depends on the hydraulic characteristics of the aquifer; the number, location, and construction of hypothetical wells; the hydraulic boundaries; and the length of the period of negligible recharge. The estimated long-term water availability is assumed to be equal to either the amount of water available from recharge over a long-term period or the maximum withdrawal rate determined from the mathematical model, whichever is less.

Computations of water availability with the analytical model are based on the Theis nonequilibrium equation (Theis, 1935). Image-well theory (Ferris and others, 1962, p. 144-149) is used to account for boundary conditions. These estimates take into account the effects of hydraulic boundaries of aquifers, aquifer hydraulic properties, well characteristics, and possible well interferences (Mazzaferro and others, 1979).

Calculation of the potential maximum withdrawal rate from hypothetical pumped wells involves two basic steps: (1) determination of aquifer and well characteristics and (2) adjustment of the discharge rate so that total drawdowns are about 1 ft above the screened interval at each pumped well. Hydraulic characteristics of the aquifer were determined by (1) estimating an area-weighted average transmissivity from transmissivity ranges shown on plates 7 and 8, (2) assuming an average storage coefficient (0.2) that is reasonable for unconfined sand and gravel aquifers and pumped for extended periods (Mazzaferro and others, 1979), and (3) assuming an average ratio of vertical to horizontal hydraulic conductivity of 0.1 (Harte and Mack, 1992, p. 38). The saturated thickness of the aquifer was determined for each hypothetical well from data on plates 7 and 8 or from nearby wells shown on plates 3 and 4. Hypothetical wells were simulated with a screen radius of 1 ft and a screen length equal to 30 percent of the saturated thickness. Total available drawdown was limited to approximately 70 percent of saturated thickness. Withdrawals were simulated for 180 days—the time approximately equal to the period of maximum evapotranspiration and also the time of relatively little or no recharge.

The total drawdown at each withdrawal well is equal to drawdown produced by six possible components: (1) aquifer and well characteristics, (2) dewatering of the aquifer, (3) partial penetration of the aquifer by the pumped well, (4) well loss caused by flow into the screen, (5) nearby withdrawal wells, and (6) hydraulic boundaries. Hydraulic boundaries that can be simulated with the Ferris image-well theory are line-source recharge boundaries and impermeable-barrier (no-flow) boundaries. Recharge boundaries represent unlimited sources of water that may be available from surface-water bodies such as streams and lakes. Impermeable-barrier boundaries can be used to represent the contact between permeable stratified-drift aquifers and the relatively impermeable till or bedrock. Drawdown at a pumped well is amplified near a barrier boundary because there is no simulated flow across this boundary (fig. 16). Because recharge boundaries function as an unlimited source of water, drawdown at the pumped well is limited (fig. 17).

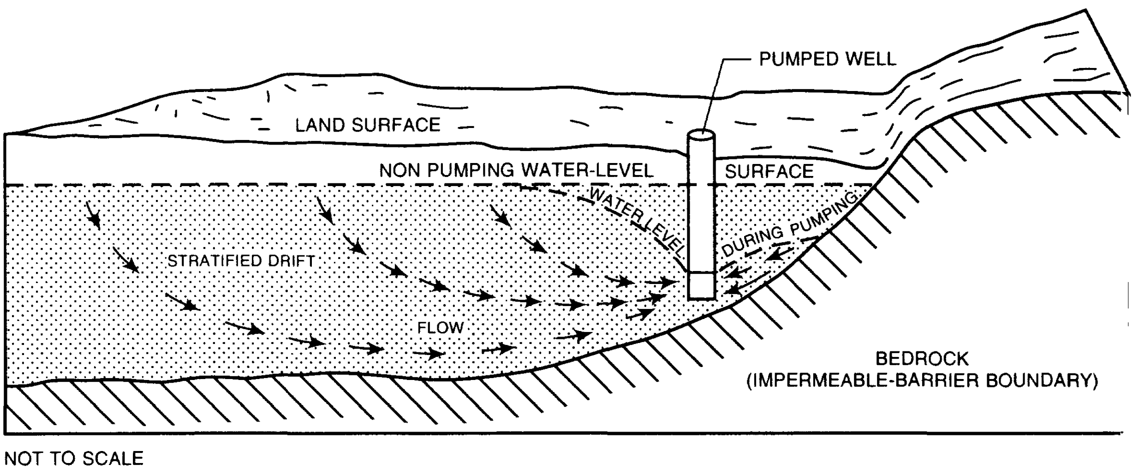

Figure 16. Ground-water flow and water-level drawdown at a pumped well near an impermeable-barrier boundary.

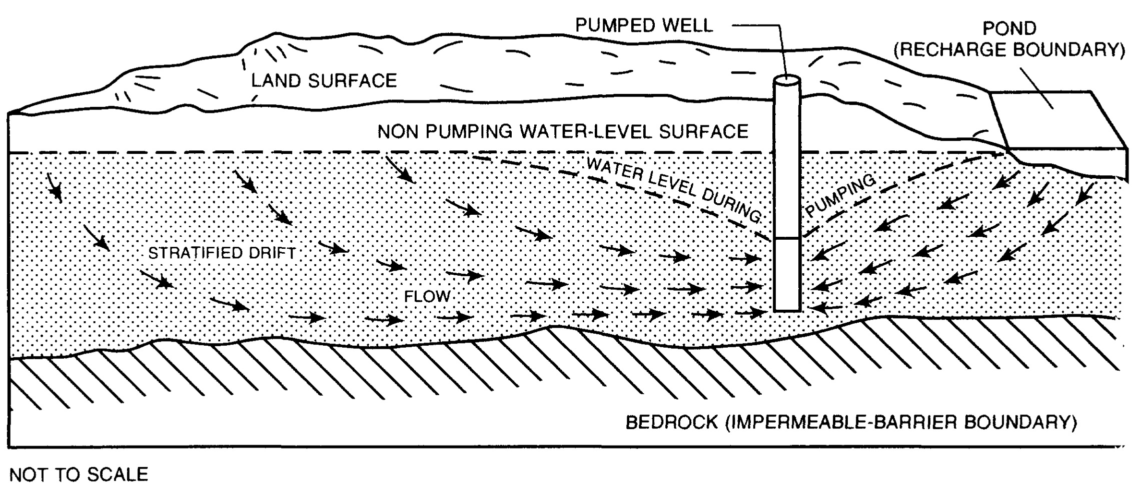

Figure 17. Ground-water flow and water-level drawdown at a pumped well near a recharge boundary.

Recharge or discharge image wells (Ferris and others, 1962) are used to simulate the effects of hydraulic boundaries. In this particular model, hydraulic boundaries (recharge or barrier) must be idealized as straight lines that enclose a rectangular area.

The maximum discharge rate for a pumped well is determined in the model under the criteria that drawdowns are above the well screen. Because well screens are assumed to penetrate the lower 30 percent of saturated thickness, drawdowns are limited by the condition that aquifer dewatering at the pumped well does not exceed 70 percent of the saturated thickness. If drawdowns exceed the above criteria, the discharge is adjusted, and drawdowns are recalculated until the criteria are met.

For each model, hypothetical withdrawal wells are distributed in the thickest, most transmissive part of the aquifer. Recharge and impermeable-barrier boundaries are idealized as vertical planes and are positioned to represent hydraulic conditions. Potential aquifer yields were estimated in two model simulations—to compare the effects of different boundary conditions and to provide a range of water-availability estimates. In the first model simulation run, the potential of induced infiltration from surface-water bodies is assumed to be absent. In the second model simulation run, the adjacent surface-water body is assumed to be a recharge boundary and to fully penetrate the aquifer. Withdrawals estimated under these two boundary conditions represents minimum and maximum long-term potential production.

Salmon Hole Aquifer

The Salmon Hole aquifer is in the Ammonoosuc River subbasin in the northern part of the study area in the town of Lisbon (fig. 11). A 39.8-square-mile area of the aquifer receives direct recharge from precipitation. The analytical model covers 0.73 mi^2 and represents one of the thickest and most transmissive parts of the aquifer along the main stem of the Ammonoosuc River. Two model simulations were done to evaluate effects of boundary conditions on aquifer yield.

The model is oriented with the predominant valley trend. Recharge boundaries correspond to the Ammonoosuc River along the northwestern and northeastern sides of the model (fig. 18). The till-bedrock contact forms an impermeable-barrier boundary along the southeastern side (fig. 18). The southwestern side is open or infinite (fig. 18). Where no boundaries are used, drawdowns are assumed to result indefinitely in that direction until equilibrium is reached without interference from hydraulic boundaries.

For the most conservative water-availability estimate, the northwestern, northeastern and southeastern sides, were simulated as impermeable-barrier boundaries. This means that any possible recharge potential from the Ammonoosuc River was ignored. The southwestern side was open.

The water-availability estimate was increased by simulating the northwestern and northeastern sides as recharge boundaries, as shown in fig. 18. This allowed induced recharge from the Ammonoosuc River to increase aquifer yield. The southeastern side remained an impermeable barrier boundary. The southwestern side remained open.

Eight hypothetical withdrawal wells were simulated, six at a spacing of 1,000 ft and two at a spacing of 2,000 ft (fig. 18). Hypothetical wells were aligned in the same orientation as that of the model and the axis of a buried bedrock channel (southwest to northeast). Each hypothetical well was assigned a saturated thickness as contoured on plate 7 or a value from a well log near the position of the hypothetical well in the model area. For example, one of the hypothetical wells was placed in the same location as Lisbon municipal well LLW-2 and was assigned the same saturated thickness as found near well LLW-2.

All eight hypothetical wells were assigned a transmissivity of 2,000 ft^2/d, which is the area-weighted average transmissivity of the model area. Calculation of this area-weighted average, as shown in table 4, was based on ranges of transmissivities and percentages of the model area to which those ranges apply. The average transmissivity for each zone (or area) was multiplied by its percentage of the model area and then these values were summed together to equal the area-weighted average transmissivity of the model area (table 4). The area-weighted average transmissivity assigned to each of the 8 hypothetical withdrawal wells in the Salmon Hole aquifer model area was 1,975.5 ft^2/d rounded to 2,000 ft^2/d.

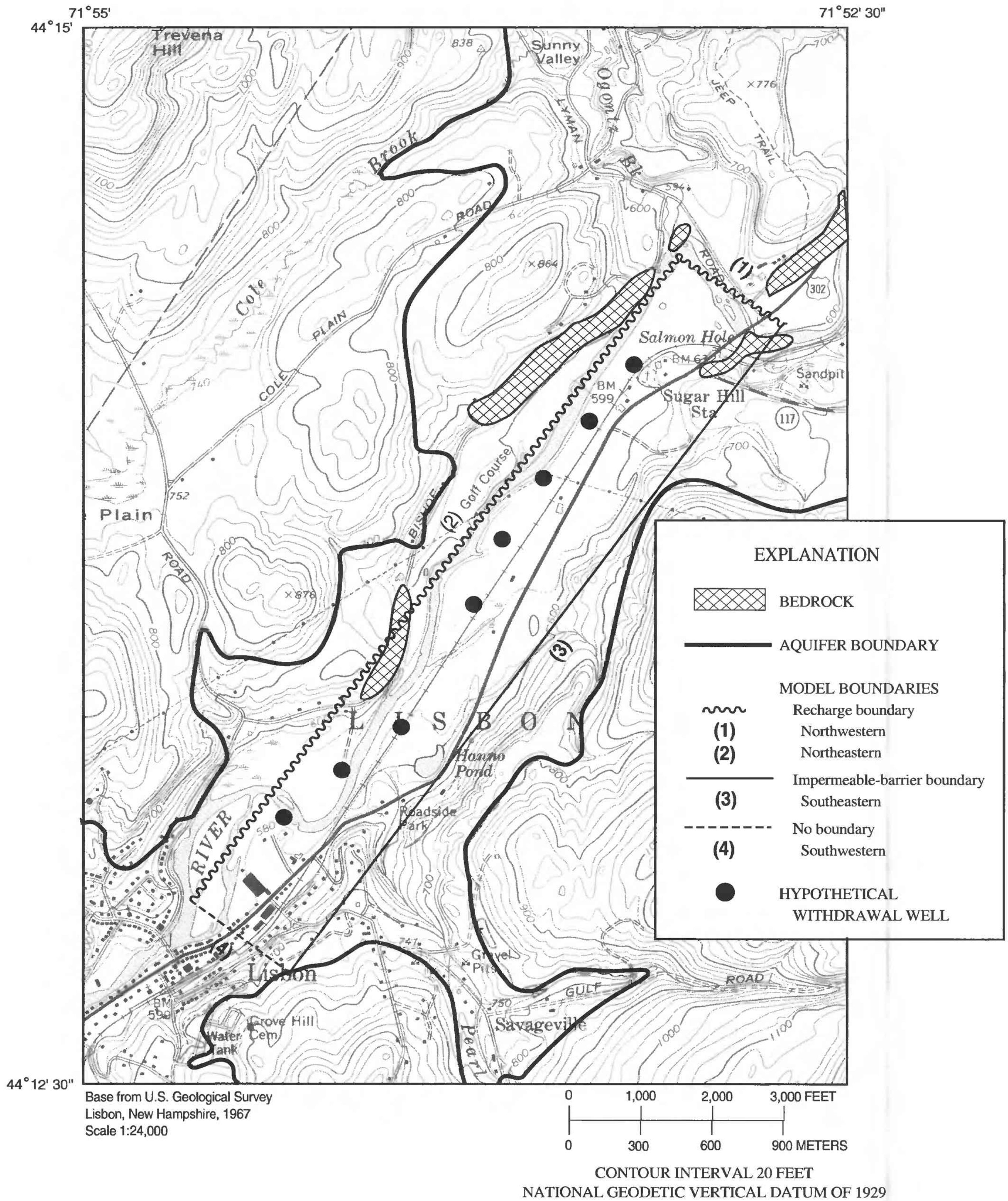

Figure 18. Locations of analytical-model boundaries and hypothetical withdrawal wells for water-availability estimates of the Salmon Hole aquifer, west-central New Hampshire.

Table 4. Calculations used in estimating area-weighted average transmissivity for the Salmon Hole aquifer analytical model, west-central New Hampshire.

[ft^2/d, foot squared per day; mi^2, square miles; >, actual value is greater than value shown; <, actual value less than value shown]

Transmissivity, in ft^2/d	Amount of model area to which transmissivity range applies		Area-weighted sum for each transmissivity value zone area, in ft^2/d
	mi^2	Percent	
> 4,000	0.08	11	$6{,}000 \times 0.11 = 660$
2,000 - 4,000	.21	28.8	$3{,}000 \times 0.288 = 864$
1,000 - 2,000	.12	16.4	$1{,}500 \times 0.164 = 246$
< 1,000	.30	41.1	$500 \times 0.411 = 205.5$
0 (till/bedrock)	.02	2.7	$0 \times 0.027 = 0$
TOTAL	[1].73	100	[2]2,000

[1]Total for model area.

[2]Rounded to two significant figures.

Water availability simulated in the analytical model ranged from 1.5 to 2.2 Mgal/d. Information from low-streamflow measurements and estimates of natural recharge to the aquifer indicate that additional water is available for withdrawal. Low streamflow was about 131 ft^3/s, or 85 Mgal/d, at the Ammonoosuc River 2 mi downstream from the aquifer on July 10, 1991 (site 27, appendix E). Water-availability analyses indicate that 2.2 Mgal/d could be withdrawn without affecting the river, although it is uncertain how much of this amount could be captured by way of induced infiltration. The municipal well (LLW-2) discussed earlier, currently (1993) uses 0.25 Mgal/d (175 gal/min), which is less than 0.3 percent of the average annual precipitation recharge of 40 Mgal/d to the 39.8-square-mile aquifer area. Although recharge available from the Ammonoosuc River and average annual precipitation are considerably greater than the water-availability estimate simulated in the analytical model, simulation results indicate that available drawdown is the major limitation on water availability.

Haverhill-French Pond Aquifer

The Haverhill-French Pond aquifer is in the Clark Brook subbasin in the northern part of the study area in the town of Haverhill (fig. 11). Clark Brook is a tributary stream to the Connecticut River. A 1.7-square-mile area of the aquifer receives direct recharge from precipitation. The analytical model covers 0.4 mi^2 and represents the thickest and most transmissive aquifer in the Clark Brook subbasin (fig. 19). Two model simulations were done to evaluate ranges of water availability.

The model is oriented with the predominant valley trend. A recharge boundary corresponds to Clark Brook and French Pond along the northwestern edge of the model area (fig. 19). Impermeable-barrier boundaries include a shallow stratified-drift deposit over bedrock at the northeastern side and a till-bedrock contact at the southeastern side of the model area (fig. 19). The southwestern side is open or infinite (fig. 19).

For the most conservative water-availability estimate the northwestern, northeastern, and southeastern sides were simulated as barrier boundaries. This means that any possible recharge potential from Clark Brook and French Pond was not simulated. The southwestern side was open.

The water-availability estimate was increased by simulating the northwestern boundary as a recharge boundary. This allowed induced infiltration from Clark Brook and French Pond to increase aquifer yield. The northeastern and southeastern sides remained as impermeable barrier boundaries. The southwestern boundary remained open.

Eight hypothetical withdrawal wells were simulated at a spacing of 1,000 ft (fig. 19). Hypothetical wells were aligned in the same orientation as that of the model and the axis of a buried bedrock channel (southwest to northeast). Each hypothetical well was assigned a saturated thickness as contoured on plate 6. All eight hypothetical wells were assigned the same transmissivity; that is, the area-weighted average transmissivity of the model area, which was calculated to be 3,000 ft^2/d.

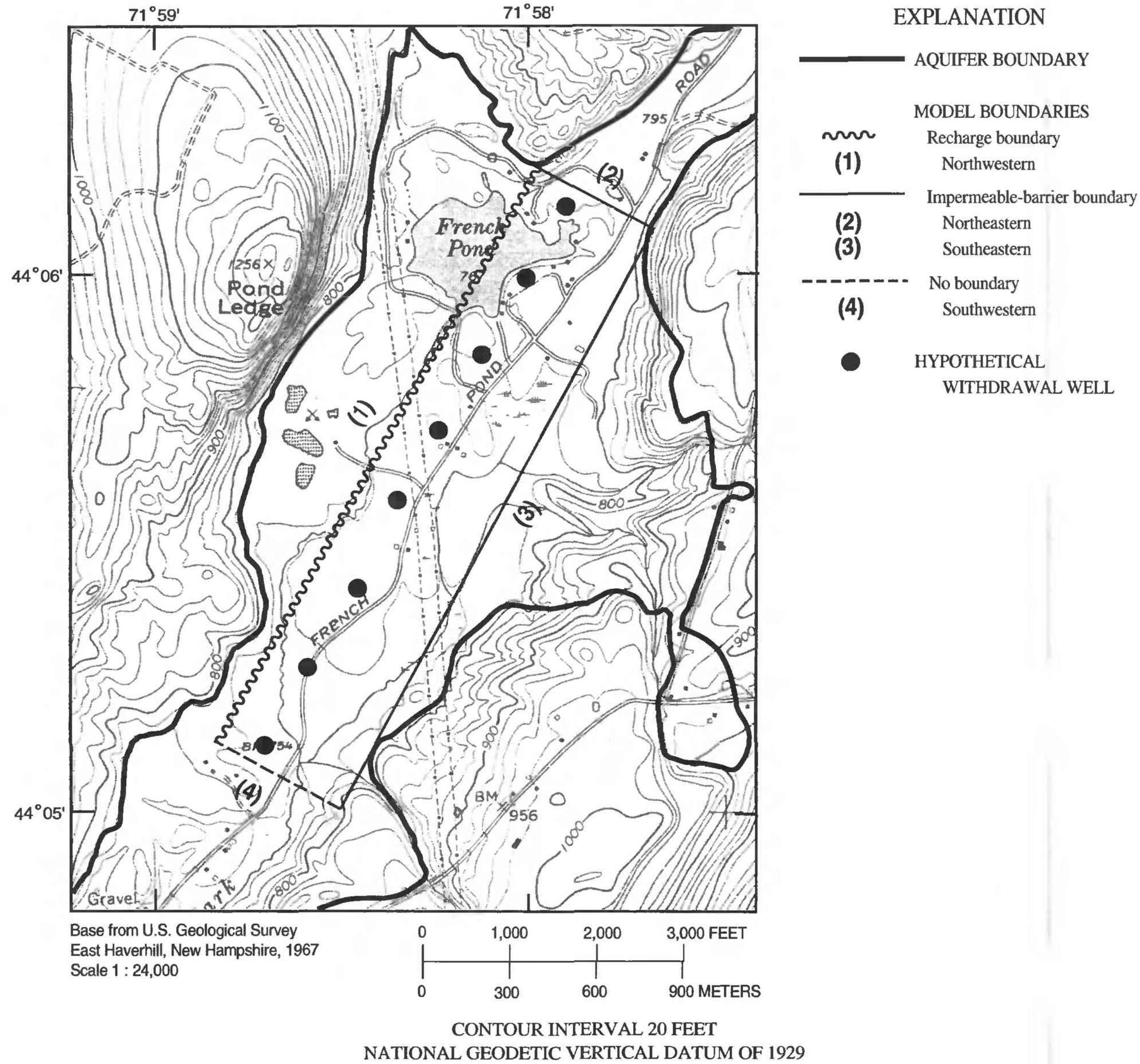

Figure 19. Locations of analytical-model boundaries and hypothetical withdrawal wells for water-availability estimates of the Haverhill-French Pond aquifer, west-central New Hampshire.

Water availability simulated in the analytical model ranged from 1.4 to 2.9 Mgal/d. Information from low-streamflow measurements and estimates of area precipitation recharge to the aquifer indicates that induced recharge from Clark Brook and area precipitation recharge may be the principal limitations on water availability. Low streamflow was about 3.1 ft^3/s or 2.0 Mgal/d at Clark Brook 0.5 mi downstream from the aquifer on September 12, 1990 (site 37, appendix E), which is less than the maximum long-term water availability of 2.9 Mgal/d simulated in the analytical model. The average annual precipitation for the 8.3-square mile drainage-basin area indicates that only 1.7 Mgal/d of precipitation recharge is available to the aquifer; this amount also is less than the maximum long-term water availability of 2.9 Mgal/d simulated in the analytical model.

Ham Branch Brook Aquifer

The Ham Branch Brook aquifer is in the Ham Branch Brook subbasin in the northern part of the study area in the towns of Franconia and Easton (fig. 11). Ham Branch Brook is a tributary stream to the Gale River. The Gale River drains into the Ammonoosuc River at Lisbon. A 3.8-square-mile area of the aquifer receives direct recharge from precipitation. The analytical model covers 0.73 mi^2 and represents the most transmissive part of the aquifer in the Ham Branch Brook subbasin (fig. 20). Two model simulations were done to evaluate the effects of boundary conditions on water availability.

The model is oriented with the predominant valley trend. A recharge boundary corresponds to the Ham Branch Brook along the western side of the model area (fig. 20). An impermeable-barrier boundary corresponds to a till-bedrock contact along the eastern side (fig. 20). The southern and northern sides of the model area are open or infinite (fig. 20).

For the most conservative water-availability estimate, the eastern and western sides of the model area were simulated as impermeable-barrier boundaries. This means that any potential recharge from the Ham Branch Brook was not simulated. The southern and northern sides were open.

The water-availability estimate was increased by simulating the western side of the model area as a recharge boundary. This allowed induced infiltration from the Ham Branch Brook to increase aquifer yield. The eastern side remained an impermeable-barrier boundary. The southern and northern sides remained open.

Eight hypothetical withdrawal wells were simulated with a spacing of 1,000 ft (fig. 20). Hypothetical wells were aligned in the same orientation as that of the model and the axis of the buried bedrock channel (south to north). Each hypothetical well was assigned a saturated thickness from plate 7 or from an actual well near the position of the hypothetical well in the model area. All eight hypothetical wells were assigned the same transmissivity; that is, the area-weighted average transmissivity of the model area, which was calculated to be 2,700 ft^2/d.

Water-availability estimates simulated in the analytical model ranged from 1.8 to 2.1 Mgal/d. Information on low-streamflow measurements and estimates of area precipitation recharge for the aquifer indicate that additional water is available for withdrawal. Low streamflow was about 11.6 ft^3/s or 7.5 Mgal/d at Ham Branch Brook 1.0 mi downstream from the aquifer on July 9, 1991 (site 17, appendix E). The average annual precipitation for the 30.7-square-mile drainage-basin area indicates that 3.8 Mgal/d of precipitation recharge is available to the aquifer. Although recharge available from the Ham Branch Brook and average annual precipitation are greater than the maximum, long-term water-availability estimate of 2.1 Mgal/d simulated in the analytical model, simulation results indicate that available drawdown is the major limitation on water availability.

Meadow Brook Aquifer

The Meadow Brook aquifer is in the Gale River subbasin in the northern part of the study area in the town of Franconia (fig. 11). Meadow Brook and Beaver Brook, a tributary to Meadow Brook, drain into the Gale River at the northern end of the aquifer. The Gale River drains into the Ammonoosuc River at Lisbon. A 0.9-square-mile area of the aquifer receives direct recharge from precipitation. The analytical model covers 0.48 mi^2 for model area A and 0.22 mi^2 for model area B (fig. 21). Two model simulations were done to evaluate the effects of boundary conditions on water availability.

The model is oriented with the predominant valley trend. Because of the curvature of the valley, the analytical model was split into two separate model areas, model area A and model area B. A recharge boundary corresponds to Meadow Brook along the western side of model area A and an impermeable-barrier boundary corresponds to the eastern side (fig. 21). The northern and southern sides of model area A are open or infinite (fig. 21). Impermeable, till-bedrock barrier boundaries are along the southeastern, southwestern, and northwestern sides of model area B (fig. 21). The northeastern end of model area B (fig. 21) is open or infinite.

For the most conservative water-availability estimate, the eastern and western sides of model area A were simulated as impermeable-barrier boundaries. This means that any potential recharge from Meadow Brook was not simulated. The northern and southern sides of model area A were open. The southeastern, northwestern, and southwestern sides of model area B were simulated as impermeable-barrier boundaries. The northeastern side for model area B was open.

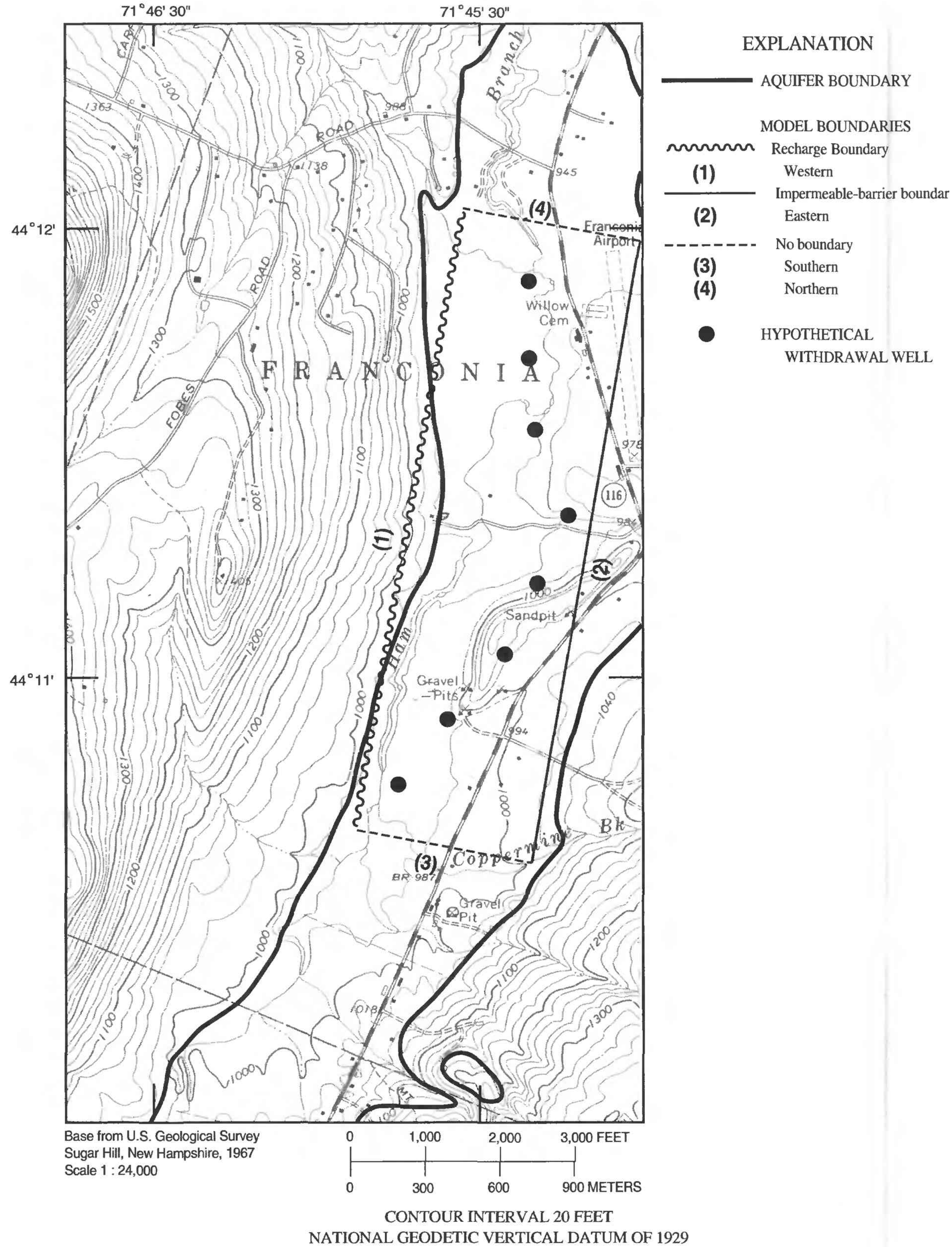

Figure 20. Locations of analytical-model boundaries and hypothetical withdrawal wells for water-availability estimates of the Ham Branch Brook aquifer, west-central New Hampshire.

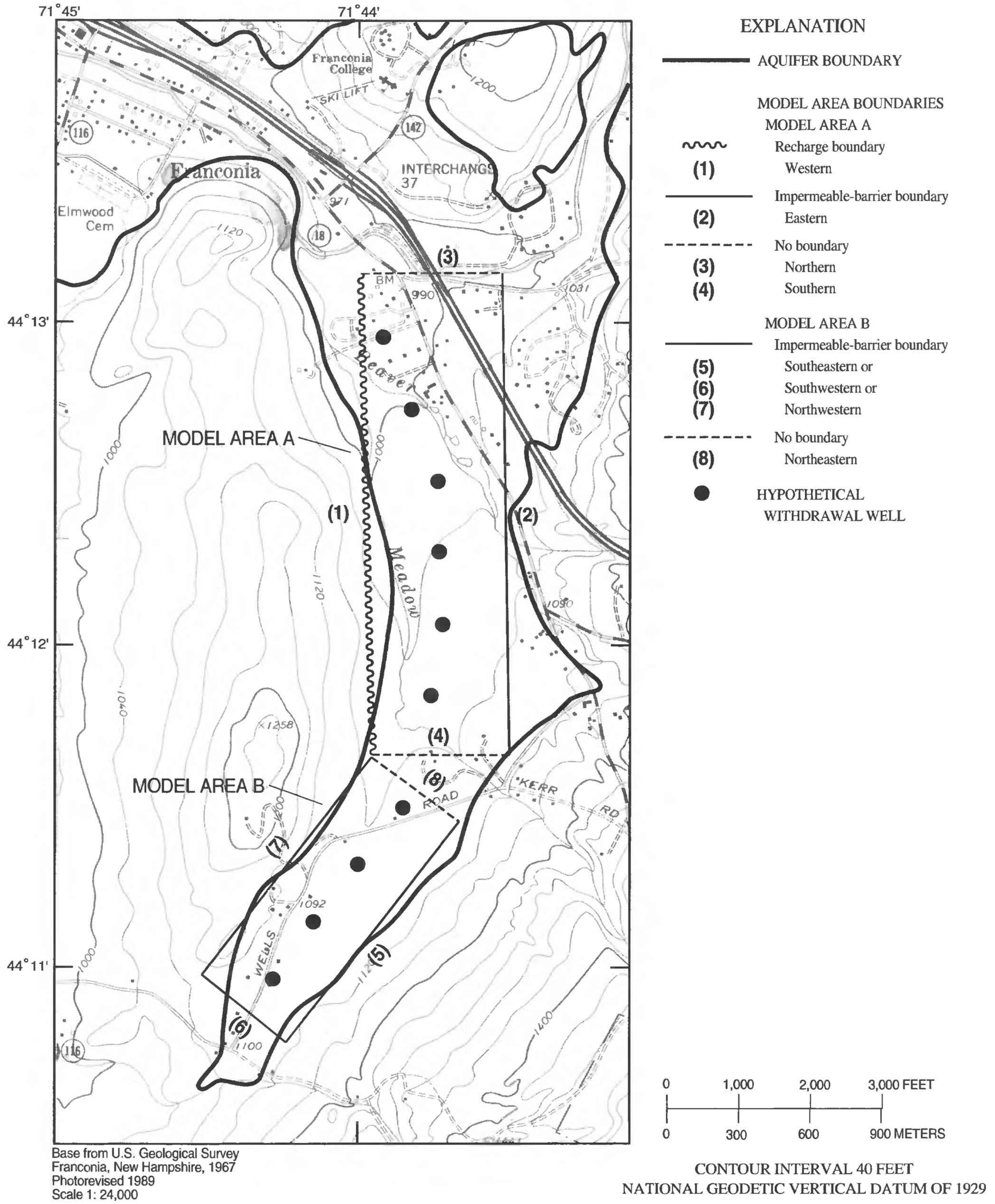

Figure 21. Locations of analytical-model boundaries and hypothetical withdrawal wells for water-availability estimates of the Meadow Brook aquifer, west-central New Hampshire.

The water-availability estimate was increased by simulating the western side of model area A as a recharge boundary. This allowed induced infiltration from Meadow Brook to increase aquifer yield. The eastern side of model area A remained an impermeable-barrier boundary. The southern and northern sides of model area A remained open. Model area B was not simulated for the effect of induced infiltration on aquifer yield.

Six hypothetical withdrawal wells in model area A and four hypothetical withdrawal wells in model area B were simulated with a spacing of 1,000 ft (fig. 21). Hypothetical wells were aligned in the same orientation as that of the model areas and the axis of the buried channel (south to north). Each hypothetical well was assigned a saturated thickness as contoured on plate 7.

The six wells in model area A and the four wells in model area B were assigned the same transmissivity; that is, the area-weighted average transmissivity of the model area, which, for model area A, was calculated to be 2,900 ft^2/d. The four wells in model area B were assigned the area-weighted average transmissivity of 2,300 ft^2/d.

Total water-availability estimates simulated in the analytical model for both model areas ranged from 1.9 to 2.5 Mgal/d. Information on low-streamflow measurements and estimates of area precipitation recharge for the aquifer indicate that area precipitation recharge is the primary limitation on aquifer yield. Low streamflow was about 6.8 ft^3/s, or 4.4 Mgal/d, at Meadow Brook just downstream from the aquifer on July 9, 1991 (site 12, appendix E). The average annual precipitation for the 8.3-square-mile drainage-basin area indicate that only 0.9 Mgal/d of precipitation recharge is available to the aquifer, less than the minimum long-term water-availability estimate of 1.9 Mgal/d simulated in the analytical model. Ground water would have to be mined from storage in the aquifer to sustain these long-term estimates of water availability.

WATER QUALITY

Water in stratified-drift aquifers in the Middle Connecticut River Basin is generally suitable for drinking and for domestic and commercial uses. Concentrations of dissolved constituents are low, and color and odor are largely absent. An exception to the general absence of ground-water-quality degradation in the study area has been identified in Hanover, where trichloroethylene (TCE) has been detected in ground water from a buried esker formation that is hydraulically connected to the Connecticut River (Shoop and Gatto, 1992).

Ground-water samples were collected from 26 USGS observation wells, 3 municipal wells, and 1 municipal spring in February, March, April, and September 1991 to characterize water quality of the stratified-drift aquifers (pls. 1-4). Ground-water samples collected from the observation wells reflect the geochemical properties of the stratified-drift aquifer over a small area around the well. Ground-water samples collected from the municipal wells and spring reflect the average geochemical properties of the aquifer over a larger area and possibly reflect the effects of induced recharge from nearby surface water sources.

All water samples were analyzed by the USGS National Water Quality Laboratory (NWQL) in Arvada, Colo. Samples were collected and analyzed according to procedures described by Fishman and Friedman (1989). Results of analysis of water samples are given in appendix F. A statistical summary of the chemical analysis of the ground-water samples is given in table 5 for comparison with the U.S. Environmental Protection Agency (1991a,b, 1992) drinking-water regulations.

Graphical representations of the major water-quality constituents for water from selected wells are presented on plates 1 through 4 and show variations in the chemistry of aquifer water. Concentrations of dissolved constituents (expressed in milliequivalents per liter) are plotted at each well site, and the points are connected to form irregular polygons called Stiff diagrams (Stiff, 1951). Four cations—sodium (Na), potassium (K), magnesium (Mg), and calcium (Ca)—are plotted along the axis to the left of the zero point. Five anions—chloride (Cl), fluoride (F), sulfate (SO_4), bicarbonate (HCO_3), and carbonate (CO_3)—are plotted along the axis to the right of the zero point. The shape of the closed figure characterizes the water composition.

Table 5. Summary of results of ground-water-quality analyses, west-central New Hampshire

[MCL (Maximum contaminant level) is an enforceable, health-based maximum level (concentration) for contaminants in public drinking-water supplies as defined in the National Primary and Secondary Drinking-Water Regulations established by the U.S. Environmental Protection Agency (U.S. Environmental Protection Agency, 1991a,b, 1992). SMCL (Secondary maximum contaminant level) is a non-enforceable, aesthetically-based maximum level (concentration) for contaminants in public drinking-water supplies as defined in the National Primary and Secondary Drinking-Water Regulations established by the U.S. Environmental Protection Agency (U.S. Environmental Protection Agency, 1991a,b, 1992). µS/cm, microsiemens per centimeter; A less than symbol "<" precedes a value whenever the concentration was below reporting level; mg/L, milligrams per liter; NO_2, nitrite; NO_3, nitrate; µg/L, micrograms per liter; --, no data]

Water-quality constituent	MCL	SMCL	Number of samples	Minimum	First quartile	Median	Third quartile	Maximum
Specific conductance, field (µS/cm at 25 degrees Celsius)	--	--	37	44	89	158	220	400
pH, field (standard units)	--	--	37	5.7	6.1	6.4	6.8	8.1
Temperature, water, in degrees Celsius	--	--	37	6.5	8	9	10.5	14
Dissolved Oxygen, (mg/L as O_2)	--	--	18	0	.7	3.2	8.5	11.2
Hardness, total (mg/L as $CaCO_3$)	--	--	28	13	27.5	39.5	64.8	170
Acidity, total (mg/L as H)	--	--	19	<.1	<.1	.1	.2	.3
Calcium, dissolved (mg/L as Ca)	--	--	28	4.1	8.4	12.5	19.8	58
Magnesium, dissolved (mg/L as Mg)	--	--	28	.57	1.6	2.2	3.2	7.3
Sodium, dissolved (mg/L as Na)	--	[1]20	28	1.6	3.2	6.9	10.8	54
Potassium, dissolved (mg/L as K)	--	--	28	.8	1.3	1.8	2.8	17
Alkalinity, field, (mg/L as $CaCO_3$)	--	--	36	6	18	28	57	150
Sulfate, dissolved (mg/L as SO_4)	--	250	28	3.8	6.8	9.9	14.5	24
Chloride, dissolved (mg/L as Cl)	--	250	28	.4	2.1	11	32.5	100
Fluoride, dissolved (mg/L as F)	4	2	28	<.1	<.1	<.1	<.1	.3
Silica, dissolved (mg/L as SiO_2)	--	--	28	8.8	11	13	17.5	23
Solids, sum of constituents, dissolved (mg/L)	--	[1]500	28	31	62	92.5	125	222
Nitrogen, nitrite, dissolved (mg/L as N)	1	--	20	<.01	<.01	<.01	<.01	<.01
Nitrogen, NO_2+NO_3, dissolved (mg/L as N)	10	--	20	<.05	.16	.47	.77	7.2
Nitrogen, ammonia, dissolved (mg/L)	--	--	20	<.01	<.01	<.01	.025	.42
Nitrogen, ammonia-plus-organic, dissolved (mg/L)	--	--	20	<.2	<.2	<.2	<.2	.6
Phosphorus, dissolved (mg/L as P)	--	--	20	<.01	<.01	<.01	.01	.06
Phosphorus, ortho, dissolved (mg/L as P)	--	--	20	<.01	<.01	<.01	<.01	.06
Aluminum, dissolved (µg/L as Al)	--	50	4	<10	--	--	--	10
Barium, dissolved (µg/L as Ba)	2,000	--	19	<2	8	19	31	62
Beryllium, dissolved (µg/L as Be)	4	--	19	<.5	<.5	<.5	<.5	.7
Boron, dissolved (µg/L as B)	--	--	4	<10	--	--	--	20
Cadmium, dissolved (µg/L as Cd)	5	--	19	<1	<1	<1	<1	1
Cobalt, dissolved (µg/L as Co)	--	--	19	<3	<3	<3	<3	5

Table 5. Summary of results of ground-water-quality analyses, west-central New Hampshire--*Continued*

Water-quality constituent	MCL	SMCL	Number of samples	Minimum	First quartile	Median	Third quartile	Maximum
Copper, dissolved (µg/L as Cu)	--	1,000	19	--	--	--	--	<10
Iron, dissolved (µg/L as Fe)	--	300	28	<3	5	7.5	122	5,600
Lead, dissolved (µg/L as Pb)	--	0	19	<10	<10	<10	<10	10
Lithium, dissolved (µg/L as Li)	--	--	19	<4	<4	<4	<4	6
Manganese, dissolved (µg/L as Mn)	--	50	28	<1	4	39	247.5	690
Molybdenum, dissolved (µg/L as Mo)	--	--	19	--	--	--	--	<10
Strontium, dissolved (µg/L as Sr)	--	--	23	27	48	81.5	150	280
Vanadium, dissolved (µg/L as V)	--	--	19	--	--	--	--	<6
Zinc, dissolved (µg/L as Zn)	--	5,000	19	<3	<3	3.5	5	15

[1]New Hampshire Department of Environmental Services, Water Supply and Engineering Bureau, written commun., 1990.

Field-Measured Properties

The sampling procedure varied with the source of the water sampled. Untreated water was sampled from one municipal spring and two municipal wells: spring HKS-1, wells LLW-2, and MUW-2 (pls. 2 and 3). The municipal wells are pumped continuously and the spring maintains constant flow, so additional evacuation of water before sampling was unnecessary. All of the USGS observation wells selected for water collection were developed before sampling. At the time of sampling, the wells were pumped with a submersible pump at an average rate of 0.8 gal/min until at least three times the volume of water in the well was evacuated and until the temperature, specific conductance, pH, and dissolved-oxygen concentration stabilized. This procedure ensured that samples were derived from the aquifer and not from stagnant water in the casing. Once the above mentioned water characteristics had stabilized, water was collected and filtered through a 0.4-micrometer-pore-size polycarbonate membrane filter. Preservatives, if necessary, were added immediately after filtration, and samples were iced and shipped to the NWQL for analysis.

Specific Conductance

Specific conductance, a measure of the ability of water to conduct electrical current, is an indication of the concentration of ions in solution or of dissolved solids. High specific conductance indicates that the concentration of one or more ions in solution is high. Specific conductance of water samples ranged from 44 µS/cm (well ENW-32) to 400 µS/cm at well HKW-22; the median was 158 µS/cm.

pH

The pH of water is a measure of the hydrogen ion activity. The pH scale ranges logarithmically from 0 to 14; each one-unit increase in the scale represents a tenfold decrease in hydrogen-ion activity. Water having a pH of 7 is neutral, less than 7 is acidic, and greater than 7 is alkaline. At a pH less than 6.5, some metals in metallic piping can dissolve and a metallic taste can be imparted to the water (U.S. Environmental Protection Agency, 1992). The pH of most ground waters in the United States ranges from about 6 to about 8.5 (Hem, 1985, p. 63-64). The pH of 37 samples measured from wells in the study area ranged from 5.7 to 8.1, and the median pH was a slightly acidic 6.4. Water from wells screened in fine-grained lake sediments generally have higher pH than does water from wells screened in coarse-grained valley-fill sediments (Moore and others, 1994). The most acidic ground-water samples (pH from 5.7 to 6.0) were from wells EBW-1, CCW-4, CFW-17, and CFW-18 in the towns of Easton, Canaan, and Carroll. The most alkaline ground-water samples (pH from 7.8 to 8.1) were from wells HKW-21, BOW-3, and CCW-3 in the towns of Haverhill, Benton, and Canaan.

Dissolved Oxygen

The equilibrium concentration of dissolved oxygen (DO) in water that is in contact with air is a function of temperature, pressure, and, to a lesser degree, the concentration of other solutes (Hem, 1985, p. 155). Oxygen is supplied to ground water through recharge and by movement of air through unsaturated material above the water table. Dissolved-oxygen concentrations from 18 samples ranged from zero (wells BOW-3 AND HKW-22) to 11.2 mg/L (well LYW-4); the median was 3.2 mg/L. Water containing measurable amounts of dissolved oxygen can migrate long distances into the ground-water system, if little reactive material is available.

Alkalinity

Alkalinity is a measure of the buffering capacity of a solution—the capacity to resist a change in pH due to the addition of an acid—and is a measure of the concentrations of carbonate (CO_3^{2-}), bicarbonate (HCO_3^-), and hydroxide (OH^-). The bicarbonate ion is the predominant anion species in ground water from stratified-drift aquifers in New Hampshire. The relatively low alkalinity of ground water in stratified-drift aquifers in the study area indicates little buffering capacity or ability to resist acidification. Alkalinity in water samples from this study was determined by incremental titration of unfiltered samples with aliquots of 0.01639N sulfuric acid to an endpoint of pH 4.5. Total alkalinity determined in the field ranged from 6 to 150, expressed as milligrams per liter of $CaCO_3$ (calcium carbonate); the median of 36 samples was 28 mg/L as $CaCO_3$. The sample with the highest total alkalinity (150 mg/L as $CaCO_3$) was from well CCW-7 (pl. 1) in the town of Canaan.

Dissolved Solids

Dissolved solids in water includes all ionized and un-ionized dissolved solids in solution (Davis and DeWiest, 1966). Concentrations of dissolved solids in the samples ranged from 31 to 222 mg/L; the median was 92.5 mg/L. The concentrations of dissolved solids in all water samples were less than the recommended limit for drinking water (500 mg/L) established by the New Hampshire Department of Environmental Services, Water Supply and Engineering Bureau (written commun., 1990) for public drinking water. The relatively low concentration of dissolved solids in stratified-drift aquifers is attributed to the insolubility of the silicate minerals that dominantly compose the aquifer matrix and to the typically short residence time of water (Morrissey and Regan, 1987). Water from wells OSW-2 and HKW-22 had the highest concentrations of dissolved solids (222 and 221 mg/L, respectively) and the highest specific conductances (361 and 400 µS/cm, respectively).

Calcium, Magnesium, and Hardness

Calcium and magnesium are common elements of alkaline-earth minerals. Calcium and magnesium are also the predominant cations in most natural ground water (Hem, 1985). Concentrations of dissolved calcium in 28 samples ranged from 4.1 to 58 mg/L; the median was 12.5 mg/L. Concentrations of dissolved magnesium in 28 samples ranged from 0.57 to 7.3 mg/L; the median was 2.2 mg/L. The USEPA has not established a drinking-water limit for calcium or magnesium.

Hardness of water, expressed in milligrams per liter as $CaCO_3$, is caused by divalent metallic cations dissolved in water. In freshwater, these cations are primarily calcium and magnesium, but iron, strontium, and manganese also may contribute to hardness. Ground waters in the study area ranged from soft (13 mg/L) to hard (170 mg/L) according to the hardness classification in table 6.

Twenty samples with a hardness of less than 60 mg/L were classified as soft water (table 6). Five samples were moderately hard (64 to 120 mg/L). Hard water was found in wells CCW-7 and OSW-2 (130 and 170 mg/L, respectively) in the towns of Canaan and Orford. Water from these wells had some of the highest concentrations of calcium (44 and 58 mg/L) and magnesium (4.4 and 5.7 mg/L), the two principal components of hardness. Water from well CCW-7 also had the highest concentration of iron (5,600 µg/L), which also contributes to hardness.

Table 6. Classification of hardness of water

[$CaCO_3$, calcium carbonate. Modified from Durfor and Becker, 1964, p. 27]

Descriptive rating	Range of hardness, as $CaCO_3$ (milligrams per liter)
Soft	0 - 60
Moderately hard	61 - 120
Hard	121 - 180
Very Hard	181 or greater

Sodium and Chloride

Sodium (Na) and chloride (Cl) are not common elements in stratified-drift aquifer mineralogy, but these elements can be introduced into ground water from natural and manmade sources. The main natural source of chloride is atmospheric precipitation and dry fallout, contributing about 0.5 mg/L to the New Hampshire land surface (Hall, 1975). Hall (1975) suggests that dissolved salt coupled with pH ranges of 5.5 to 7.5 could pose a health threat because of the corrosion of iron, zinc, and cadmium from plumbing systems. The major manmade source of sodium and chloride is NaCl (sodium chloride) used for road salting. From the winter of 1982-83 through the winter of 1992-93, the State of New Hampshire used an average of 152,000 tons/yr of NaCl to deice State highways and roads. These applications of NaCl probably contributed to an increase in concentrations of sodium and chloride in ground water statewide (Robert Hogan, New Hampshire Department of Transportation, oral commun., 1993). The concentrations of dissolved sodium and chloride in water from well HKW-22 were 54 mg/L and 100 mg/L, respectively. Given that the ratio of their milliequivalents (2.4 and 2.8 meq) is close to 1:1, NaCl is likely to be a major source of both elements in water from that well.

Five samples had dissolved-sodium concentrations that equalled or exceeded the recommended Health Advisory Limit for sodium (20 mg/L) established by the New Hampshire Department of Environmental Services, Water Supply and Engineering Bureau (written commun., 1990); the median for 28 water samples was 6.9 mg/L. At present, sodium concentrations that exceed the recommended limit of 20 mg/L, are considered to pose a potential health problem for individuals who require sodium-restricted diets. Concentrations of chloride for 28 samples ranged from 0.4 to 100 mg/L; the median was 11 mg/L. All of the concentrations of chloride were below the secondary drinking-water limit of 250 mg/L (U.S. Environmental Protection Agency, 1992).

Nitrogen

Nitrogen can be in many forms in natural waters, depending on the source of nitrogen and the degree of decomposition. Nitrogen is present in water as nitrite (NO_2^-) or nitrate (NO_3^-) anions, in cationic form as the ammonium (NH_4^+) cation, and at intermediate oxidation states as a part of organic solutes (Hem, 1985, p. 124). The predominant form of inorganic nitrogen in water is nitrate, from the oxidation of nitrogeneous compounds. Excess nitrate in ground water can originate from fertilizer application, leachate from sewage systems (such as septic tanks, sewage lagoons, or cesspools), or wastes from farm animals. Relatively high concentrations of nitrate (greater than 10 mg/L as nitrogen or greater than 44 mg/L as nitrate) in drinking water can cause methemoglobinemia, or blue-baby syndrome (Lukens, 1987). Dissolved nitrite plus nitrate (as N) concentrations in 20 samples ranged from less than 0.05 to 7.2 mg/L; the median was 0.47 mg/L. Water from municipal well MUW-2 in Monroe had the highest concentration of dissolved nitrite plus nitrate (as N) (7.2 mg/L) and also had the highest dissolved ammonia plus organic nitrogen concentration (0.6 mg/L). A possible source of nitrogen in water from well MUW-2 may be septic systems from private homes near and upgradient from the well.

Phosphorus

Although phosphorus is a common element in igneous rocks and is fairly abundant in soils, concentrations of phosphorus in ground water are generally low. Many inorganic compounds of phosphorus are not soluble in water. Even when phosphorus is available in water, it is efficiently used by biota as a nutrient (Hem, 1985). Manmade sources of phosphorus in ground water include waste disposal through septic tanks and sewage lagoons and applications of chemical fertilizer. In this study, 13 of 20 samples analyzed for dissolved phosphorus and 19 of 20 samples analyzed for dissolved orthophosphate were reported as less than the minimum reporting level. The highest concentrations of dissolved phosphorus and dissolved orthophosphate (both 0.06 mg/L) were detected in water from well CCW-3 in Canaan. At present, the USEPA has not set a drinking-water limit for phosphorus.

Sulfate

Sulfur is widely distributed in reduced form in igneous, sedimentary, and metamorphic rocks as metallic sulfide minerals such as pyrite. Combustion of fuels and smelting of ores is another major source of sulfur, in the form of sulfate (SO_4^{-2}) for natural water. Under anoxic conditions, sulfate can be reduced by anaerobic bacteria to hydrogen sulfide gas (H_2S), which can be detected by smell at concentrations of only a few tenths of a milligram per liter (Hem, 1985). Dissolved sulfate concentrations in 28 samples ranged from 3.8 to 24 mg/L, and the median was 9.9 mg/L. None of the samples exceeded the USEPA's secondary drinking-water limit (250 mg/L) for sulfate (U.S. Environmental Protection Agency, 1992).

Iron and Manganese

Elevated concentrations of iron and manganese were the most common water-quality problems found during this investigation. Iron and manganese are common elements in minerals of bedrock and stratified-drift in New Hampshire and commonly are present in dissolved or colloidal form in ground water in these deposits (Morrissey and Regan, 1987). If present in high amounts in water supplies, iron forms red oxyhydroxide precipitates that stain clothes and plumbing fixtures. Manganese is an undesirable element in water due to its tendency to deposit black oxide stains (Hem, 1985). Water from 6 of the 28 samples collected had dissolved iron concentrations that exceeded the USEPA's secondary drinking-water limit of 300 µg/L, and water from 13 of the 28 samples collected had dissolved manganese concentrations that exceeded the USEPA's secondary drinking-water limit of 50 µg/L (U.S. Environmental Protection Agency, 1992).

The highest iron concentrations were detected in samples from 6 wells—5,600 µg/L at CCW-7, 4,500 µg/L at CCW-6, 2,600 µg/L at DAW-1, 1,600 µg/L at BOW-3, and 1,400 µg/L at CCW-5 and HKW-22. Concentrations of manganese ranged from less than 1 µg/L (CFW-17, ENW-32, AND LYW-4) to 690 µg/L (OSW-2), and the median was 39 µg/L. Elevated concentrations of iron and manganese are not known to be harmful to human health, but they can stain clothing and plumbing fixtures and give water an objectionable taste and color.

Silica

Silicon (Si_4^+) is the second-most abundant element (after oxygen) in the Earth's crust (Hem, 1985). Crystalline silica (SiO_2) as quartz is a major constituent of many igneous and metamorphic rocks and is a common mineral in sediments from stratified-drift aquifers in New Hampshire. However, quartz is highly resistant to dissolution by water so concentrations of silica are generally low in natural waters. Dissolved silica concentrations for 28 samples ranged from 8.8 to 23 mg/L with a median of 13 mg/L. At present, the USEPA has not set a drinking-water limit for silica.

Trace Elements

The term "trace" is commonly used to refer to substances that nearly always are present at concentrations less than 1.0 mg/L in natural waters (Hem, 1985). Water samples collected from USGS observation wells in the Middle Connecticut River Basin and analyzed for fluoride, beryllium, boron, cadmium, cobalt, copper, molybdenum, zinc, aluminum, lead, lithium, and vanadium generally had concentrations that ranged from less than the reporting level to 0.3 mg/L. None of the samples exceeded the USEPA's SMCL for copper of 1,000 µg/L (1991b). Water from municipal well MUW-2 had a dissolved lead concentration equal to 10 µg/L which exceeded the USEPA's SMCL of 0 µg/L (1991b), but the source of lead in this water sample could be sampling or analytical error.

Trace elements that consistently had concentrations above the reporting level, but were less than 1.0 mg/L, were barium (less than 2 to 62 µg/L with a median of 19 µg/L) and strontium (27 to 280 µg L with a median of 81.5 µg/L). None of the samples exceeded the USEPA's MCL drinking-water limit of 2,000 µg/L for barium. Strontium is a fairly common element, replacing calcium or potassium in igneous-rock minerals in minor amounts, especially those typical of granitic rocks (Hem, 1985). The USEPA has not set a drinking-water limit for strontium.

SUMMARY AND CONCLUSIONS

Stratified-drift aquifers in the Middle Connecticut River Basin in west-central New Hampshire underlie 123 mi^2 or 12.5 percent of the study area. The aquifers consist of stratified, sorted, principally coarse-grained sediments (sands and gravels) deposited by glacial meltwater at the time of deglaciation. Characteristics of the sediments that affect ground-water storage and flow are related to the original glaciofluvial or glaciolacustrine depositional environment.

The various types of stratified-drift deposits underlying the study area formed during retreat of the glacial-ice front. Deltas and other lake deposits formed in glacial lakes that filled most of the major river valleys in the study area. Eskers, kames, kame terraces, outwash deposits, and alluvial fans formed during deglaciation in the upland valleys, away from the glacial lakes.

More than 11 mi of seismic-refraction surveys were completed at 95 sites and seismic-reflection data were collected along 1.6 mi of Mascoma Lake shoreline in the study area to provide information on thickness of stratified drift. Saturated thickness of stratified drift in the study area locally exceeded 600 ft in parts of the main valley of the Connecticut River in Orford and Haverhill but was generally less than 100 ft. Layers of saturated silts and clays that lie above or below or interlayer with the coarse-grained aquifer material are included in the saturated thickness. Thickness of the underlying till deposits, where known, are not included as part of the overall thickness.

Water levels at 19 wells screened in stratified drift that underlie the study area fluctuated less than 10 ft during more than 1 year of periodic data collection. Water-table gradients in fine-grained stratified drift commonly exceeded 5 percent in areas of high topographic relief. Water-table gradients in coarse-grained stratified drift in areas of low topographic relief were less than 0.1 percent.

Hydraulic conductivity of the aquifer material was estimated from field descriptions of the grain-size distributions of aquifer-material samples collected during test drilling and from sieve-analysis data. Transmissivity, estimated from aquifer tests at 10 sites in the study area, ranged from 1,400 ft^2/d to 36,800 ft^2/d. A total of 42 stratified-drift aquifer areas underlying 6.2 mi^2 or 0.6 percent of the study area have transmissivities greater than 2,000 ft^2/d.

Currently (1993), ground-water withdrawals from the 42 stratified-drift aquifers in the study area are about 1.5 Mgal/d for municipal and community supply and about 2.1 Mgal/d for industrial supply. Of these 42 aquifers, 7 are used for public supply: Rosebrook aquifer in Carroll, Dalton-Burns Pond aquifer in Whitefield, Mascoma Lake aquifer in Enfield, North Haverhill delta aquifer in Haverhill, Salmon Hole aquifer in Lisbon, Monroe I aquifer in Monroe, and the Orford-Fairlee aquifer in Orford. Ground water from the Whitefield Airport aquifer in Whitefield is used for industrial supply, and the Hanover-CRREL aquifer in Hanover is used both for industrial supply (by CRREL) and for municipal supply by the town of Norwich, Vt.

Water availability was estimated for four aquifers by means of an analytical ground-water-flow model based on the Theis nonequilibium formula and was adjusted by use of image-well theory to account for boundary effects typically associated with stratified-drift aquifers. Water availability during a 180-day period of no recharge was estimated to be 1.9 Mgal/d for the Meadow Brook aquifer; 1.8 Mgal/d for the Ham Branch Brook aquifer; 1.5 Mgal/d for the Salmon Hole aquifer; and 1.4 Mgal/d for the Haverhill-French Pond aquifer. Water availability may exceed these rates during periods of recharge.

Water-quality samples were collected at 26 USGS observation wells, 3 municipal wells, and 1 municipal spring in the study area; known areas of contamination were avoided. Water quality of the stratified-drift aquifers generally is suitable for most uses with the following exceptions: water from an aquifer system in Hanover is reported to have elevated concentrations of trichloroethylene and is currently unsuitable for drinking; water from five wells had elevated concentrations of sodium; water from one municipal well had an elevated concentration of nitrite plus nitrate; water from six wells had elevated concentrations of iron; and almost half of all samples had elevated concentrations of manganese. The USEPA's primary and secondary drinking-water regulations for the sum of dissolved constituents, chloride, nitrite, nitrate, sulfate, barium, copper, fluoride, beryllium, cadmium, zinc, or aluminum were not exceeded in any ground-water sample.

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GLOSSARY

Ablation Till. Loosely consolidated rock debris, formerly carried by glacial ice, that accumulated in places as the surface ice was removed by mass wasting.

Alluvial fan. A gently sloping mass of loose rock debris, shaped like an open fan that is deposited by a stream emanating from the till uplands upon a plain or valley floor. A fan is steepest near the mouth of the mountain valley where its apex points upstream, and it slopes gently outward with gradually decreasing gradient.

Aquifer. A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable materials to yield significant quantities of water to wells and springs. Where water only partly fills an aquifer, the upper surface of the saturated zone is free to rise and decline.

Aquifer boundary. A geologic or hydrologic feature that limits the extent of an aquifer.

Base flow. Streamflow composed largely of ground-water discharge.

Bedrock. Solid rock, often called "ledge," that forms the earth's crust. It may be exposed at the surface but more commonly is buried beneath a few inches to more than 100 ft of unconsolidated deposits.

Colluvium. Loose, heterogeneous, and incoherent mass of soil and rock material deposited by rainwash, sheetwash, or slow continuous downslope creep, usually collecting at the base of gentle slopes or hillsides.

Cone of depression. A depression produced in a water table or other potentiometric surface by the withdrawal of water from an aquifer; in cross section, shaped like an inverted cone with its apex at the pumped well.

Confined aquifer. An aquifer saturated with water and bounded above and below by material having a distinctly lower hydraulic conductivity than the aquifer.

Contact. A plane or irregular surface between two different types or ages of rocks or unconsolidated sediments.

Cubic feet per second (ft^3/s). A unit expressing rate of discharge. One cubic foot per second is equal to the discharge of a stream 1-foot wide and 1-foot deep flowing at an average velocity of 1 foot per second.

Cubic feet per second per square mile [(ft^3/s)/mi^2]. A unit expressing average number of cubic feet of water flowing per second from each square mile of area drained.

Dissolved solids. The residue from a clear sample of water after evaporation and drying for 1 hour at 180°C; consists primarily of dissolved mineral constituents, but may also contain organic matter and water from crystallization.

Drainage area. The area or tract of land, measured in a horizontal plane, that gathers water and contributes it ultimately to some point on a stream channel, lake, reservoir, or other water body.

Drawdown. The lowering of the water table or potentiometric surface caused by the withdrawal of water from an aquifer by pumping; equal to the difference between the static water level and the pumping water level.

Drumlin. A low, smoothly rounded, elongated oval-shaped hill of glacial till deposited under the margin of glacial ice and shaped by its flow; its longer axis is parallel to the direction of movement of the ice.

Effective grain size. The grain size at which 10 percent of the sample consists of smaller grains and 90 percent consists of larger grains.

Esker. A long ridge of sand and gravel that was deposited by water flowing in tunnels within or beneath glacial ice.

First quartile. For a set of measurements arranged in order of magnitude, that value where 25 percent of the measurements are lower in magnitude and 75 percent are higher.

Flow duration (of a stream). The percentage of time during which specified daily discharges are equaled or exceeded within a given time period.

Foreset bed. One of the gently inclined layers of sandy material deposited upon or along an advancing and relatively steep frontal slope.

Fluvial. Pertaining to the flow of liquid water in the natural environment.

Fracture. A break, crack, or opening in bedrock along which water may move.

Glacial lake. A body of water that formed from the melting of glacial ice.

Glaciofluvial. Pertaining to the flow of meltwater streams from glacial ice and to the landforms produced by such streams, including kames, kame terraces, and outwash.

Glaciolacustrine. Pertaining to deposits in glacial lakes, especially deposits such as deltas and varved sediments, composed of material brought by meltwater streams flowing into lakes bordering the glacier.

Gneiss. A coarse-grained metamorphic rock with alternating bands of granular and micaceous minerals.

Granite. A coarse-grained, light-colored, igneous rock.

Gravel. Unconsolidated rock debris composed principally of particles larger than 2 millimeters in diameter.

Ground water. Water in the saturated zone that is under a pressure equal to or greater than atmospheric pressure.

Ground-water discharge. The discharge of water from the saturated zone by (1) natural processes such as ground-water seepage into stream channels and ground-water evapotranspiration and (2) discharge through wells and other manmade structures.

Ground-water divide. A hypothetical line on a water table on each side of which the water table slopes downward in a direction away from the line. In the vertical dimension, a plane across which ground water does not flow.

Ground-water evapotranspiration (GWET). Ground water discharged into the atmosphere in the gaseous state either by direct evaporation from the water table or by the transpiration of plants.

Ground-water recharge. Water that is added to the saturated zone of an aquifer.

Ground-Water Site Inventory (GWSI). A computerized file maintained by the U.S. Geological Survey that contains information about wells and springs collected throughout the United States.

Head, static. The height of the surface of a water column above a standard datum that can be supported by the static pressure of a given point.

Hydraulic conductivity (K). A measure of the ability of a porous medium to transmit a fluid that can be expressed in unit length per unit time. A material has a hydraulic conductivity of 1 foot per day if it will transmit in 1 day, 1 cubic foot of water at the prevailing kinematic viscosity through a 1-foot-square cross section of aquifer, measured at right angles to the direction of flow, under a hydraulic gradient, of 1-foot change in head over 1-foot length of flow path.

Hydraulic gradient. The change in static head per unit of distance in a given direction. If not specified, the direction is generally understood to be that of the maximum rate of decrease in head.

Hydrograph. A graph showing stage (height), flow velocity, or other property of water with respect to time.

Ice-contact deposits. Stratified drift deposited in contact with melting glacial ice. Landforms include eskers, kames, kame terraces, and grounding-line deltas.

Igneous. Descriptive term for rocks or minerals solidified from molten or partially molten material, (that is, from a magma) such as basalt or granite.

Induced infiltration. The process by which water infiltrates an aquifer from an adjacent surface-water body in response to pumping.

Kame. A low mound, knob, hummock, or short, irregular ridge composed of stratified sand and gravel deposited by glacial meltwater; the precise mode of formation is uncertain.

Kame terrace. A terrace-like ridge consisting of stratified sand and gravel formed as a glaciofluvial deposit between a melting glacier or stagnant ice lobe and a higher valley wall, and left standing after the ice retreated.

Kettle. A steep-sided, basin- or bowl-shaped hole or depression, commonly without surface drainage, in stratified-drift deposits; formed by the melting of a large, detached block of stagnant ice left behind by a retreating glacier.

Lodgement till. A firm, compact clay-rich till deposited beneath a moving glacier, containing abraided stones oriented, in general, with their long axes parallel to the direction of ice movement.

Median. The middle value of a set of measurements that are ordered from lowest to highest; 50 percent of the measurements are lower than the median and 50 percent are higher.

Metamorphic. Descriptive term for rocks such as gneiss and schist that have formed, in the solid state, from other rocks.

Micrograms per liter (μg/L). A unit expressing the concentration of chemical constituents in solution as the mass (micrograms) of a constituent per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter.

Milligrams per liter (mg/L). A unit for expressing the concentration of chemical constituents in solution as the mass (milligrams) of a constituent per unit volume (liter) of water.

Morphosequence. A continuum of time-equivalent landforms composed of meltwater deposits, ranging in morphology from collapsed forms caused by melting of ice blocks at the head or upstream parts of outwash to progressively less collapsed forms downstream. A sequence can thus be viewed as a body of stratified drift laid down, layer upon layer, by meltwater at and beyond the margin of a glacier.

Outwash. Stratified deposits chiefly of sand and gravel removed or "washed out" from a glacier by meltwater streams and deposited beyond the margin of a glacier, usually found in flat or gently sloping outwash plains.

Outwash deltas. Deltas formed beyond the margin of the glacier where glacial meltwater entered a water body.

pH. The negative logarithm of the hydrogen ion activity. A pH of 7.0 indicates neutrality; values below 7.0 denote acidity, and those above 7.0 denote alkalinity.

Phi grade scale. A logarithmic transformation of the Wentworth grade scale based on the negative logarithm to the base 2 of the particle diameter, in millimeters.

Phyllite. A fine-grained metamorphic rock, similar to schist, often having a silky luster.

Porosity. The property of a rock or unconsolidated deposit that is a measure of the size and number of internal voids or open spaces; it may be expressed quantitatively as the ratio of the volume of its open spaces to its total volume.

Primary porosity. Porosity that is intrinsic to the sediment or rock matrix.

Runoff. That part of the precipitation that appears in streams. It is the same as streamflow unaffected by artificial diversions, storage, or other human activities in or on the stream channels.

Saturated thickness (of stratified drift). Thickness of stratified drift extending down from the water table to the till or bedrock surface.

Saturated zone. The subsurface zone in which all open (interconnected) spaces are filled with water. Water below the water table, the upper limit of the saturated zone, is under pressure greater than atmospheric.

Schist. A metamorphic rock with subparallel orientation of the visible micaceous minerals that dominate its composition.

Specific capacity (of a well). The rate of discharge of water divided by the corresponding drawdown of the water level in the well; stated in this report in gallons per minute per foot [(gal/min)/ft)].

Specific yield. The ratio of the volume of water that a rock or soil will yield, by gravity drainage, after being saturated to the total volume of the rock or soil.

Storage coefficient. The volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head. In an unconfined aquifer, the storage coefficient is virtually equal to the specific yield.

Stratified drift. Sorted and layered unconsolidated material deposited in meltwater streams flowing from glaciers or settled from suspension in quiet-water bodies fed by meltwater streams.

Third quartile. For a set of measurements arranged in order of magnitude, that value where 75 percent of the measurements are lower in magnitude and 25 percent of the measurements are higher.

Till. A predominantly nonsorted, nonstratified sediment deposited directly by a glacier and composed of boulders, gravel, sand, silt, and clay mixed in various proportions.

Topset bed. One of the nearly horizontal layers of sediments deposited on the top surface of a delta: it truncates or covers the foreset beds.

Transmissivity. The rate at which water is transmitted through a unit width of aquifer under a unit hydraulic gradient. Equal to the average hydraulic conductivity times the saturated thickness.

Unconfined aquifer (water-table aquifer). An aquifer only partly filled with water. In such aquifers, the water table or upper surface of the saturated zone is at atmospheric pressure and is free to rise and fall.

Unconsolidated deposit. A sediment in which the particles are not firmly cemented together, such as sand in contrast to sandstone.

Unsaturated zone. The zone between the water table and the land surface in which the open spaces are not completely filled with water.

Water table. The upper surface of the saturated zone. Water at the water table is at atmospheric pressure.

APPENDIX A

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin, west-central New Hampshire

EXPLANATION

Local site number: First two characters are U.S. Geological Survey town code. Third-character codes are the following: A, auger hole; B, highway bridge boring; S, spring; W, well. The numbers are sequential numbers for each town.

Latitude, longitude: Accurate within 5 seconds.

Elevation: Elevations are expressed in feet above National Geodetic Vertical Datum of 1929. Altitudes given in whole feet are interpolated from U.S. Geological Survey topographic maps and are accurate to plus or minus half the contour interval of the map (10 to 20 feet or 3 meters); altitudes in tenths of feet are determined by instrument.

Depth of hole: Depth drilled, in feet below land-surface datum.

Depth to bottom of casing: Depth to the bottom of casing, in feet below land-surface datum (for wells finished in bedrock, the depth to the bottom of casing can be used to approximate the depth to the bedrock surface).

Depth of well: Depth of well, in feet below land-surface datum.

Depth to refusal: Depth to refusal on bedrock, in till, or on large boulders.

Type of site: TH, test hole; BB, bridge boring; Dug, dug well; GPW, gravel-packed well; X, bedrock well; V, driven well; TW, test well; Spr, spring; O, observation well; Z, well finished in unconsolidated deposits.

Water level: Water level, in feet below land-surface datum; mm-dd-yy, month-day-year.

Use of water: Codes are the following: C, commercial; F, fire; H, domestic; J, cooling; P, public; S, livestock; T, institutional; U, unused; Z, other.

Name of driller or New Hampshire Water Resources Division (NHWRD) driller number: A+B, ; E-H, ; Env. Drill., Environmental Drilling, Inc.; Green MTN, Green Mountain Boring; GSE, Granite State Explorations; Maine T.B., Maine Test Boring; NEWD, ; NHDOT, New Hampshire Department of Transportation; NH Boring Co., New Hampshire Boring; NHWRD, New Hampshire

Remarks:

L, stratigraphic log reported in appendix B.
H, periodic water-level hydrograph shown in appendix D.
CA, chemical analysis reported in appendix F.
gal/min, gallons per minute.
TCE, trichloroethylene.
VOC, volatile organic compounds.
ft/d, feet per day.

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

[**Remarks:** Some of the remarks are well owners' or well drillers' opinions on water quality of water from their wells. --, no data]

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date com-pleted (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			COOS COUNTY							
			Carroll							
CFA 1	441829	0713252	Twin MTN Fish Hatchery	9-16-88	1,300	26	--	--	--	26
CFA 2	441822	0713251	Twin MTN Fish Hatchery	9-16-88	1,319	28	--	--	--	--
CFA 3	441819	0713249	Twin MTN Fish Hatchery	9-16-88	1,329	17	--	--	--	17
CFA 4	441818	0713251	Twin MTN Fish Hatchery	9-19-88	1,329	35	--	--	--	--
CFA 5	441521	0712607	Mt. Washington Develop. Corp.	1972	1,595	88.5	--	--	--	83.5
CFA 6	441520	0712658	Mt. Washington Develop. Corp.	8-24-72	1,568	69	--	--	--	--
CFA 7	441514	0712630	Mt. Washington Develop. Corp.	9-05-72	1,570	67.5	--	--	--	62.5
CFA 8	441502	0712555	Mt. Washington Develop. Corp.	9-15-72	1,590	52.3	--	--	--	52.3
CFA 9	441449	0712558	Mt. Washington Develop. Corp.	9-07-72	1,620	52	--	--	--	52
CFA 10	441453	0712608	Mt. Washington Develop. Corp.	9-12-72	1,620	47	--	--	--	--
CFA 11	441457	0712618	Mt. Washington Develop. Corp.	9-07-72	1,600	57	--	--	--	51
CFA 12	441512	0712607	Mt. Washington Develop. Corp.	8-31-72	1,585	75	--	--	--	70
CFA 13	441556	0712811	Mt. Washington Develop. Corp.	8-16-72	1,555	69.5	--	--	--	69.5
CFA 14	441554	0712809	Mt. Washington Develop. Corp.	8-17-72	1,555	72	--	--	--	72
CFA 15	441553	0712807	Mt. Washington Develop. Corp.	8-21-72	1,555	65	--	--	--	65
CFA 16	441555	0712813	Mt. Washington Develop. Corp.	8-15-72	1,555	43	--	--	--	43
CFA 17	441553	0712811	Mt. Washington Develop. Corp.	8-16-72	1,555	42	--	--	--	42
CFA 18	441551	0712809	Mt. Washington Develop. Corp.	8-13-72	1,555	42	--	--	--	--
CFA 19	441539	0712750	Mt. Washington Develop. Corp.	8-10-72	1,565	31.9	--	--	--	31.9
CFA 20	441502	0712622	Mt. Washington Develop. Corp.	8-01-72	1,575	33.1	--	--	--	33.1
CFA 21	441504	0712624	Mt. Washington Develop. Corp.	8-04-72	1,570	41	--	--	--	--
CFA 22	441506	0712621	Mt. Washington Develop. Corp.	8-08-72	1,575	40.2	--	--	--	40.2
CFA 23	441557	0712803	Mt. Washington Develop. Corp.	8-23-72	1,557	92	--	--	--	92
CFA 24	441549	0712749	Mt. Washington Develop. Corp.	8-24-72	1,565	93.8	--	--	--	93.8
CFA 25	441559	0712823	Brooks, James	7-17-91	1,545	63	--	--	--	63
CFA 26	441622	0713410	Beechhill Campgrounds	7-15-91	1,330	38	--	--	--	--
CFA 27	441553	0713431	Weeks, Alexander	10-30-91	1,410	80	--	--	--	80
CFA 28	441536	0712738	Mt. Washington Develop. Corp.	1972	1,585	21.5	--	--	--	--
CFB 1	441613	0713227	N.H. Dept. of Transportation	7-00-69	1,356.8	25	--	--	--	--
CFB 2	441435	0712551	N.H. Dept. of Transportation	6-00-63	1,631.8	61	--	--	--	--
CFB 3	441557	0712928	N.H. Dept. of Transportation	10-00-72	1,470	--	--	30	--	30
CFB 4	441609	0712834	N.H. Dept. of Transportation	10-00-72	1,555	--	--	50.5	--	--
CFB 5	441610	0712820	N.H. Dept. of Transportation	10-00-72	1,555	--	--	75	--	75
CFB 6	441546	0712727	N.H. Dept. of Transportation	10-00-83	1,571.1	62	--	--	--	62
CFW 1	441802	0713222	Saltman	1949	1,450	--	116	168	--	112
CFW 2	441545	0713400	Paquette, M.	1988	1,417	--	93	100	--	--
CFW 3	441832	0713247	Twin MTN Fish Hatchery	9-14-88	1,270	--	13	16.5	1.25	--
CFW 4	441830	0713247	Twin MTN Fish Hatchery	9-15-88	1,280	18	12	17	1.25	--
CFW 5	441817	0713250	Twin MTN Fish Hatchery	9-20-88	1,329	7	1	7	1.25	--
CFW 6	441544	0712736	Mt. Washington Develop. Corp.	6-06-72	1,565	78	33	43	12	78
CFW 9	441553	0713333	Bolduc, R.	1988	1,410	--	65	70	--	--
CFW 10	441538	0713348	Dumont, Mark	5-09-90	1,455	105	83	83	6	105
CFW 11	441616	0713434	Matz, M.	1985	1,340	--	60	395	--	49
CFW 12	441610	0713233	Foster's Crossroads Sports	11-17-87	1,370	26	14	24	2	--
CFW 13	441611	0713235	Foster's Crossroads Sports	11-17-87	1,365	31	19	29	2	--

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
						COOS COUNTY	
						Carroll	
CFA 1	TH	19.9	9-16-88	U	--	Maher	L
CFA 2	TH	11.3	9-16-88	U	--	Maher	L
CFA 3	TH	4.4	9-19-88	U	--	Maher	L
CFA 4	TH	3.8	9-20-88	U	--	Maher	L
CFA 5	TH	6.5	1972	U	--	Guild	L
CFA 6	TH	5.8	8-30-72	U	--	Guild	L
CFA 7	TH	5.6	9-07-72	U	--	Guild	L
CFA 8	TH	4.17	9-15-72	U	--	Guild	L
CFA 9	TH	6.25	9-12-72	U	--	Guild	L
CFA 10	TH	6	9-12-72	U	--	Guild	L
CFA 11	TH	2.33	9-12-72	U	--	Guild	L
CFA 12	TH	2.5	9-07-72	U	--	Guild	L
CFA 13	TH	9	8-16-72	U	--	Guild	L
CFA 14	TH	7	8-17-72	U	--	Guild	L
CFA 15	TH	14.5	8-21-72	U	--	Guild	L
CFA 16	TH	8	8-15-72	U	--	Guild	L
CFA 17	TH	2	8-16-72	U	--	Guild	L
CFA 18	TH	13.6	8-13-72	U	--	Guild	L
CFA 19	TH	7.5	8-10-72	U	--	Guild	L
CFA 20	TH	4.3	8-01-72	U	--	Guild	L
CFA 21	TH	.4	8-04-72	U	--	Guild	L
CFA 22	TH	1.5	8-08-72	U	--	Guild	L
CFA 23	TH	8.1	8-23-72	U	--	Guild	L
CFA 24	TH	8	8-24-72	U	--	Guild	L
CFA 25	TH	8.8	7-17-91	U	--	USGS	L
CFA 26	TH	3	7-15-91	U	--	USGS	L
CFA 27	TH	10	10-30-91	U	--	USGS	L
CFA 28	TH	--	--	U	--	Guild	L
CFB 1	BB	--	--	U	--	NHDOT	L
CFB 2	BB	--	--	U	--	NHDOT	L
CFB 3	BB	--	--	U	--	--	L
CFB 4	BB	5	10-24-75	U	--	--	L
CFB 5	BB	1	10-00-72	U	--	--	L
CFB 6	BB	9	10-00-83	U	--	NHDOT	L
CFW 1	X	55	1949	H	6	Chapman	--
CFW 2	X	--	--	H	15	Falcon	Drilled in gravel
CFW 3	V	2.1	9-15-88	U	75	Maher	L
CFW 4	V	3.6	9-15-88	U	30	Maher	L
CFW 5	V	--	--	U	--	Maher	L, flowing well
CFW 6	GPW	3.5	9-20-72	P	322	Chapman	L; Aquifer test data reported in table 3
CFW 9	X	--	--	H	15	Falcon	Drilled in gravel
CFW 10	X	--	--	H	15	Falcon	L
CFW 11	X	--	--	H	1.25	Cushing	--
CFW 12	O	19.8	11-18-87	U	--	Tomilla	L; 1 of 4 monitoring wells; petroleum contamination detected here
CFW 13	O	22.4	11-18-87	U	--	Tomilla	L; 1 of 4 monitoring wells; petroleum contamination detected here

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			COOS COUNTY—*Continued*							
			Carroll—*Continued*							
CFW 14	441606	0713239	Hogan's General Store	3-26-86	1,400	--	11.3	21.3	2	--
CFW 15	441731	0713248	Twin MTN Sand and Gravel, Inc.	7-15-91	1,455	92	78.3	81.3	2	92
CFW 16	441615	0713244	Gadbois	7-17-91	1,348	44	37.5	40	2	44
CFW 17	441615	0713244	Gadbois	7-17-91	1,348	16	13	15.5	2	--
CFW 18	441558	0713014	U.S. Forest Service	7-18-91	1,475	64	42	45	2	--
CFW 19	441555	0713203	Carroll, town of	10-28-91	1,420	95	77.5	80	2	95
CFW 20	441522	0713400	Lydon, J.	1986	1,500	--	104	340	--	93
CFW 21	441530	0713404	Lyons, D.	1986	1,480	--	129	600	--	120
CFW 22	441540	0713413	Finlayson, S.	1986	1,460	--	144	180	--	138
CFW 23	441858	0713306	Desousa, A.	1986	1,270	--	40	175	--	30
CFW 24	441638	0713425	Briant, D.	1986	1,385	--	39	155	--	27
CFW 25	441903	0713248	Louering Sr, R.	1987	1,300	--	34	180	--	20
CFW 26	441642	0713420	Werner, G.	1987	1,395	--	39	180	--	30
CFW 27	441533	0713339	Pigeon, C.	1987	1,476	--	59	60	--	--
CFW 28	441524	0713404	Brote, P.	1987	1,500	--	99	120	--	--
CFW 29	441530	0713408	Fabrizio, C.	1987	1,490	--	109	500	--	98
CFW 30	441624	0712822	Weloth, Clara	8-06-92	1,614	--	178	345	6	155
CFW 32	441906	0713345	Materio, S.	1987	1,263	--	19	180	--	10
CFW 33	441905	0713247	Piccerelli, S.	1987	1,300	--	34	280	--	24
CFW 34	441752	0713248	Pike Indus	1987	1,411	--	74	350	--	63
CFW 37	441550	0713216	Carroll, town of	1987	1,437	--	80	81	--	--
CFW 38	441643	0713404	Haskell, R.	1987	1,380	--	47	220	--	42
CFW 39	441617	0713430	Robidoux, W.	1987	1,345	--	82	180	--	73
CFW 40	441640	0713416	Alling, S.	1987	1,378	--	39	405	--	35
CFW 41	441756	0713208	Rogalski, J.	1988	1,526	--	41	240	--	30
CFW 42	441535	0713319	Mycko, W.	1988	1,486	--	149	400	--	135
CFW 43	441556	0712802	Waste-Water Treatment Plant	1988	1,555	--	113	265	--	100
CFW 44	441558	0713216	Carroll, town of	1988	1,400	--	42	61	8	--
CFW 45	441818	0713218	Garneau, L.	1988	1,437	--	83	360	--	69
CFW 47	441620	0713428	Low, P.	1988	1,368	--	59	405	--	41
CFW 48	441625	0712821	Bottomly, J.	1988	1,614	--	74	80	--	--
CFW 49	441625	0712819	Bottomly, J.	1988	1,614	--	244	380	--	233
CFW 51	441312	0712441	Appalachian Mtn Club	1989	1,920	--	159	405	--	110
CFW 53	441542	0713350	Coote, G.	1989	1,437	--	170.5	305	--	156
CFW 55	441641	0713413	Brown, P.	1985	1,370	--	52	200	--	40
CFW 57	441913	0713327	Schwartz, W.	1988	1,200	--	39	280	--	29
CFW 58	441645	0713415	Monihan, A.	1989	1,395	--	29	105	--	20
CFW 60	441557	0713212	Carroll, town of	6-22-93	1,370	45	36	42	2.5	45
CFW 61	441558	0713213	Carroll, town of	6-22-93	1,370	46	36	42	2.5	46
CFW 62	441556	0713224	Carroll, town of	6-23-93	1,398	46	40	46	2.5	--
CFW 63	441601	0713214	Living Water Campground	6-24-93	1,370	60	50	56	2.5	60
CFW 64	441607	0713221	Carroll, town of	6-24-93	1,378	31	24	30	2.5	--
			Dalton							
DAA 1	442251	0713718	--	7-28-81	875	45	--	--	--	--
DAB 1	442246	0713726	N.H. Dept. of Transportation	3-00-75	877.9	41	--	--	--	41
DAB 2	442426	0713755	N.H. Dept. of Transportation	1-00-48	859	16	--	--	--	--
DAW 1	442403	0713747	Rexford, Wendell	7-16-91	856	35	26.5	29.5	2	--
DAW 2	442351	0713743	Rexford, Wendell	7-16-91	856	65	27	30	2	65

Local site No.	Type of site	Water level: Depth (feet)	Water level: Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
				COOS COUNTY—*Continued*			
				Carroll—*Continued*			
CFW 14	O	15.5	3-26-86	U	--	Con-Tec	L; 1 of 3 monitoring wells; petroleum contamination reported here
CFW 15	O	44.6	8-08-91	U	--	USGS	L; CA
CFW 16	O	5.07	8-08-91	-	--	USGS	L; CA
CFW 17	O	4.97	8-08-91	U	15	USGS	CA
CFW 18	O	23.7	8-08-91	U	--	USGS	L; CA
CFW 19	O	25	10-28-91	U	--	USGS	L
CFW 20	X	5	8-01-86	H	40	Cushing	--
CFW 21	X	15	8-08-86	H	20	Cushing	--
CFW 22	X	35	9-23-86	H	8.5	Cushing	--
CFW 23	X	--	--	H	50	Falcon	--
CFW 24	X	--	--	H	6	Falcon	--
CFW 25	X	--	--	H	10	Falcon	--
CFW 26	X	--	--	H	3	Falcon	--
CFW 27	Z	--	--	H	20	Falcon	Drilled in gravel
CFW 28	Z	--	--	H	50	Falcon	L; drilled in gravel
CFW 29	X	--	--	H	.5	Cushing	--
CFW 30	X	--	--	H	6	NHWRD 381	--
CFW 32	X	--	--	H	5	Falcon	--
CFW 33	X	--	--	H	3	Falcon	--
CFW 34	X	--	--	H	4	NHWRD 192	--
CFW 37	Z	--	--	U	--	Cushing	Drilled in gravel
CFW 38	X	--	--	H	5	Cushing	--
CFW 39	X	--	--	H	10	Falcon	--
CFW 40	X	--	--	H	.5	Falcon	--
CFW 41	X	--	--	H	50	Cushing	--
CFW 42	X	--	--	H	1	Cushing	--
CFW 43	X	--	--	-	30	NHWRD 381	--
CFW 44	TW	41	9-09-88	U	150	Cushing	Two wells nested here
CFW 45	X	--	--	H	12	Cushing	--
CFW 47	X	--	--	H	20	Falcon	--
CFW 48	Z	--	--	H	6	Falcon	Drilled in gravel
CFW 49	X	--	--	H	1	Falcon	--
CFW 51	X	--	--	H	25	NHWRD 381	--
CFW 53	X	--	--	H	30	Falcon	L
CFW 55	X	--	--	H	3.5	Cushing	--
CFW 57	X	--	--	H	5	Falcon	--
CFW 58	X	--	--	H	20	Falcon	--
CFW 60	TW	6.6	6-22-93	U	100	Maher	L; new 18-in. production well installed December 1993; will become new town well for Carroll
CFW 61	O	--	--	U	--	Maher	L; located 80 feet from CFW-60
CFW 62	O	17.1	6-23-93	U	50	Maher	L
CFW 63	O	6.8	6-24-93	U	--	Maher	L
CFW 64	O	16	6-24-93	U	--	Maher	L; drilled through boulders at 5, 8, and 10 feet
				Dalton			
DAA 1	TH	--	--	U	--	--	L
DAB 1	BB	6	3-00-75	U	--	NHDOT	L
DAB 2	BB	--	--	U	--	NHDOT	L
DAW 1	O	5.12	8-08-91	U	2.5	USGS	L; CA
DAW 2	O	4.61	8-08-91	U	--	USGS	L; CA

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
COOS COUNTY—*Continued*										
Dalton—*Continued*										
DAW 3	442434	0714239	Murray Robert	1-06-91	895	--	132	305	6	120
DAW 7	442435	0714326	Bartlett, F.	1984	856	--	--	805	--	120
DAW 14	442534	0713917	Rexford, A.	1985	866	--	174	575	--	170
DAW 17	442539	0714011	Fales, J.	1986	846	--	79	95	--	--
DAW 21	442335	0713717	Grimard, R.	1986	900	--	79	200	--	74
DAW 23	442440	0713823	Forbush, H.	1986	890	--	119	225	--	110
DAW 32	442454	0714141	Smith, K.	1987	915	--	119	260	--	22
DAW 33	442449	0714136	& N. Bean, K.	1987	940	--	104	240	--	92
DAW 34	442442	0713805	Kuo, A.	1987	890	--	163	240	--	150
DAW 36	442535	0713910	Rexford, K.	1987	870	--	134	205	--	95
DAW 37	442503	0713916	McKay, J.	1987	925	--	94	305	--	85
DAW 38	442540	0714007	Brindle, E.	1988	846	--	77	80	--	--
DAW 43	442513	0713929	Fairbrother, B.	1988	905	--	110	290	--	40
DAW 50	442517	0714108	Vervier	1988	905	--	196	285	--	140
DAW 52	442438	0713831	Frost, B.	1988	890	--	84	185	--	26
DAW 53	442507	0713831	Quellett, D.	1988	890	--	39	673	--	24
DAW 54	442539	0713914	Fielding, H.	1989	876	--	109	340	--	97
DAW 62	442523	0713937	Peterson, G.	1989	860	--	30.5	660	--	15
DAW 65	442306	0713744	Forst, P.	1989	1,010	--	69	225	--	56
DAW 68	442453	0713809	Depina, B.	1989	945	--	159	500	--	148
Jefferson										
JEW 1	442100	0713108	Whitefield, town of	1932	1437	--	43	305	8	--
JEW 2	442115	0713120	Whitefield, town of	1900	1310	--	--	600	--	--
JEW 3	442110	0713117	Whitefield, town of	1900	1348	--	--	400	--	--
JEW 4	442110	0713117	Whitefield, town of	1900	1348	--	--	650	--	--
JEW 5	442110	0713117	Whitefield, town of	1900	1348	--	--	600	--	--
Whitefield										
WLA 1	442226	0713716	--	7-23-81	886	66	--	--	--	66
WLA 2	442213	0713442	--	7-21-81	1,024	75	--	--	--	--
WLA 3	442149	0713321	--	7-23-81	1,034	70	--	--	--	--
WLA 4	442206	0713556	--	7-27-81	1,100	17.5	--	--	--	--
WLA 5	442151	0713753	Whitefield, town of	1990	994	192	--	--	--	172
WLB 1	442222	0713645	N.H. Dept. of Transportation	1-00-38	937.5	13	--	--	--	13
WLB 2	442208	0713618	Whitefield, town of	11-14-66	985	7.4	--	--	--	7.4
WLB 3	442242	0713703	Whitefield, town of	11-15-66	906	8	--	--	--	--
WLB 5	442215	0713613	Whitefield, town of	11-14-66	1,014	6.6	--	--	--	6.6
WLB 6	442157	0713711	N.H. Dept. of Transportation	1900	948.7	10	--	--	--	10
WLW 1	442153	0713325	--	7-21-81	1,034	49	--	49	--	49
WLW 2	442135	0713804	--	1981	1,014	150	--	150	--	150
WLW 3	442133	0713336	--	12-14-81	1,090	400	--	400	--	23
WLW 5	442124	0713828	Anderson, G.	1986	1,043	--	134	230	--	130
WLW 6	442149	0713735	Whitefield, town of	1-23-91	990	--	65	80	8	89
WLW 7	442153	0713731	Whitefield, town of	12-04-90	980	23	14	20	2.5	23
WLW 8	442147	0713738	Whitefield, town of	1991	990	84	--	76	--	76
WLW 9	442134	0713809	Gannon, George	7-10-90	1,014	--	128	130	6	--
WLW 10	442215	0713348	Greenwood, Dan	7-06-90	1,043	--	147	220	6	120
WLW 11	442144	0713745	Whitefield, town of	10-26-90	995	--	81	81	6	--

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
				COOS COUNTY—*Continued*			
				Dalton—*Continued*			
DAW 3	X	--	--	H	1	Falcon	L
DAW 7	X	--	--	H	1.2	NHWRD 237	
DAW 14	X	--	--	H	3	Cushing	L
DAW 17	Z	8	4-11-86	H	10	NHWRD 104	L; drilled in gravel
DAW 21	X	--	--	H	6	Falcon	--
DAW 23	X	--	--	H	1.5	Falcon	--
DAW 32	X	--	--	H	3.5	Cushing	--
DAW 33	X	--	--	H	2.5	Cushing	--
DAW 34	X	--	--	H	8	Cushing	--
DAW 36	X	--	--	H	3	Falcon	--
DAW 37	X	--	--	H	1	Falcon	--
DAW 38	Z	--	--	H	2	Falcon	L; drilled in gravel
DAW 43	X	--	--	H	8	NHWRD 381	--
DAW 50	X	--	--	H	10	Falcon	--
DAW 52	X	--	--	H	15	Falcon	--
DAW 53	X	--	--	H	--	Falcon	--
DAW 54	X	--	--	H	1.5	Cushing	L
DAW 62	X	100	8-30-89	H	7.5	Falcon	L
DAW 65	X	--	--	H	3	Falcon	--
DAW 68	X	--	--	H	1.5	Cushing	--
				Jefferson			
JEW 1	X	--	--	P	125	--	--
JEW 2	X	--	--	P	50	Guilford	--
JEW 3	X	--	--	P	100	Guilford	--
JEW 4	X	--	--	P	12	Guilford	--
JEW 5	X	--	--	P	23	Guilford	--
				Whitefield			
WLA 1	TH	--	--	U	--	--	L
WLA 2	TH	--	--	U	--	--	L
WLA 3	TH	--	--	U	--	--	L
WLA 4	TH	--	--	U	--	--	--
WLA 5	TH	--	--	U	--	Maher	L
WLB 1	BB	--	--	U	--	NHDOT	L
WLB 2	BB	--	--	U	--	NE Soil	L
WLB 3	BB	--	--	U	--	NE Soil	L
WLB 5	BB	--	--	U	--	NE Soil	L
WLB 6	BB	--	--	U	--	NHDOT	L
WLW 1	O	0.3	7-21-81	U	--	--	L
WLW 2	O	--	--	H	--	--	L
WLW 3	X	3	12-14-81	P	--	--	L; 1 of 3 bedrock wells nested here
WLW 5	X	--	--	H	10	Falcon	--
WLW 6	GPW	10.5	2-13-91	P	285	Maher	L; aquifer-test results reported in table 3. Water reported to be good quality except for elevated sodium concentration
WLW 7	O	3.32	2-13-91	U	--	Maher	L
WLW 8	O	6.18	2-13-91	U	--	Maher	L
WLW 9	Z	15	7-10-90	H	50	Falcon	L; drilled in gravel
WLW 10	X	--	--	H	7	Cushing	L
WLW 11	--	8	10-26-90	U	100	A+W	L

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
				COOS COUNTY—*Continued*						
				Whitefield—*Continued*						
WLW 12	442146	0713741	Whitefield, town of	10-29-90	995	--	75	75	6	--
WLW 16	442132	0713757	Poplar Cabins	11-06-50	1,060	--	101	303	--	100
WLW 19	442233	0713658	Mellen	6-22-54	930	--	30	120	--	23
WLW 22	442419	0713253	Whitefield, town of	1900	1,309	--	--	305	--	--
WLW 23	442419	0713253	Whitefield, town of	1990	1,309	--	--	640	--	--
WLW 24	442430	0713240	Whitefield, town of	1978	1,358	--	--	300	--	--
WLW 25	442430	0713240	Whitefield, town of	1978	1,358	--	--	640	--	--
WLW 26	442128	0713246	Thermo Electron Energy Systems	11-24-87	1,073	--	41.5	71.5	12	--
WLW 27	442235	0713720	Nuroco	8-23-85	876	--	4	9	1.5	9
WLW 28	442238	0713721	Nuroco	8-23-85	876	--	6	11	1.5	11
WLW 29	442241	0713721	Nuroco	8-23-85	876	--	2	7	1.5	7
WLW 30	442237	0713715	Nuroco	8-23-85	886	20	6	16	1.5	--
WLW 37	442206	0713743	Spigel, S.	1985	994	--	74	75	--	--
WLW 39	442122	0713805	Robson, J.	1985	1,083	--	199	705	--	175
WLW 40	442124	0713824	McCabe, E.	1986	1,024	--	114	133	--	--
WLW 42	442127	0713828	Gaudreault, A.	1986	1,083	--	159	375	--	154
WLW 43	442123	0713837	Rohm, J.	1986	1,049	--	94	350	--	79
WLW 46	442223	0713451	Pilotte, R.	1986	1,063	--	174	340	--	168
WLW 47	442042	0713836	Underhill	1987	1,086	--	82	355	--	74
WLW 57	442157	0713807	Dupont, J.	1987	1,043	--	44	130	--	35
WLW 58	442212	0713702	Elmer, H.	1987	1,024	--	204	455	--	170
WLW 64	442146	0713628	Curran, P.	1987	1,122	--	47	400	--	36
WLW 65	442126	0713809	Martin, M.	1987	1,043	--	144	150	--	--
WLW 67	442131	0713827	Routhier, S.	1988	1,083	--	141	400	--	126
WLW 70	442147	0713811	Lord, W.	1988	1,024	--	30	160	--	13
WLW 75	442131	0713631	Austin, E.	1988	1,073	--	40	365	--	29
WLW 83	442152	0713331	Healy, T.	1989	1,083	--	164	565	--	140
WLW 84	442123	0713809	Mack, G.	1989	1,049	--	185	500	--	174
				GRAFTON COUNTY						
				Bath						
BDA 1	440903	0715836	Woodsville Water and Light Dept.	2-05-88	500	7	--	--	--	7
BDA 2	440925	0720108	Woodsville Water and Light Dept.	2-24-88	450	19	--	--	--	19
BDA 3	440922	0720106	--	2-22-88	450	14	--	--	--	14
BDA 4	440918	0720101	Woodsville Water and Light Dept.	2-23-88	455	14	--	--	--	14
BDA 5	440915	0720059	Woodsville Water and Light Dept.	2-23-88	450	52.5	--	--	--	52.5
BDA 6	440929	0720130	Woodsville Water and Light Dept.	2-22-88	430	28	--	--	--	28
BDA 7	440928	0720137	Woodsville Water and Light Dept.	2-22-88	430	7	--	--	--	7
BDA 8	440912	0720136	Woodsville Water and Light Dept.	12-02-87	430	117	--	--	--	--
BDA 9	440916	0720117	Woodsville Water and Light Dept.	12-03-87	430	24	--	--	--	--
BDA 10	440748	0715638	Woodsville Water and Light Dept.	12-01-87	710	11	--	--	--	--
BDA 11	440744	0715635	Woodsville Water and Light Dept.	12-01-87	720	8	--	--	--	--
BDA 12	440908	0720120	Woodsville Water and Light Dept.	5-08-74	440	84	--	--	--	--
BDA 15	441156	0715718	Geneen, Harold	10-03-90	530	79	--	--	--	--
BDA 16	441207	0715701	Geneen, Harold	10-04-90	530	29	--	--	--	--
BDA 17	441147	0715740	Ellyson, Inc.	10-04-90	530	22	--	--	--	--

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
				COOS COUNTY—*Continued*			
				Whitefield—*Continued*			
WLW 12	--	12	10-29-90	U	60	A+W	L
WLW 16	X	75	11-06-50	H	9	A+B	--
WLW 19	X	20	6-22-54	H	5	A+B	--
WLW 22	X	--	--	P	23	--	WLW-22 and WLW-23 are nested together
WLW 23	X	--	--	P	30	--	--
WLW 24	X	--	--	P	20	--	Uses 2 springs as auxiliary supply. WLW-24 and WLW-25 are nested together
WLW 25	X	--	--	P	10	--	
WLW 26	GPW	--	--	J	75	Layne	L
WLW 27	O	4.5	8-23-85	U	--	East Coast	L; petroleum contamination reported here
WLW 28	O	6.8	8-24-85	U	--	East Coast	L; petroleum contamination reported here
WLW 29	O	4	8-24-85	U	--	East Coast	L; petroleum contamination reported here
WLW 30	O	6.5	8-24-85	U	--	East Coast	L
WLW 37	Z	--	--	H	50	Cushing	--
WLW 39	X	20	11-06-85	H	1	NHWRD 237	--
WLW 40	X	--	--	H	20	Falcon	--
WLW 42	X	--	--	H	1	Falcon	--
WLW 43	X	--	--	H	1.5	Falcon	--
WLW 46	X	--	--	H	.88	Cushing	--
WLW 47	X	--	--	H	35	Falcon	--
WLW 57	X	--	--	H	25	Falcon	--
WLW 58	X	--	--	H	15	Falcon	--
WLW 64	X	--	--	H	1	Cushing	--
WLW 65	X	--	--	H	--	Falcon	--
WLW 67	X	70	7-19-88	H	5	NHWRD 192	--
WLW 70	X	--	--	H	4	Cushing	--
WLW 75	X	--	--	H	1	Falcon	--
WLW 83	X	--	--	H	2.5	NHWRD 381	--
WLW 84	X	--	--	H	.5	Cushing	--
				GRAFTON COUNTY			
				Bath			
BDA 1	TH	--	--	U	--	--	L
BDA 2	TH	--	--	U	--	--	L
BDA 3	TH	2.6	2-22-88	U	--	--	L
BDA 4	TH	--	--	U	--	--	L
BDA 5	TH	--	--	U	--	--	L
BDA 6	TH	1.8	2-22-88	U	--	--	L
BDA 7	TH	2.2	2-22-88	U	--	--	L
BDA 8	TH	1.4	12-02-87	U	--	Chapman	L
BDA 9	TH	4.3	12-03-87	U	--	Chapman	L
BDA 10	TH	3.5	12-01-87	U	--	Chapman	L
BDA 11	TH	3.5	12-01-87	U	--	Chapman	L
BDA 12	TH	2	5-08-74	U	--	Maher	L
BDA 15	TH	5	10-03-90	U	--	USGS	L
BDA 16	TH	--	--	U	--	USGS	L
BDA 17	TH	--	--	U	--	USGS	L

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Bath—*Continued*							
BDA 18	441143	0715729	Ellyson, Inc.	10-04-90	530	29	--	--	--	--
BDW 1	440905	0720114	Woodsville Water and Light Dept.	5-07-74	440	41	--	35	--	41
BDW 2	440855	0720042	Burton, Steven	10-30-58	460	--	21	125	--	13
BDW 3	440752	0715714	Griffen, Herman	11-27-59	710	--	84	325	--	74
BDW 5	440901	0720124	Woodsville Water and Light Dept.	5-09-74	440	--	--	35	--	--
BDW 6	440903	0720120	Woodsville Water and Light Dept.	5-10-74	440	--	--	35	--	--
BDW 8	440850	0715837	--	--	700	--	--	10.1	36	--
BDW 9	440811	0715719	Sandmann, K.	7-02-90	750	--	--	180	--	65
BDW 10	441237	0720304	--	--	530	--	--	8.5	36	--
BDW 11	441145	0720323	--	--	515	--	--	10.6	36	--
BDW 12	441143	0720322	--	--	515	--	--	9.8	36	--
BDW 13	441015	0720249	Battes, Evelyn	4-01-57	470	--	126	300	--	116
BDW 14	440750	0715634	Woodsville Water and Light Dept.	10-22-87	710	50	18.5	38.5	6	41
BDW 15	441204	0715616	--	--	570	--	--	11.7	36	--
BDW 16	440715	0715610	Preskins, R.	1985	890	--	100	260	--	91
BDW 17	440807	0715737	Corda, J.	1985	630	--	--	8	--	--
BDW 18	440807	0715652	Wyman	--	770	--	--	16.2	36	--
BDW 19	440803	0715657	--	--	750	--	--	10.6	--	--
BDW 20	440744	0715658	Richardson, S.	1985	780	--	20	160	--	6
BDW 21	441029	0715926	Minot	1965	700	--	--	6.1	36	--
BDW 22	440815	0715649	Duncan, F.	1985	800	--	37	145	--	28
BDW 25	440827	0715751	Springstein, C.	1986	670	--	55	330	--	43
BDW 26	440724	0715603	Prishwalko, H.	1986	880	--	179	450	--	165
BDW 27	440724	0715600	Hall, G.	1986	900	--	159	415	--	150
BDW 29	440750	0715624	Morgan, B.	1987	730	--	29	130	--	21
BDW 33	440722	0715553	Costello, L.	1987	900	--	129	280	--	115
BDW 34	440747	0715622	McGovern, H.	1987	740	--	29	180	--	19
BDW 37	440931	0720212	Downer, G.	1987	480	--	69	390	--	60
BDW 40	440917	0715945	Dickenson, R.	1988	620	--	82	205	--	75
BDW 44	440801	0715713	Starer, R.	1988	660	--	114	180	--	100
BDW 45	440839	0715740	Chalifoux, C.	1988	750	--	20	140	--	6
BDW 47	440819	0715724	Such, P.	1988	760	--	69	180	--	40
BDW 48	440700	0715454	Catania	1988	900	--	41	80	--	30
			Benton							
BOB 1	440036	0715622	N.H. Dept. of Transportation	1960	823	60	--	--	--	60
BOW 3	440055	0715652	Cadreact, Ed	6-14-90	810	50	29.5	31	2	50
BOW 9	440032	0715615	Steckey	1987	820	--	49	605	--	35
			Bethlehem							
BSA 1	441540	0713736	Sanco Landfill	6-09-76	1,327	30	--	--	--	--
BSA 2	441543	0713736	Sanco Landfill	6-19-76	1,330	33	--	--	--	--
BSA 3	441543	0713738	Sanco Inc	1987	1,370	--	--	270	--	259
BSA 4	441608	0713804	Tucker, Dan	10-29-91	1,210	20	--	--	--	--
BSA 5	441508	0713757	U.S. Forest Sevice	10-29-91	1,330	35	--	--	--	35
BSA 6	441501	0713815	U.S. Forest Sevice	10-30-91	1,320	18	--	--	--	--
BSA 7	441531	0713756	Sanco Inc	1987	1,360	--	--	130	--	114
BSA 8	441848	0714317	Person's Concrete	11-01-91	915	13	--	--	--	--
BSB 1	441618	0713755	N.H. Dept. of Transportation	9-00-80	1,188.8	40	--	--	--	--
BSW 1	441625	0713823	U.S. Geological Survey	1-01-66	1,195	--	25.5	28	1.25	--

Local site No.	Type of site	Water level: Depth (feet)	Water level: Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
GRAFTON COUNTY—*Continued*							
Bath—*Continued*							
BDA 18	TH	--	--	U	--	USGS	L
BDW 1	O	5	5-07-74	U	30	Maher	L
BDW 2	X	18	10-30-58	H	8	A+B	--
BDW 3	X	--	--	H	1	Tasker	--
BDW 5	O	5.5	5-09-74	U	37	Maher	L
BDW 6	O	5.5	5-10-74	U	--	Maher	L
BDW 8	Dug	6.92	8-07-91	H	--	--	Well is spring fed
BDW 9	X	--	--	H	6	Cushing	--
BDW 10	Dug	.90	8-06-91	S	--	--	Water reportedly not suited for human consumption
BDW 11	Dug	6	8-06-91	H	--	--	--
BDW 12	Dug	3.18	8-06-91	H	--	--	--
BDW 13	X	--	--	H	1	Tasker	--
BDW 14	O	8	10-22-87	U	15	Falcon	L
BDW 15	Dug	7.45	7-30-91	H	--	--	--
BDW 16	X	--	--	H	60	A+W	--
BDW 17	Dug	3	7-20-85	H	--	NHWRD 671	L
BDW 18	Dug	13.6	8-07-91	H	--	--	--
BDW 19	Dug	4	8-07-91	H	--	--	--
BDW 20	X	--	--	H	20	Cushing	--
BDW 21	Dug	2.75	8-07-91	S	--	--	--
BDW 22	X	--	--	H	10	NHWRD 381	--
BDW 25	X	--	--	H	15	A+W	--
BDW 26	X	--	--	H	5	Falcon	--
BDW 27	X	--	--	H	100	Falcon	L
BDW 29	X	--	--	H	10	Falcon	--
BDW 33	X	--	--	H	5	Falcon	L
BDW 34	X	--	--	H	30	Falcon	--
BDW 37	X	--	--	H	6	A+W	--
BDW 40	X	--	--	H	5	Falcon	--
BDW 44	X	--	--	H	4	Cushing	L
BDW 45	X	--	--	H	15	Cushing	--
BDW 47	X	--	--	H	5	Falcon	--
BDW 48	X	--	--	H	20	Falcon	--
Benton							
BOB 1	BB	--	--	U	--	NHDOT	L
BOW 3	O	3.98	9-03-90	U	2	USGS	L; H; CA
BOW 9	X	20	8-06-87	H	1.75	NHWRD 173	--
Bethlehem							
BSA 1	TH	19	6-09-76	U	--	--	L
BSA 2	TH	--	--	U	--	--	L
BSA 3	TH	--	--	U	--	Falcon	L
BSA 4	TH	3	10-29-91	U	--	USGS	L
BSA 5	TH	3	10-29-91	U	--	USGS	L
BSA 6	TH	3	10-30-91	U	--	USGS	L
BSA 7	TH	--	--	U	--	Falcon	L
BSA 8	TH	--	--	U	--	USGS	L
BSB 1	BB	--	--	U	--	NHDOT	L
BSW 1	O	12	11-01-66	U	--	USGS	L

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Bethlehem—*Continued*							
BSW 2	441805	0713935	--	1900	1,100	--	13	13	30	--
BSW 3	441621	0713828	Littleton, town of	1-20-54	1,220	140	38	54	8	140
BSW 4	441545	0713736	Sanco Landfill	9-04-84	1,347	--	--	71.5	--	--
BSW 5	441542	0713732	Sanco Landfill	9-06-84	1,331.6	--	--	61	--	--
BSW 6	441544	0713733	Sanco Landfill	9-10-84	1,333.5	--	--	47	--	--
BSW 7	441538	0713739	Sanco Landfill	9-12-84	1,326.6	--	--	34	--	34
BSW 8	441531	0713757	Sanco Landfill	8-31-87	1,346.7	--	33	43	1.5	--
BSW 9	441534	0713800	Sanco Landfill	9-11-87	1,332.8	40	23.1	39.1	1.5	--
BSW 10	441534	0713755	Sanco Landfill	9-15-87	1,351.6	51	40	50	1.5	--
BSW 11	441534	0713757	Sanco Landfill	9-15-87	1,343.7	42	30.9	40.9	1.5	--
BSW 12	441539	0713751	Sanco Landfill	1-13-87	1,318.7	87.5	81.1	86.1	.75	--
BSW 13	441642	0713818	Schafer	--	1,160	--	--	9.3	36	--
BSW 22	441848	0714026	Foote, Robert	11-18-55	1,040	--	68	180	--	58
BSW 23	441532	0713746	Sanco Landfill	1-07-86	1,340.5	--	--	45	--	--
BSW 24	441536	0713754	Sanco Landfill	1-14-86	1,322.6	83	--	78.8	--	--
BSW 25	441537	0713745	Sanco Landfill	1-09-86	1,333.4	--	--	41	--	--
BSW 26	441538	0713742	Sanco Landfill	1-21-86	1,330.5	50	--	35.9	--	--
BSW 27	441539	0713748	Sanco Landfill	1-10-86	1,323.6	36.5	--	35	--	--
BSW 28	441535	0713741	Sanco Landfill	1-22-86	1,317.9	--	--	15	--	--
BSW 29	441937	0714105	Pine Tree Power Co.	12-19-84	1,003.9	--	90	600	6	78
BSW 30	441936	0714049	Pine Tree Power Co.	12-28-84	1,053	--	69	200	6	73
BSW 31	441937	0714108	Pine Tree Power Co.	12-21-84	980	--	88	450	6	69
BSW 32	441937	0714108	Pine Tree Power Co.	12-28-84	980	--	82	450	6	73
BSW 33	441940	0714055	Pine Tree Power Co.	3-12-85	1,053	76.5	46	75	10	64.5
BSW 34	441945	0714110	Pine Tree Power Co.	6-22-86	980	--	77	790	8	58
BSW 35	441936	0714115	Littleton Lumber Co	1988	975	--	35	36	--	--
BSW 37	441748	0714402	Brown, C.	1987	975	--	54	180	--	42
BSW 38	441736	0714411	Faddan, J.	1987	945	--	94	280	--	90
BSW 39	441956	0714109	Oneal, J.	1984	1,043	--	--	260	--	90
BSW 40	441817	0713959	Littleton, town of	3-26-87	1,055	--	150	500	7	130
BSW 41	441922	0714107	Littleton, town of	3-07-87	975	--	136	500	7	126
BSW 43	441846	0714006	Dixon, Harry	3-18-87	1,050	--	80	80	6	--
BSW 44	441846	0714003	Teehan	1-22-86	1,065	--	61.4	73	6	--
BSW 46	441834	0713956	Holden Co.	9-30-87	1,060	--	35	35	6	--
BSW 47	441842	0714001	Holden Co.	10-10-86	1,065	--	111	111	6	--
BSW 48	441841	0713955	Holden, Inc.	9-30-86	1,090	--	59	60	6	--
BSW 49	441845	0714005	Holden, Inc.	10-10-86	1,060	--	101	160	6	150
BSW 50	441842	0713947	Altman, Mark	6-12-86	1,140	--	170	275	6	156
BSW 51	441841	0713935	Drechnowicz, Edward	6-12-87	1,200	--	60	60	6	--
BSW 52	441514	0713331	Rollins	1987	1,565	--	59	60	--	--
BSW 53	441833	0713952	Holden, Inc.	6-15-87	1,080	--	100	100	6	--
BSW 54	441826	0714007	Wedick, John	10-08-86	1,065	--	150	560	6	135
BSW 55	441748	0713941	MacDonald, Elmer	10-09-86	1,075	--	52	275	6	38
BSW 56	441739	0713918	Haines, Alan	5-09-86	1,140	--	130	370	6	120
BSW 57	441742	0713924	Stone, Wayne	2-05-87	1,150	--	130	505	6	120

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
					GRAFTON COUNTY—*Continued*		
					Bethlehem—*Continued*		
BSW 2	Dug	9.3	11-28-66	U	--	--	L; abandoned because of salt contamination
BSW 3	TW	--	--	U	380	Chapman	L; 11-hr aquifer test during 7/6/54 - 7/7/54; well reportedly destroyed
BSW 4	O	45	9-17-84	U	--	Maine T.B.	L
BSW 5	O	26.8	9-17-84	U	--	Maine T.B.	L
BSW 6	O	29.8	9-17-84	U	--	Maine T.B.	L
BSW 7	O	15.9	9-17-84	U	--	Maine T.B.	L
BSW 8	O	35.6	9-17-87	U	--	Maine T.B.	L
BSW 9	O	24.3	9-17-87	U	--	Maine T.B.	L
BSW 10	O	42.8	9-17-87	U	--	Maine T.B.	L
BSW 11	O	35.1	9-21-87	U	--	Maine T.B.	L
BSW 12	O	18.3	1-13-87	U	--	Maine T.B.	L; three wells are nested here
BSW 13	Dug	8.31	8-12-91	H	--	--	--
BSW 22	O	--	--	H	--	Tasker	--
BSW 23	O	31.3	2-04-86	U	--	Maine T.B.	L
BSW 24	O	13.8	2-04-86	U	--	Maine T.B.	L
BSW 25	O	26.1	2-04-86	U	--	Maine T.B.	L
BSW 26	O	23.6	2-04-86	U	--	Maine T.B.	L
BSW 27	O	21.4	2-04-86	U	--	Maine T.B.	L
BSW 28	O	8.7	2-04-86	U	--	Maine T.B.	L
BSW 29	X	--	--	U	30	NEWD	L
BSW 30	X	6	1985	C	150	NEWD	L
BSW 31	X	--	--	C	1	NEWD	L. BSW-31 and BSW-32 are nested together
BSW 32	X	6	1985	C	25	NEWD	L
BSW 33	X	4	3-12-85	J	50	Cushing	L
BSW 34	X	30	6-22-86	C	75	Cushing	--
BSW 35	Z	--	--	H	35	NHWRD 381	Drilled in gravel
BSW 37	X	--	--	H	4	Falcon	--
BSW 38	X	--	--	H	2	Falcon	--
BSW 39	X	10	10-13-84	H	8	NHWRD 88	L
BSW 40	TW	--	--	U	2	Cushing	L
BSW 41	X	--	--	U	8	Cushing	L
BSW 43	Z	--	--	H	30	Falcon	L
BSW 44	Z	--	--	H	15	Falcon	L
BSW 46	Z	--	--	H	25	Falcon	L
BSW 47	Z	--	--	H	30	Falcon	L
BSW 48	Z	--	--	H	9	Falcon	L
BSW 49	X	--	--	H	15	Falcon	L
BSW 50	X	--	--	H	1	Falcon	L
BSW 51	Z	--	--	H	10	Falcon	L
BSW 52	Z	--	--	H	10	Falcon	L; drilled in gravel
BSW 53	Z	--	--	H	20	Falcon	L
BSW 54	X	40	10-10-86	H	4	Cushing	--
BSW 55	X	--	--	H	6	Falcon	--
BSW 56	X	80	5-10-86	H	50	Cushing	--
BSW 57	X	--	--	H	3	Falcon	L

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Bethlehem—*Continued*							
BSW 58	441728	0713952	Thomas, John A.	4-15-88	1,309	--	300	300	6	--
BSW 59	441725	0713954	Village of Maplewood	10-22-87	1,329	--	300	300	6	--
BSW 60	441729	0713957	Cryans, David	10-08-86	1,329	--	320	325	6	310
BSW 62	441729	0713846	Duffy, Charles	3-07-85	1,180	--	84	620	6	70
BSW 63	441727	0713836	Sawicki, Stan	10-30-87	1,200	--	140	300	6	120
BSW 64	441614	0713814	Grautski, Beverly	9-14-87	1,210	--	75	505	6	52
BSW 65	441544	0713808	Henderson, Ross	6-23-88	1,305	--	120	305	6	101
BSW 67	441606	0713653	Matz, Michael	9-30-85	1,350	--	61	395	6	49
BSW 71	441818	0714100	Procacina, Robert	6-09-88	1,250	--	124	605	6	115
BSW 72	441827	0714106	Boedecker, Heidi	10-01-86	1,299	--	65	550	6	58
BSW 78	441845	0713928	Gifford, R.	1985	1,220	--	78	145	--	70
BSW 80	441840	0713953	Prunier, G.	1986	1,100	--	60	63	--	--
BSW 83	441743	0713925	Stone, D.	1987	1,140	--	119	305	--	110
BSW 84	441549	0713734	Sanco Landfill	12-17-86	1,333.7	76.5	72.7	74.7	.75	--
BSW 85	441535	0713733	Sanco Landfill	1-22-87	1,373.7	115	104	106	.75	--
BSW 86	441531	0713756	Sanco Landfill	1987	1,360	--	124	280	--	114
BSW 88	441832	0713952	New England Allbank	1987	1,070	--	119	120	--	--
BSW 89	441839	0713941	Hough, G.	1987	1,170	--	51	380	--	50
BSW 95	441939	0714214	Pentaliros, G.	1987	1,000	--	100	300	--	96
BSW 99	441858	0714005	Carroll, P.	1987	1,055	--	59	65	--	--
BSW 100	441747	0713927	Haynes, L.	1988	1,145	--	79	825	--	60
BSW 101	441603	0713703	Schaffer, B.	1988	1,360	--	194	440	--	180
BSW 106	441840	0713948	Ulwick, R.	1988	1,140	--	175	500	--	160
BSW 109	441701	0713831	Putney, J.	1988	1,180	--	182	300	--	173
BSW 111	441846	0714001	Readon, S.	1989	1,070	--	91	95	--	--
BSW 124	441714	0714254	Wessler, M.	1989	1,110	--	29	405	--	20
BSW 125	441946	0714120	Mitchell, K.	1989	995	--	99	245	--	50
BSW 128	441859	0714258	Rumpp, G.	1989	995	--	159	240	--	145
BSW 129	441822	0713927	Thompson, L.	1989	1,180	--	71	425	--	60
BSW 131	441643	0713806	Lerch, S.	1989	1,205	--	79	260	--	68
BSW 133	441851	0713936	Roy, B.	1989	1,180	--	127	310	--	90
BSW 136	441507	0713333	Szakmary, I.	1986	1,575	--	40	81	--	80
BSW 138	441513	0713312	Ainsworth, P.	-1989	1,654	--	104	245	--	130
			Canaan							
CCA 1	433849	0715946	Canaan, town of	1-14-87	1,010	23.5	--	--	--	--
CCA 2	434113	0715932	--	5-10-90	1,040	5	--	--	--	5
CCA 3	433929	0720615	Lebanon Crushed Stone, Inc.	6-12-90	800	69	--	--	--	69
CCB 1	433837	0720649	N.H. Dept. of Transportation	2-00-40	795.3	75	--	--	--	75
CCB 2	433842	0720032	N.H. Dept. of Transportation	6-00-39	940	55	--	--	--	55
CCB 3	433849	0720611	N.H. Dept. of Transportation	1940	798.8	36	--	--	--	36
CCB 4	433906	0720536	N.H. Dept. of Transportation	5-00-64	800.5	16	--	--	--	16
CCB 5	433846	0720130	N.H. Dept. of Transportation	11-00-76	899.7	42	--	--	--	42
CCW 1	434021	0720221	Cardigan Mountain School	1985	1,165	--	58	525	6	58
CCW 2	434022	0720217	Cardigan Mountain School	1984	1,194	--	--	525	--	--
CCW 3	433943	0715957	Gibson, Doug	5-07-90	960	72.7	51	53.5	2	72.7
CCW 4	434038	0715943	Neily, Charles	5-08-90	970	83.7	20.5	23	2	83.7
CCW 5	433856	0720330	McKee, Brownlee	5-09-90	863	79	26.5	29	2	--
CCW 6	434021	0715953	N.H. Dept. of Transportation	5-10-90	970	47.7	17.5	20	2	47.7
CCW 7	433935	0720610	Lebanon Crushed Stone, Inc.	6-12-90	800	65	50	52.5	2	65

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
GRAFTON COUNTY—*Continued*							
Bethlehem—*Continued*							
BSW 58	X	--	--	H	30	Falcon	L
BSW 59	X	--	--	H	30	Falcon	L
BSW 60	X	--	--	H	15	Falcon	L
BSW 62	X	80	3-08-85	H	1	Cushing	L
BSW 63	X	--	--	H	10	Cushing	--
BSW 64	X	--	--	H	.3	Falcon	--
BSW 65	X	--	--	H	3	Falcon	--
BSW 67	X	--	--	H	1.3	Cushing	--
BSW 71	X	--	--	H	0	Falcon	--
BSW 72	X	--	--	H	0	Falcon	--
BSW 78	X	--	--	H	15	NHWRD 381	--
BSW 80	Z	--	--	H	6	Falcon	L
BSW 83	X	--	--	H	50	Falcon	L
BSW 84	O	47.9	12-17-86	U	--	Maine T.B.	L; two wells nested here
BSW 85	O	67.4	1-22-87	U	--	Maine T.B.	L; two wells nested here; second well is 70 feet away
BSW 86	X	--	--	H	30	Falcon	--
BSW 88	Z	--	--	H	4	Falcon	L; drilled in gravel
BSW 89	X	--	--	H	2	Falcon	--
BSW 95	X	--	--	H	2	Cushing	--
BSW 99	Z	--	--	H	20	Falcon	--
BSW 100	X	--	--	H	.5	NHWRD 381	--
BSW 101	X	--	--	H	2.25	Cushing	--
BSW 106	X	--	--	H	1	Cushing	L
BSW 109	X	--	--	H	25	Falcon	--
BSW 111	Z	--	--	H	7	Falcon	L; drilled in gravel
BSW 124	X	--	--	H	.5	Falcon	--
BSW 125	X	--	--	H	60	NHWRD 381	--
BSW 128	X	--	--	H	4	Cushing	--
BSW 129	X	--	--	H	1	NHWRD 381	--
BSW 131	X	--	--	H	20	Cushing	--
BSW 133	X	--	--	H	20	NHWRD 381	--
BSW 136	Z	--	--	H	12	Falcon	--
BSW 138	X	--	--	H	2	Falcon	--
Canaan							
CCA 1	TH	23	1-14-87	U	--	Granite	L
CCA 2	TH	1	5-10-90	U	--	USGS	L
CCA 3	TH	--	--	U	--	USGS	L
CCB 1	BB	--	--	U	--	NHDOT	L
CCB 2	BB	--	--	U	--	NHDOT	L
CCB 3	BB	--	--	U	--	NHDOT	L
CCB 4	BB	--	--	U	--	NHDOT	L
CCB 5	BB	4	11-00-76	U	--	NHDOT	L
CCW 1	X	12.9	10-09-84	T	25	Sargent	L
CCW 2	X	--	--	P	15	--	--
CCW 3	O	--	--	U	--	USGS	L; CA; flowing well
CCW 4	O	4.40	5-30-90	U	--	USGS	L; H; CA
CCW 5	O	8.42	5-30-90	U	--	USGS	L; H; CA
CCW 6	O	3.13	5-30-90	U	--	USGS	L; H; CA
CCW 7	O	2.63	7-26-90	U	--	USGS	L; CA

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Bain,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Canaan—*Continued*							
CCW 8	433925	0720017	Gilbert, Jesse	1963	960	--	17	25	--	10
CCW 9	433931	0720905	Enfield, town of	--	885	460	--	460	6	--
CCW 10	433914	0720547	Nielly, Norman	1962	807	--	10	100	--	5
CCW 11	433909	0720531	Dube, Clevis	1958	827	--	11	62	--	6
CCW 13	433844	0720613	Dearborn	1940	837	--	--	5.5	--	--
CCW 14	433904	0720538	--	1970	807	--	--	9.7	--	--
CCW 15	433939	0720557	--	--	817	--	--	15	--	--
CCW 16	434006	0720602	--	1968	827	--	--	10	--	--
CCW 18	433842	0720533	--	--	807	--	30	130	6	--
CCW 19	434028	0720317	Lesheway	1987	896	--	--	9.5	--	--
CCW 20	434015	0720317	Felfalt Home	4-25-58	896	--	252	320	--	242
CCW 21	434022	0720318	Robinson	1988	886	--	--	15	--	--
CCW 22	433924	0720258	--	--	915	--	--	13.1	--	--
CCW 23	433926	0720313	--	--	876	--	--	12.5	--	--
CCW 24	433848	0720215	--	--	886	--	--	7.4	--	--
CCW 25	434039	0720314	Stewart, Robert	1962	915	--	20	217	--	14
CCW 26	433845	0720133	Joyce	--	915	--	--	9	--	--
CCW 27	433849	0720146	--	--	896	--	--	14	--	--
CCW 28	434107	0720309	--	--	915	--	--	9.1	--	--
CCW 29	434124	0720254	Tibbits	1987	1,004	--	--	10	--	--
CCW 30	433852	0715959	Canaan, town of	1-15-87	960	12	5	10	2	--
CCW 31	433848	0715954	Canaan, town of	1-15-87	960	12	5	10	2	--
CCW 32	433848	0715950	Canaan, town of	1-15-87	975	20.2	15	20	2	--
CCW 33	433850	0715946	Canaan, town of	1-14-87	997.4	18.5	13	18	2	--
CCW 34	433847	0720047	Evans Fuel Corp.	10-30-89	955	12	2	9	2	--
CCW 35	434113	0715938	Marin, Gaston	1962	1,035	--	92	205	--	87
CCW 36	434141	0720245	Brown	1965	974	--	--	13.1	--	--
CCW 38	434007	0715955	--	1977	970	--	--	14	--	--
CCW 39	433904	0720556	Mascoma Valley School	1986	835	--	19	700	--	8
CCW 40	434124	0715921	--	--	1,025	--	--	4.7	36	--
CCW 41	434155	0715839	--	--	1,110	--	--	7.5	36	--
CCW 42	434033	0715952	N.H. Dept. of Transportation	1986	975	--	79	230	--	53
CCW 43	434201	0715806	--	--	1,140	--	--	300	6	--
CCW 44	434051	0715939	Kennedy, D.	7-31-86	1,020	--	30	340	6	18
CCW 45	433847	0720654	Gilette, Tom	7-03-89	817	--	30	305	6	19
CCW 46	433834	0720524	McGrath, D.	1986	825	--	139	465	--	125
CCW 47	433817	0720001	Lashua, Don	6-15-90	955	--	60	295	6	40
CCW 48	433902	0720124	Galpin, Pete	6-13-90	1,043	--	110	285	6	90
CCW 51	433906	0715921	Boivin, S.	1986	1,045	--	59	360	--	40
CCW 52	433824	0720009	Lashua	1986	960	--	40	305	--	18
CCW 53	433904	0720558	del Etoile, R.	1986	836	--	29	820	--	10
CCW 55	434100	0715946	Normandy, L.	1987	1,010	--	84	350	--	70
CCW 64	434058	0720304	Rogers, L.	1987	935	--	49	165	--	38
CCW 69	433856	0720553	Miller, D.	1987	825	--	26	275	--	26
CCW 74	434051	0720305	Neily, G.	1987	935	--	41	60	--	30
CCW 77	434135	0720249	Larocque, R.	1987	965	--	86	245	--	75
CCW 82	434058	0715948	McAlister	1987	1,005	--	129	300	--	120
CCW 85	434055	0720305	Brown, R.	1987	935	--	54	300	--	45
CCW 87	434132	0720318	Dunscombe	1987	955	--	29	300	--	20
CCW 95	433841	0720244	Bohlen	1984	885	--	149	200	--	132

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
GRAFTON COUNTY—*Continued*							
Canaan—*Continued*							
CCW 8	X	4	1963	H	10	A+W	--
CCW 9	X	--	--	P	44	--	Water from well is used by the town of Enfield
CCW 10	X	--	--	H	3	D. Herrick	--
CCW 11	X	--	--	H	5	D. Herrick	--
CCW 13	V	2	6-06-91	H	--	--	Ocassionally goes dry in summer
CCW 14	V	6.5	6-06-91	U	--	Remarals	Reported high iron; bad "smell" in spring
CCW 15	V	8.5	6-06-91	H	--	--	Water quality reported good; good supply
CCW 16	Dug	8	6-10-91	H	--	--	Water quality reported good
CCW 18	X	--	--	H	30	Valley Art.	Water quality reported good; no problems
CCW 19	Dug	6.2	6-10-91	H	--	--	Water quality reported good; seasonal
CCW 20	X	30	4-25-58	H	9	A+B	--
CCW 21	Dug	7	6-10-91	H	--	--	Swamp bacteria reported in water; chlorine has been added; no problems with supply
CCW 22	Dug	4.2	6-10-91	H	--	--	--
CCW 23	Dug	7.2	6-11-91	H	--	--	--
CCW 24	Dug	3.6	6-11-91	H	--	--	--
CCW 25	X	--	--	H	10	E-H	--
CCW 26	Dug	6	6-11-91	H	--	--	Water reported to taste good; slightly hard; some iron
CCW 27	Dug	5	6-11-91	H	--	--	Water reported to be soft; tastes good
CCW 28	Dug	3.8	6-11-91	H	--	--	Water quality reported good; good taste
CCW 29	Dug	3	6-11-91	H	--	--	Water reported safe to drink, but tastes bad; has iron
CCW 30	O	4.2	1-15-87	U	--	Granite	L
CCW 31	O	6.4	1-15-87	U	--	Granite	--
CCW 32	O	16.1	1-15-87	U	--	Granite	--
CCW 33	O	16.1	1-14-87	U	--	Granite	--
CCW 34	O	4.5	10-30-89	U	--	Con-Tec	1 of 5 monitoring wells; petroleum contamination detected
CCW 35	X	--	--	H	3	D. Herrick	--
CCW 36	Dug	8.2	6-11-91	H	--	--	Water reported to taste good
CCW 38	Dug	10	6-13-91	H	--	--	Water quality reported to be hard, with high iron
CCW 39	X	33	10-19-86	T	1.75	NHWRD 160	--
CCW 40	Dug	2.6	6-12-91	H	--	--	Water has high iron content and brown color
CCW 41	Dug	6	6-13-91	H	--	--	--
CCW 42	X	--	--	H	12	NHWRD 549	--
CCW 43	X	--	--	H	--	--	Water is soft; no iron; tastes good
CCW 44	X	--	--	H	100	Valley Art.	--
CCW 45	X	--	--	H	5	Valley Art.	--
CCW 46	X	20	10-21-86	H	4	NHWRD 172	--
CCW 47	X	--	--	H	30	Valley Art.	--
CCW 48	X	--	--	H	5	Valley Art.	--
CCW 51	X	--	--	H	1	A+W	--
CCW 52	X	20	9-19-86	H	6	NHWRD 549	--
CCW 53	X	--	--	P	9	NHWRD 3	--
CCW 55	X	--	--	H	.5	A+W	--
CCW 64	X	--	--	H	12	NHWRD 245	--
CCW 69	X	--	--	H	1.5	NHWRD 160	--
CCW 74	X	20	8-08-87	H	40	A+W	--
CCW 77	X	--	--	H	4	Valley Art.	--
CCW 82	X	--	--	H	6	A+W	--
CCW 85	X	20	11-04-87	H	1.5	A+W	L
CCW 87	X	20	12-28-87	H	1.5	A+W	--
CCW 95	X	--	--	H	30	Valley Art.	--

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
GRAFTON COUNTY—*Continued*										
Canaan—*Continued*										
CCW 99	433849	0720536	Webber, S.	1985	810	--	99	100	--	--
CCW 105	434038	0720546	& M. Woodward, S.	1985	820	--	54	360	--	45
CCW 106	433848	0720534	Rousseau, I.	1985	815	--	134	320	--	135
CCW 107	433850	0720537	Stevens, B.	1985	810	--	94	405	--	80
CCW 110	434202	0720233	Ott, C.	1985	980	--	30	360	--	20
CCW 117	433857	0720553	Stevens, A.	1985	825	--	29	265	--	17
CCW 119	434021	0720551	Blair	1985	825	--	106	300	--	92
CCW 121	433928	0720700	Taylor, G.	1985	810	--	52	122	--	21
CCW 122	434106	0715940	Moffatt, G.	1986	1,030	--	109	610	--	95
CCW 128	433856	0720547	Eggleston, H.	1986	805	--	30	200	--	20
CCW 134	434032	0715956	Allen, P.	1986	980	--	63	225	--	47
CCW 135	433946	0720603	Camber, J.	1987	815	--	122	140	--	110
CCW 137	433838	0720053	Lowell, L.	1987	990	--	19	305	--	10
CCW 138	434035	0720546	Licence, R.	1987	820	--	59	305	--	40
CCW 141	434102	0715943	Hooker, K.	1988	1,025	--	89	245	--	78
CCW 147	434109	0720523	Sawyers, R.	1988	835	--	27	300	--	10
CCW 152	433901	0720424	Monmaney, H.	1988	885	--	190	300	--	180
CCW 159	433837	0720640	Trussel, N.	1988	805	--	80	85	--	--
CCW 163	433842	0720529	Pickens, B.	1988	815	--	149	185	--	135
CCW 168	434108	0720528	Mehler, R.	1988	815	--	59	500	--	50
CCW 170	434053	0720303	Patnode, S.	1988	940	--	79	180	--	70
CCW 182	433822	0720012	Boivin, P.	1989	985	--	44	305	--	35
CCW 188	434053	0715946	Allen, D.	1989	990	--	120	500	--	100
CCW 189	434104	0715946	Buzzell, E.	1988	1,040	--	119	605	--	105
CCW 194	434107	0715938	Richardson, R.	1989	1,030	--	150	360	--	103
CCW 198	434118	0720304	Ricard, R.	1989	935	--	99	305	--	90
CCW 225	434118	0720309	Neily, C.	1990	935	--	39	300	--	30
CCW 226	434120	0720305	Seamans, J.	1990	935	--	94	240	--	67
Easton										
EBW 1	440745	0714759	Locke, Fred	07-12-90	1,240	69	24.5	27	2	70
EBW 2	440940	0714616	--	1986	1,070	--	--	15.6	36	--
EBW 3	440755	0714718	--	--	1,250	--	--	5.2	36	--
EBW 4	440938	0714625	Chase, C.R.	1960	1,045	--	51	520	--	50
EBW 5	440755	0714744	--	1973	1,235	--	--	14	36	--
EBW 6	440836	0714722	Gerson, Otto	08-09-59	1,200	--	154	235	--	144
EBW 7	440751	0714754	--	--	1,235	--	--	12.4	36	--
EBW 8	440745	0714734	--	--	1,270	--	--	11.5	36	--
EBW 9	440744	0714731	--	1991	1,275	--	--	10.4	36	--
EBW 10	440931	0714642	Glover, C.M.	11-26-56	1,060	--	60	300	--	50
EBW 11	441000	0714559	Searle, Williams	10-00-49	1,030	--	--	500	--	50
EBW 12	440443	0714752	U.S. Forest Service	10-31-61	1,300	--	--	205	--	72
EBW 13	440815	0714709	Searle	1985	1,270	--	80	550	6	--
EBW 14	440536	0714937	--	1991	1,180	--	--	7.5	36	--
EBW 15	440925	0714622	Pimental, J.	1986	1,100	--	43	225	--	34
EBW 16	440809	0714714	Tatosian, H.	1986	1,240	--	180	305	--	170
EBW 17	440829	0714717	Dexter, R.	1986	1,220	--	139	225	--	130
EBW 18	440820	0714719	Chatier	1987	1,240	--	194	305	--	130
EBW 20	440851	0714725	Walsh, J.	1988	1,140	--	79	300	--	32
EBW 22	440843	0714743	Sorg, G.	1989	1,190	--	65	300	--	50

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
				GRAFTON COUNTY—*Continued*			
				Canaan—*Continued*			
CCW 99	X	15	10-03-85	H	20	NHWRD 160	L; drilled in gravel
CCW 105	X	--	--	H	10	A+W	--
CCW 106	X	--	--	H	2.5	A+W	--
CCW 107	X	--	--	H	6	Valley Art.	--
CCW 110	X	--	--	H	.5	A+W	--
CCW 117	X	--	--	H	30	Valley Art.	--
CCW 119	X	--	--	H	2	Valley Art.	--
CCW 121	X	8	8-14-85	H	6	NHWRD 633	--
CCW 122	X	--	--	H	1.5	Valley Art.	--
CCW 128	X	--	--	H	15	NHWRD 160	L
CCW 134	X	--	--	H	10	Valley Art.	--
CCW 135	X	--	--	H	20	A+W	L
CCW 137	X	20	8-26-87	H	7	NHWRD 173	--
CCW 138	X	--	--	H	6	NHWRD 173	--
CCW 141	X	--	--	H	4	Valley Art.	--
CCW 147	X	--	--	H	3.5	A+W	--
CCW 152	X	--	--	H	8	A+W	L
CCW 159	Z	--	--	H	75	Valley Art.	L; drilled in gravel
CCW 163	X	--	--	H	20	Valley Art.	--
CCW 168	X	--	--	H	1	A+W	L
CCW 170	X	--	--	H	6	A+W	L
CCW 182	X	30	2-28-89	H	8	Valley Art.	--
CCW 188	X	--	--	H	.75	A+W	--
CCW 189	X	18	11-05-88	H	.5	NHWRD 172	--
CCW 194	X	--	--	H	6	A+W	L
CCW 198	X	--	--	H	3	Valley Art.	--
CCW 225	X	7	4-12-90	H	2	A+W	--
CCW 226	X	20	4-16-90	H	7.5	A+W	--
				Easton			
EBW 1	O	5.32	7-26-90	U	--	USGS	L; H; CA
EBW 2	Dug	10.5	7-31-91	H	--	--	Water reported to taste good
EBW 3	Dug	4	7-31-91	H	--	--	Water quality reported to be good
EBW 4	X	--	--	H	15	--	--
EBW 5	Dug	11	7-31-91	H	--	--	Water quality reported to be good
EBW 6	X	14	8-09-59	H	8	Tasker	--
EBW 7	Dug	7.85	7-31-91	H	--	--	Water quality reported to be good
EBW 8	Dug	7.68	7-31-91	H	--	--	Water reported to be soft, taste good
EBW 9	Dug	7.9	7-31-91	H	--	--	Water reported to be very hard, has iron
EBW 10	X	--	--	H	3	Tasker	--
EBW 11	X	--	--	H	15	H.B. Smith	--
EBW 12	X	30	10-31-61	H	--	A+B	--
EBW 13	X	40	7-31-91	H	4	--	Water quality reported to be very good
EBW 14	Dug	4.19	7-19-91	H	25	--	Water quality reported to be good
EBW 15	X	--	--	H	2.5	Falcon	--
EBW 16	X	--	--	-	--	A+W	--
EBW 17	X	--	--	H	2.5	Falcon	--
EBW 18	X	--	--	H	5	Falcon	L
EBW 20	X	--	--	H	1	Cushing	--
EBW 22	X	20	8-18-89	H	4	A+W	--

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Easton—*Continued*							
EBW 24	440458	0714809	Braun, T.	1989	1,300	--	100	296	--	80
EBW 25	440825	0714637	Johnson, R.	1985	1,360	--	69	262	--	50
			Enfield							
ENA 1	433841	0720736	Enfield, town of	12-08-81	797	33	--	--	--	--
ENA 2	433824	0720736	Enfield, town of	12-09-81	794	35	--	--	--	--
ENA 3	433236	0720555	Jackson, Gordon	6-11-90	1,043	19	--	--	--	19
ENB 1	433550	0720658	N.H. Dept. of Transportation	2-00-64	781.6	20	--	--	--	--
ENB 2	433800	0720922	N.H. Dept. of Transportation	5-22-39	750	61	--	--	--	61
ENB 3	433757	0720924	N.H. Dept. of Transportation	5-22-39	750	51	--	--	--	51
ENB 4	433753	0720927	N.H. Dept. of Transportation	5-22-39	750	56	--	--	--	56
ENB 5	433750	0720929	N.H. Dept. of Transportation	5-22-39	767	64	--	--	--	--
ENB 6	433825	0720857	N.H. Dept. of Transportation	1-00-54	749.9	32	--	--	--	32
ENB 7	433638	0721120	N.H. Dept. of Transportation	11-00-58	1,123.6	34.5	--	--	--	34.5
ENB 8	433550	0720958	N.H. Dept. of Transportation	7-00-58	1,239.7	33.4	--	--	--	--
ENS 1	433218	0720544	--	--	1,063	--	--	--	--	--
ENW 1	433831	0720730	Enfield, town of	1983	1,803.79	--	--	493	--	116
ENW 2	433844	0720735	Enfield, town of	1983	807	--	70	424	8	62
ENW 3	433446	0720604	Crate	--	984	--	--	14.5	--	--
ENW 6	433624	0720155	--	1950	1,200	--	--	6	--	--
ENW 7	433613	0720736	Gardiner	1960	758	--	--	8.5	--	--
ENW 29	433711	0720835	Shaker Village	9-03-85	760	39.8	--	38	--	--
ENW 30	433616	0720740	--	5-09-90	758	50	35	37.5	2	--
ENW 31	433710	0720834	Shaker Village	7-26-85	768	48	25	30	2.5	--
ENW 32	433304	0720607	Jackson, Gordon	6-11-90	1,000	22.2	15.5	18	2	22.2
ENW 33	433312	0720607	Jackson, Gordon	6-11-90	1,004	44	34.5	37	2	--
ENW 34	433715	0720841	Shaker Village	7-25-85	768	69	25	30	2.5	--
ENW 73	433532	0720645	Beliveau, R.	1985	835	--	43	145	--	30
ENW 78	433620	0720651	Bradley, L.	1985	860	--	19	122	--	9
ENW 82	433713	0720836	Shaker Village	1985	754	--	26.5	55	--	--
ENW 85	433714	0720837	Shaker Village	1985	760	--	31	37	--	--
ENW 86	433712	0720835	Shaker Village	1985	755	--	26.6	47	--	--
ENW 87	433836	0720730	Battis, R.	1986	800	--	81	295	--	70
ENW 93	433623	0720736	Kenney, R.	1986	760	--	89	145	--	78
ENW 98	433622	0720743	Flint, A.	1986	760	--	86	140	--	77
ENW 104	433512	0720631	Crate Sr., D.	1986	905	--	19	120	--	10
ENW 107	433522	0720636	Ashey, F.	1986	853	--	39	120	--	20
ENW 111	433449	0720609	Nylund, T.	1986	985	--	29	400	--	20
ENW 113	433548	0720651	Croft, C.	1986	813	--	19	120	--	10
ENW 114	433546	0720652	Dutile, D.	1986	815	--	19	120	--	10
ENW 124	433848	0720738	Town of Enfield	1987	812.31	--	119	600	--	100
ENW 127	433713	0720854	Shaker Village	1987	800	--	79	560	--	70
ENW 131	433547	0720655	Farnsworth, J.	1987	810	--	30	280	--	20
ENW 135	433546	0720657	Anderson, T.	1985	810	--	50	285	--	36
ENW 158	433838	0720728	Crate, D.	1987	805	--	66	300	--	57
ENW 171	433622	0720727	Salman, M.	1987	780	--	29	240	--	20
ENW 175	433608	0720732	LaChance, C.	1987	780	--	79	305	--	60
ENW 177	433834	0720719	Town Center Partnership	1988	830	--	74	300	--	60
ENW 191	433631	0720514	Rhoda, C.	1988	900	--	80	500	--	70

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
						GRAFTON COUNTY—*Continued*	
						Easton—*Continued*	
EBW 24	X	--	--	H	2	NHWRD 192	--
EBW 25	X	--	--	H	10	NHWRD 3	--
						Enfield	
ENA 1	TH	--	--	U	--	Chapman	L
ENA 2	TH	--	--	U	--	Chapman	L
ENA 3	TH	18	6-11-90	U	--	USGS	L
ENB 1	BB	--	--	U	--	NHDOT	L
ENB 2	BB	--	--	U	--	NHDOT	L
ENB 3	BB	--	--	U	--	NHDOT	L
ENB 4	BB	--	--	U	--	NHDOT	L
ENB 5	BB	--	--	U	--	NHDOT	L
ENB 6	BB	--	--	U	--	NHDOT	L
ENB 7	BB	--	--	U	--	NHDOT	L
ENB 8	BB	--	--	U	--	NHDOT	L
ENS 1	Spr	--	--	H	--	--	Reported never gone dry; water quality is good
ENW 1	X	--	--	U	150	--	L; also known as Lovejoy Brook well No. 1
ENW 2	X	--	--	P	150	--	--
ENW 3	Dug	1.75	6-05-91	H	--	--	--
ENW 6	Dug	2.65	6-05-91	U	--	--	Well is spring fed; water quality reported to be good
ENW 7	Dug	4.57	6-05-91	H	--	--	Owner reports water has "metallic" taste; leaves rust stains; never gone dry
ENW 29	GPW	4.1	9-03-85	P	115	Layne	L; aquifer-test results reported in table 3
ENW 30	O	1.77	5-30-90	U	--	USGS	L; H; CA
ENW 31	O	7.8	7-26-85	U	15	Layne	L
ENW 32	O	1.59	7-26-90	U	--	USGS	L; H; CA
ENW 33	O	3.20	7-26-90	U	--	USGS	L; H; CA
ENW 34	O	--	--	U	10	Layne	L; flowing well
ENW 73	X	--	--	H	10	Valley Art.	--
ENW 78	X	7	10-03-85	H	7	NHWRD 633	--
ENW 82	Z	4.6	9-09-85	U	30	NHWRD 313	--
ENW 85	Z	1.7	7-26-85	U	30	NHWRD 313	--
ENW 86	O	1.8	7-26-85	U	30	NHWRD 313	--
ENW 87	X	--	--	-	2	Valley Art.	--
ENW 93	X	--	--	H	6	Valley Art.	--
ENW 98	X	--	--	H	10	A+W	--
ENW 104	X	--	--	H	20	A+W	--
ENW 107	X	--	--	H	15	A+W	--
ENW 111	X	--	--	H	1.5	A+W	--
ENW 113	X	--	--	H	10	A+W	--
ENW 114	X	--	--	H	12	A+W	--
ENW 124	X	--	--	P	100	A+W	Also known as the Prior 2 well
ENW 127	X	--	--	-	150	A+W	--
ENW 131	X	--	--	H	15	A+W	--
ENW 135	X	--	--	H	20	Valley Art.	--
ENW 158	X	--	--	H	15	A+W	--
ENW 171	X	--	--	H	40	A+W	--
ENW 175	X	15	9-24-87	H	15	NHWRD 172	--
ENW 177	X	--	--	H	12	A+W	L
ENW 191	X	20	4-23-88	H	.25	A+W	L

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Enfield—*Continued*							
ENW 223	433815	0720857	Stinson, B.	1988	770	--	19	175	--	10
ENW 230	433445	0720611	Gallant, M.	1989	990	--	29	305	--	20
ENW 231	433447	0720611	Chesley, W.	1989	990	--	39	265	--	28
ENW 244	433518	0720634	Bailey, G.	1989	865	--	17	545	--	11
ENW 246	433532	0720642	Terino, A.	1989	835	--	33	185	--	20
ENW 247	433624	0720751	3093 Realty Assoc	1989	755	--	49	305	--	40
ENW 248	433657	0720832	Garipy, S.	1989	760	--	29	185	--	20
ENW 251	433634	0720801	Braun, E.	1989	775	--	79	300	--	68
ENW 260	433436	0720333	Rockwood, C.	1989	1,130	--	29	285	--	19
ENW 268	433618	0720159	Graham, D.	1989	1,207	--	59	500	--	50
			Franconia							
FDA 3	441106	0714519	Weld	7-09-90	1,010	19	--	--	--	--
FDA 4	441056	0714532	--	7-09-90	1,000	30	--	--	--	--
FDA 5	441017	0714556	McKenzie	7-12-90	1,000	49	--	--	--	--
FDB 1	441307	0714347	N.H. Dept. of Transportation	1900	983.7	21	--	--	--	21
FDB 2	441320	0714403	N.H. Dept. of Transportation	9-00-57	992.7	33	--	--	--	33
FDB 3	441351	0714522	N.H. Dept. of Transportation	1900	912.2	23	--	--	--	23
FDB 6	441042	0714134	N.H. Dept. of Transportation	11-00-83	1,941	16	--	--	--	16
FDB 7	441155	0714055	N.H. Dept. of Transportation	7-00-57	1,676	45	--	--	--	27
FDB 10	441321	0714401	N.H. Dept. of Transportation	10-00-70	998	51	--	--	--	--
FDB 11	441342	0714450	N.H. Dept. of Transportation	10-00-70	949.4	26	--	--	--	--
FDW 1	441345	0714513	Ristuccia, Joel M.	5-19-88	924.4	16.3	4.5	14.5	2	--
FDW 2	441344	0714513	Ristuccia, Joel M.	5-19-88	924	15.9	4.8	14.1	2	--
FDW 3	441051	0714538	Ford Family Ventures	7-09-90	970	74	57.5	60	2	74
FDW 4	441121	0714512	Moore, Richard	6-10-90	960	76	57.5	60	2	76
FDW 5	441201	0714344	--	--	1,080	--	--	9.2	36	--
FDW 6	441149	0714406	--	--	1,100	--	--	9.8	36	--
FDW 7	441219	0714349	Lovett's Inn	10-31-88	1,040	76	65.4	75.4	6	--
FDW 8	441218	0714349	Lovett's Inn	11-02-88	1,040	76	65.8	75.8	6	--
FDW 9	441029	0714539	Green, Frederick	1963	1,010	--	33	400	--	27
FDW 12	441215	0714324	Kemp, W.S.	7-22-61	1,100	--	16	128	--	10
FDW 13	441224	0714328	--	--	1,080	--	--	6	36	--
FDW 14	441345	0714516	Ristuccia, Joel M.	5-19-88	917.1	8.5	1.5	6	2	--
FDW 15	441346	0714515	Ristuccia, Joel M.	5-23-88	922.1	16	3.9	13.9	2	--
FDW 16	441200	0714522	McKinney	--	940	--	--	8.7	36	--
FDW 17	441146	0714517	--	--	950	--	--	9.2	36	--
FDW 19	441138	0714417	Leary	1984	1,120	--	121	400	--	50
FDW 20	441144	0714514	--	--	955	--	--	6.6	36	--
FDW 21	441112	0714502	--	1981	1,000	--	--	4.6	36	--
FDW 22	441050	0714523	--	1985	1,005	--	--	7.4	36	--
FDW 27	441119	0714432	Valar, V.	1986	1,080	--	84	240	--	--
FDW 29	441129	0714419	Phillips, C.	1986	1,100	--	64	160	--	60
FDW 37	441308	0714306	Sargent, F.	1987	1,150	--	72	210	--	12
FDW 39	441136	0714514	Franconia Inn	1988	960	--	95	280	--	97
FDW 44	441334	0714344	Brawn	1988	1,180	--	41	200	--	31
FDW 51	441315	0714320	Leonard, R.	1988	1,020	--	47	55	--	--
FDW 54	441335	0714348	Forest Hills Assoc	1989	1,180	--	69	380	--	58
FDW 59	441237	0714258	Crosby, H.	1990	1,260	--	209	480	--	194

Local site No.	Type of site	Water level: Depth (feet)	Water level: Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
GRAFTON COUNTY—*Continued*							
Enfield—*Continued*							
ENW 223	X	--	--	H	10	A+W	--
ENW 230	X	--	--	H	2.5	Valley Art.	--
ENW 231	X	--	--	H	10	Valley Art.	--
ENW 244	X	60	4-28-89	H	1.25	NHWRD 522	--
ENW 246	X	--	--	H	15	Valley Art.	--
ENW 247	X	--	--	H	3	Valley Art.	--
ENW 248	X	--	--	H	3	Valley Art.	--
ENW 251	X	--	--	H	15	A+W	--
ENW 260	X	--	--	H	15	Valley Art.	--
ENW 268	X	--	--	H	2	A+W	--
Franconia							
FDA 3	TH	--	--	U	--	USGS	L
FDA 4	TH	17	7-09-90	U	--	USGS	L
FDA 5	TH	12	7-12-90	U	--	USGS	L
FDB 1	BB	--	--	U	--	NHDOT	L
FDB 2	BB	--	--	U	--	NHDOT	L
FDB 3	BB	--	--	U	--	NHDOT	L
FDB 6	BB	7.5	11-00-83	U	--	NHDOT	L
FDB 7	BB	--	--	U	--	NHDOT	L
FDB 10	BB	--	--	U	--	NHDOT	L
FDB 11	BB	--	--	U	--	NHDOT	L
FDW 1	O	7.7	5-19-88	U	--	Kennedy	L
FDW 2	O	7.8	5-19-88	U	--	Kennedy	L
FDW 3	O	3.91	7-26-90	U	--	USGS	L; H; CA
FDW 4	O	3.29	7-26-90	U	--	USGS	L; H; CA
FDW 5	Dug	6.4	8-01-91	H	--	--	--
FDW 6	Dug	6.05	8-01-91	H	--	--	--
FDW 7	TW	6.23	11-04-88	U	120	Maher	L; aquifer-test results reported in table 3
FDW 8	TW	7.7	11-04-88	U	120	Maher	L; well is located 101 feet south of FDW-7
FDW 9	X	--	--	H	--	Chapman	
FDW 12	X	90	7-22-61	H	7	Tasker	--
FDW 13	Dug	3.9	8-01-91	H	--	--	--
FDW 14	O	3	5-19-88	U	--	Kennedy	L
FDW 15	O	6.9	6-01-88	U	--	Kennedy	L
FDW 16	Dug	6.65	8-01-91	H	--	--	--
FDW 17	Dug	5.48	7-31-91	H	--	--	L; water reported to be "soft, taste good"
FDW 19	X	--	--	H	2	Tasker	--
FDW 20	Dug	3.45	7-31-91	S	--	--	--
FDW 21	Dug	1.55	7-31-91	H	--	--	Water reported to be "hard, taste good"
FDW 22	Dug	5.55	8-01-91	H	--	--	Water reported to be "very hard"
FDW 27	X	30	10-16-86	H	3	Cushing	--
FDW 29	X	20	12-11-86	H	40	Cushing	--
FDW 37	X	--	--	H	100	NHWRD 381	--
FDW 39	X	--	--	H	2	Cushing	L
FDW 44	X	--	--	H	4	Cushing	--
FDW 51	Z	--	--	H	8	Falcon	L; drilled in gravel
FDW 54	X	--	--	H	1.5	Cushing	--
FDW 59	X	--	--	H	3	Cushing	--

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Hanover							
HHA 1	434319	0721621	Purcell, Tom	3-31-89	530	61	--	--	--	--
HHA 2	434330	0721627	Dept of Army (CRREL)	9-24-79	480	60	--	--	--	--
HHA 3	434147	0721751	Hanover Water Works Co.	11-14-57	390	38	--	--	--	38
HHB 1	434134	0721728	N.H. Dept. of Transportation	2-00-40	390	76.5	--	--	--	76.5
HHW 1	434337	0721624	Hanover Water Works Co.	7-18-66	470	156	114	154	8	156.5
HHW 2	434330	0721629	Dept of Army (CRREL)	9-12-57	462.4	150	--	150	--	--
HHW 3	434332	0721628	Dept of Army (CRREL)	1989	470	--	124	160	--	162
HHW 4	434327	0721631	Dept of Army (CRREL)	11-19-63	462.1	--	--	147	--	--
HHW 5	434325	0721634	Dept of Army (CRREL)	8-18-76	470	167	110	150	10	167
HHW 6	434325	0721632	Dept of Army (CRREL)	10-02-79	470	171.7	--	137	1.5	170.7
HHW 7	434148	0721755	Hanover Water Works Co.	11-12-57	390	72	--	62	2.5	72
HHW 8	434148	0721753	Hanover Water Works Co.	11-13-57	390	68	--	60	2.5	68
HHW 9	434548	0721257	--	--	400	--	--	15.8	36	--
HHW 10	434206	0721716	Dartmouth College	1989	520	--	--	20.5	--	--
HHW 11	434116	0721412	Guyer, G.	1959	630	--	--	175	--	50
HHW 12	434117	0721440	Hanover Water Works Co.	1962	620	--	51	125	--	43
HHW 13	434536	0721314	Stead, D.	1989	405	--	67	305	--	58
HHW 14	434527	0721322	Banker, Richard	1961	400	--	31	85	--	25
HHW 15	434118	0721356	Olson, Walter	1960	670	--	14	250	--	8
HHW 16	434550	0721246	Jillson, M.	1987	470	--	45	500	--	36
HHW 17	434548	0721255	Green, P.	1989	400	--	39	500	--	30
HHW 18	434536	0721232	Baxter, J.	1988	530	--	99	160	--	90
HHW 19	434043	0721416	Neiley	1961	660	--	20	115	--	4
HHW 20	434107	0721624	Hanover, town of	10-17-90	670	--	10	35	2	--
HHW 21	434427	0721421	Powell	1951	430	--	--	210	--	40
HHW 22	434205	0721712	Dartmouth College	2-21-90	510	--	13	31	1.5	--
HHW 23	434425	0721435	Rich, Dwight	1948	420	--	--	148	--	70
HHW 24	434217	0721721	Dartmouth College	10-09-90	540	--	47	47	1.5	--
HHW 25	434328	0721615	Dept of Army (CRREL)	2-01-92	523	188.5	169	179	4	181
HHW 26	434328	0721620	Dept of Army (CRREL)	2-17-92	512.7	149	136.5	146.5	4	--
HHW 27	434327	0721623	Dept of Army (CRREL)	2-12-92	507.2	139	126.5	136.5	4	--
HHW 28	434333	0721631	Dept of Army (CRREL)	1-24-92	467.8	100	78	98	2	65
HHW 86	434527	0721231	Piper, Alan	1959	570	--	15	70	--	8
HHW 88	434150	0721651	Co-op Food Service	11-11-87	510	12	4.7	9.7	2	--
HHW 89	434152	0721652	Co-op Food Service	11-11-87	507.6	12	5.8	10.8	2	--
HHW 91	434416	0721505	Fullington, Haslett	1960	400	--	--	120	--	38
HHW 92	434343	0721608	Chieftan Motel	1954	510	--	--	520	--	280
HHW 95	434436	0721415	Deming, V.	1984	394	--	114	160	--	100
HHW 111	434436	0721410	Forward, J.	1985	394	--	149	315	--	136
HHW 121	434432	0721420	Raymond, J.	1985	410	--	105	375	--	95
HHW 126	434104	0721400	Creare Corp	1986	665	--	19	390	--	10
HHW 169	434437	0721408	Fredyma, J.	1987	394	--	119	500	--	105
HHW 175	434358	0721528	Jodoin, R.	1987	420	--	36	280	--	27
HHW 211	434409	0721504	Dartmouth College	1988	440	--	119	300	--	110
HHW 217	434410	0721509	Dartmouth College	1988	420	--	94	220	--	85
HHW 230	434353	0721607	Kendall at Hanover	1988	460	--	--	32	--	--
HHW 269	434402	0721527	Lawrence & J. Higgins	1990	400	--	109	110	--	--
HHW 276	434121	0721514	Gilbert	1950	600	--	--	135	--	--

Local site No.	Type of site	Water level: Depth (feet)	Water level: Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
						GRAFTON COUNTY—*Continued*	
						Hanover	
HHA 1	TH	--	--	U	--	Tommila	L; 1 of 3 borings at site; dry hole
HHA 2	TH	--	9-24-79	U	--	GSE	L; dry hole
HHA 3	TH	--	--	U	--	Chapman	L
HHB 1	BB	--	--	U	--	NHDOT	L
HHW 1	GPW	82	8-10-66	P	440	Chapman	L; 5.5 hour aquifer test on 8/10/1966; discontinued use in 1991
HHW 2	GPW	77.8	9-12-57	J	600	--	L; TCE contamination detected in water
HHW 3	GPW	91	8-02-89	-	366	NHWRD 115	L; TCE contamination detected in water
HHW 4	GPW	--	--	J	300	--	L; TCE contamination detected in water
HHW 5	GPW	79	8-18-76	J	500	Aqua Wells	L; TCE contamination detected in water
HHW 6	O	90	10-02-79	U	--	GSE	L
HHW 7	O	.8	11-12-57	U	40	Chapman	L
HHW 8	O	.8	11-13-57	U	65	Chapman	L; 7-hour aquifer test on 11/15/57
HHW 9	Dug	11.8	7-26-91	H	--	--	--
HHW 10	O	6.1	9-05-89	U	--	NHWRD 672	--
HHW 11	X	35	1959	H	1	A+W	--
HHW 12	X	--	--	H	3	A+W	--
HHW 13	X	--	--	H	30	Valley Art.	--
HHW 14	X	--	--	H	4	A+W	--
HHW 15	X	--	--	H	24	A+W	--
HHW 16	X	--	--	H	3	A+W	--
HHW 17	X	--	--	H	4	A+W	--
HHW 18	X	--	--	H	50	A+W	--
HHW 19	X	--	--	H	1	A+W	--
HHW 20	O	22.7	10-17-90	U	--	Soils Eng.	L
HHW 21	X	--	--	H	20	O. Dube	--
HHW 22	O	17.8	2-21-90	U	--	Soils Eng.	L
HHW 23	X	--	--	H	20	O. Dube	--
HHW 24	O	--	10-09-90	U	--	Soils Eng.	L.
HHW 25	O	140	2-20-92	U	--	WTD	L; VOC contamination detected in ground water
HHW 26	O	130	2-17-92	U	--	WTD	L; VOC contamination detected in ground water
HHW 27	O	125	2-20-92	U	--	WTD	L; VOC contamination detected in ground water
HHW 28	X	84.9	2-20-92	U	--	WTD	L
HHW 86	O	--	--	H	7	A+W	--
HHW 88	O	6.95	12-10-88	U	--	GSE	L; 1 of 4 monitoring wells
HHW 89	O	9.55	12-10-88	U	--	GSE	L; 1 of 4 monitoring wells; VOC contamination reported
HHW 91	X	--	--	H	1	O. Dube	--
HHW 92	X	--	--	H	25	O. Dube	--
HHW 95	X	--	--	H	20	A+W	--
HHW 111	X	--	--	H	4	Valley Art.	--
HHW 121	X	--	--	H	4	Valley Art.	--
HHW 126	X	--	--	U	20	A+W	--
HHW 169	X	--	--	H	5	Valley Art.	--
HHW 175	X	--	--	H	8	A+W	L
HHW 211	X	--	--	H	20	A+W	L
HHW 217	X	--	--	H	20	A+W	L
HHW 230	Z	--	--	U	--	NHWRD 672	--
HHW 269	Z	25	4-23-90	H	60	A+W	L; drilled in gravel
HHW 276	Z	--	--	H	30	O. Dube	--

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date com-pleted (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Haverhill							
HKA 1	440619	0715815	Woodsville Water and Light Dept.	1988	774.15	35	--	--	--	35
HKA 2	440706	0720302	Grafton County Farm	3-26-74	410	147	--	--	--	--
HKA 3	440853	0720130	Woodsville Water and Light Dept.	12-03-87	440	59	--	--	--	--
HKA 4	440658	0720240	Grafton County Farm	3-28-74	410	135	--	--	--	--
HKA 5	440903	0720223	Woodsville Water and Light Dept.	3-02-88	410	21	--	--	--	--
HKA 6	440901	0720220	Woodsville Water and Light Dept.	3-03-88	410	27	--	--	--	--
HKA 7	440857	0720221	Woodsville Water and Light Dept.	3-03-88	410	30	--	--	--	--
HKA 8	440834	0720205	Woodsville Water and Light Dept.	2-24-88	410	28	--	--	--	--
HKA 9	440835	0720116	Woodsville Water and Light Dept.	5-01-74	450	71	--	--	--	71
HKA 10	440615	0715750	Woodsville Water and Light Dept.	3-02-88	780	19	--	--	--	19
HKA 11	440624	0715811	Woodsville Water and Light Dept.	2-01-88	800	5	--	--	--	5
HKA 12	440500	0715933	N. Haverhill Water District	8-09-78	670	20.5	--	--	--	--
HKA 13	440458	0715937	N. Haverhill Water District	8-14-78	690	58	--	--	--	58
HKA 14	440455	0715937	N. Haverhill Water District	8-10-78	690	61.5	--	--	--	61.5
HKA 15	440501	0715934	N. Haverhill Water District	8-14-78	670	31	--	--	--	31
HKA 16	440503	0715934	N. Haverhill Water District	8-14-78	670	34	--	--	--	34
HKA 17	440505	0715935	N. Haverhill Water District	8-15-78	670	33	--	--	--	33
HKA 18	440446	0715857	N. Haverhill Water District	8-08-78	710	32.5	--	--	--	32.5
HKA 19	440446	0715854	N. Haverhill Water District	8-07-78	710	31.5	--	--	--	31.5
HKA 20	440442	0715918	N. Haverhill Water District	8-07-78	690	24	--	--	--	24
HKA 21	440153	0715919	Wolter, John	6-14-90	770	22	--	--	--	22
HKA 22	440841	0720053	Woodsville Water and Light Dept.	4-26-74	460	22	--	--	--	--
HKA 23	440538	0715749	Woodsville Water and Light Dept.	3-20-74	790	12	--	--	--	--
HKB 1	440356	0720305	N.H. Dept. of Transportation	7-00-69	402.6	81	--	--	--	81
HKB 2	440840	0720108	N.H. Dept. of Transportation	9-03-36	460	14	--	--	--	--
HKB 3	440236	0720329	N.H. Dept. of Transportation	7-24-37	480	45.7	--	--	--	45.7
HKB 4	440138	0715831	N.H. Dept. of Transportation	1-17-41	780	62	--	--	--	62
HKS 1	440428	0715955	North Haverhill Water District	--	550	--	--	--	--	--
HKW 1	440858	0720126	Woodsville Water and Light Dept.	5-10-74	440	--	--	42	--	--
HKW 2	440614	0715818	Woodsville Water and Light Dept.	1988	770	47	25	35	--	--
HKW 3	440619	0715819	Woodsville Water and Light Dept.	1988	776.64	32	27	32	--	--
HKW 4	440614	0715818	Woodsville Water and Light Dept.	1988	770	--	33	43	--	44
HKW 5	440048	0720136	Haverhill Corner Water District	2-11-91	890	--	121	600	6	105
HKW 6	440123	0715805	Bearse, Herbert	10-00-60	790	--	26	69	--	--
HKW 7	440154	0720207	Taylor	--	600	--	--	12.8	36	--
HKW 8	440143	0720144	Kent	--	650	--	--	8.6	36	--
HKW 9	440543	0720029	Derosia	1960	520	--	--	172	--	33
HKW 10	440138	0715836	Pike School	--	765	--	--	13	36	--
HKW 11	440451	0715900	--	--	760	--	--	14	--	--
HKW 12	440811	0720102	Guilmette, Henery	9-15-55	620	--	28	105	--	18
HKW 13	440615	0715814	Woodsville Water & Light Dept.	1988	787	46.5	36	41	--	46.5
HKW 14	440612	0715820	Woodsville Water & Light Dept.	3-01-88	770	54	30	50.7	--	54
HKW 15	440609	0715818	Woodsville Water & Light Dept.	2-27-88	770	49	42.7	47.7	--	49
HKW 16	440611	0715817	Woodsville Water & Light Dept.	2-25-88	770	55	30	35	--	55
HKW 17	440610	0715812	Woodsville Water & Light Dept.	2-28-88	770	35	29	34	--	--
HKW 18	440500	0715937	N. Haverhill Water District	8-10-78	670	47.5	--	47	--	47.5
HKW 19	440447	0715858	N. Haverhill Water District	8-08-78	710	34	--	34	--	34
HKW 20	440447	0715858	N. Haverhill Water District	8-16-78	710	23	--	23	--	--
HKW 21	440441	0715949	Blaisdell, Dr.	11-15-90	670	62	40	42.5	2	--
HKW 22	440509	0715835	Haverhill, town of	11-16-90	750	52	24.5	27	2	52

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
				GRAFTON COUNTY—*Continued*			
				Haverhill			
HKA 1	TH	--	--	U	--	--	L
HKA 2	TH	23	3-26-74	U	--	Maher	L
HKA 3	TH	7.2	12-03-87	U	--	Chapman	L
HKA 4	TH	19	3-28-74	U	--	Maher	L
HKA 5	TH	--	--	U	--	Chapman	L
HKA 6	TH	--	--	U	--	Chapman	L
HKA 7	TH	14.7	3-03-88	U	--	Chapman	L
HKA 8	TH	--	--	U	--	--	L
HKA 9	TH	10	5-01-74	U	--	Maher	L
HKA 10	TH	1.2	3-02-88	U	--	--	L
HKA 11	TH	--	--	U	--	Chapman	L
HKA 12	TH	2.5	8-09-78	U	--	--	L
HKA 13	TH	7.5	8-14-78	U	--	--	L
HKA 14	TH	6.2	8-10-78	U	--	--	L
HKA 15	TH	3.5	8-14-78	U	--	--	L
HKA 16	TH	3.5	8-14-78	U	--	--	L
HKA 17	TH	2.1	8-15-78	U	--	--	L
HKA 18	TH	2.1	8-08-78	U	--	--	L
HKA 19	TH	2.3	8-07-78	U	--	--	L
HKA 20	TH	5.16	8-07-78	U	--	--	L
HKA 21	TH	5	6-14-90	U	--	USGS	L
HKA 22	TH	--	--	U	--	Maher	L
HKA 23	TH	--	--	U	--	--	L
HKB 1	BB	--	--	U	--	NHDOT	L
HKB 2	BB	--	--	U	--	NHDOT	L
HKB 3	BB	--	--	U	--	Chas Leary	L
HKB 4	BB	--	--	U	--	Chas Leary	L
HKS 1	Spr	--	--	P	300	--	CA; also known as the Cold Springs
HKW 1	O	8	5-10-74	U	--	Maher	L
HKW 2	O	3.6	1988	U	--	Chapman	L
HKW 3	O	6.00	1988	U	--	Dufresne	L
HKW 4	O	3.6	1988	U	50	Chapman	--
HKW 5	X	--	--	P	60	A+W	L; well flows 8 gal/min
HKW 6	Z	45	10-00-60	H	30	Griffin	--
HKW 7	Dug	8.56	8-05-91	H	--	--	--
HKW 8	Dug	8.6	8-02-91	H	--	--	--
HKW 9	X	--	--	H	1	--	--
HKW 10	Dug	8.22	8-09-91	H	--	--	--
HKW 11	Dug	--	--	P	80	--	Private well supplying several homes in a development
HKW 12	X	--	--	H	20	Tasker	--
HKW 13	O	25.1	1988	U	--	Chapman	L
HKW 14	O	2.3	3-01-88	U	5	Chapman	L
HKW 15	O	.7	2-27-88	U	5	Chapman	L
HKW 16	O	2.3	2-25-88	U	12	Chapman	L
HKW 17	O	2.2	2-28-88	U	4	Chapman	L
HKW 18	O	5.6	8-10-78	U	--	--	L
HKW 19	O	2.25	8-08-78	U	5	--	L
HKW 20	O	1.8	8-16-78	U	50	--	
HKW 21	O	20.8	9-12-91	U	--	USGS	L; H; CA
HKW 22	O	3.70	9-12-91	U	--	USGS	L; H; CA

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
GRAFTON COUNTY—*Continued*										
Haverhill—*Continued*										
HKW 23	440601	0715751	Layden, M.	1984	780	--	124	360	--	115
HKW 24	440713	0715606	Burt	1984	910	--	71	160	--	60
HKW 25	440228	0720256	Fadden, L.	1984	650	--	80	360	--	70
HKW 26	440841	0720122	Woodsville Water and Light Dept.	5-03-74	450	104	91	100	2.5	--
HKW 27	440819	0720155	Woodsville Water and Light Dept.	4-25-74	410	150	--	35	--	--
HKW 28	440616	0715749	Chase, R.	1985	790	--	--	9	--	--
HKW 34	440254	0720043	Candlewood Sportsman Club	1985	780	--	57	202	--	46
HKW 35	440405	0720012	Kazmaerski, T.	1985	700	--	217	223	--	--
HKW 36	440404	0720010	Woodward, D.	1986	710	--	209	270	--	202
HKW 37	440221	0720330	Horton, J.	1985	590	--	77	600	--	60
HKW 39	440154	0720233	Hanson, H.	1986	690	--	89	400	--	82
HKW 40	440418	0715923	Metzger, J.	1986	740	--	122	220	--	110
HKW 41	440149	0715952	Messick, A.	1986	750	--	139	180	--	128
HKW 42	440407	0720012	Brooks, H.	1986	690	--	219	220	--	--
HKW 43	440436	0720056	Baker, L.	1987	510	--	39	240	--	30
HKW 45	440713	0715623	Villamil, R.	1987	880	--	39	125	--	28
HKW 47	440610	0715544	Fiore, J.	1987	1,200	--	19	300	--	8
HKW 49	440439	0715824	Whitney, W.	1987	960	--	125	280	--	88
HKW 52	440221	0720325	Moreau	1987	580	--	63	350	--	53
HKW 53	440226	0720254	Hunt, K.	1987	650	--	101	300	--	90
HKW 63	440227	0720236	Wright, R.	1987	670	--	74	300	--	65
HKW 68	440206	0720256	Schurr, G.	1988	530	--	45	300	--	41
HKW 69	440434	0720055	Johnson, P.	1988	510	--	39	280	--	30
HKW 71	440215	0720323	Gautreau, A.	1988	580	--	108	500	--	99
HKW 77	440424	0720037	Martel, G.	1988	570	--	115	260	--	105
HKW 78	440624	0715551	Brown, E.	1988	1,130	--	19	360	--	7
HKW 79	440430	0720157	Henson, R.	1988	420	--	59	300	--	48
HKW 80	440410	0720021	Natola, F.	1988	680	--	210	215	--	--
HKW 85	440425	0720033	Englert, G.	1988	570	--	109	160	--	100
HKW 86	440712	0715615	Mitchell, V.	1988	880	--	96	140	--	65
HKW 87	440140	0720139	Lackey, P.	1988	680	--	114	305	--	100
HKW 93	440152	0720054	Hall, R.	1989	740	--	20	160	--	10
HKW 94	440153	0720058	Tobey, P.	1989	730	--	40	400	--	28
HKW 95	440203	0720243	Dean, A.	1989	560	--	69	140	--	55
HKW 96	440235	0720300	Hobbs, L.	1989	630	--	39	400	--	28
HKW 98	440415	0720020	Lloyd, R.	1989	640	--	209	400	--	200
HKW 101	440400	0715939	Elliott, C.	1989	760	--	59	180	--	48
HKW 105	440344	0720016	Davis Realty	1989	800	--	19	260	--	8
HKW 110	440356	0715943	Thompson, G.	1989	760	--	13	13	--	--
HKW 111	440520	0715952	Applebee, W.	1989	680	--	9	10	--	--
HKW 112	440707	0715620	Maguire, J.	1989	890	--	27	130	--	16
HKW 113	440417	0720025	Enderson, B.	1989	620	--	173	174	--	--
Landaff										
LFB 1	440620	0715215	N.H. Dept. of Transportation	3-00-75	1,016.8	24	--	--	--	24
LFW 1	441153	0715526	Santy	--	660	--	--	10	--	--
LFW 2	441210	0715427	Nute, J.	1989	850	--	21	330	--	12
LFW 3	441159	0715533	Hill, D.	1989	600	--	41	200	--	28
LFW 4	441141	0715526	Towle, T.	1986	680	--	44	200	--	40

Local site No.	Type of site	Water level: Depth (feet)	Water level: Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
				GRAFTON COUNTY—*Continued*			
				Haverhill—*Continued*			
HKW 23	X	--	--	H	8	A+W	--
HKW 24	X	--	--	H	8.5	A+W	--
HKW 25	X	--	--	H	3.5	A+W	--
HKW 26	O	15	5-03-74	U	15	Maher	L; water reported to have high iron content
HKW 27	O	.1	4-25-74	U	20	Maher	L
HKW 28	Dug	4	7-19-85	H	--	NHWRD 671	--
HKW 34	X	12	11-23-85	H	20	NHWRD 633	--
HKW 35	X	20	8-02-85	H	30	Cushing	L; drilled in till
HKW 36	X	20	10-09-86	H	30	Cushing	L
HKW 37	X	--	--	H	1.25	Cushing	--
HKW 39	X	40	7-01-86	H	4	Cushing	--
HKW 40	X	20	10-13-86	H	40	Cushing	--
HKW 41	X	--	--	H	20	A+W	--
HKW 42	Z	--	--	H	20	A+W	L; drilled in gravel
HKW 43	X	--	--	H	3.5	A+W	--
HKW 45	X	--	--	H	--	Falcon	--
HKW 47	X	--	--	H	8.5	Cushing	L
HKW 49	X	--	--	H	7	Cushing	--
HKW 52	X	--	--	H	10	A+W	--
HKW 53	X	--	--	H	2	A+W	--
HKW 63	X	20	12-02-87	H	3	A+W	L
HKW 68	X	--	--	H	.75	Cushing	L
HKW 69	X	--	--	H	4	A+W	L
HKW 71	X	40	6-16-88	H	1.5	A+W	L
HKW 77	X	--	--	H	3	A+W	L
HKW 78	X	--	--	H	25	Cushing	
HKW 79	X	--	--	H	2	Cushing	L
HKW 80	Z	--	--	H	15	A+W	L; drilled in gravel
HKW 85	X	--	--	H	25	Cushing	L
HKW 86	X	--	--	H	8	Cushing	--
HKW 87	X	20	10-04-88	H	4.5	NHWRD 171	--
HKW 93	X	--	--	H	5	Cushing	--
HKW 94	X	--	--	H	.75	Cushing	--
HKW 95	X	--	--	H	6	Cushing	--
HKW 96	X	20	5-18-89	H	2	A+W	L
HKW 98	X	--	--	H	4	Cushing	--
HKW 101	X	--	--	H	15	Cushing	--
HKW 105	X	--	--	H	6	NHWRD 150	--
HKW 110	Dug	--	--	H	--	NHWRD 403	--
HKW 111	Dug	7	8-04-89	H	--	NHWRD 403	--
HKW 112	X	--	--	H	6	Falcon	--
HKW 113	Z	--	--	H	5	Falcon	L; drilled in gravel
				Landaff			
LFB 1	BB	--	--	U	--	NHDOT	L
LFW 1	Dug	5	8-07-91	H	--	--	Water quality reported to be good
LFW 2	X	--	--	H	1.25	Falcon	--
LFW 3	X	--	--	H	10	Cushing	--
LFW 4	X	--	--	H	4	Falcon	--

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Landaff—*Continued*							
LFW 5	441119	0715513	Erb, D.	1984	690	--	39	436	--	18
LFW 6	441200	0715530	Callender, W.	1987	590	--	39	180	--	30
LFW 7	441153	0715549	Curtis, G.	1987	600	--	45	130	--	35
LFW 10	441111	0715511	Hubbard, D.	1987	710	--	59	280	--	50
LFW 11	441208	0715431	Titus, E.	1987	830	--	30	100	--	15
LFW 15	441201	0715525	Kimber, G.	1987	600	--	39	405	--	30
LFW 21	441143	0715538	Currier, S.	1988	640	--	56	340	--	50
			Lebanon							
LHA 1	433714	0721952	Lebanon Landfill	4-28-86	368	80	--	--	--	--
LHB 1	433802	0721942	N.H. Dept. of Transportation	10-00-63	339.2	80	--	--	--	--
LHB 2	433755	0721912	N.H. Dept. of Transportation	8-00-63	350	75	--	--	--	--
LHB 3	433833	0721621	N.H. Dept. of Transportation	2-00-64	530	88	--	--	--	88
LHB 4	433838	0721839	N.H. Dept. of Transportation	10-00-47	380.4	62	--	--	--	--
LHB 5	433859	0721515	N.H. Dept. of Transportation	4-00-64	590	44	--	--	--	44
LHB 6	433815	0721559	N.H. Dept. of Transportation	8-00-71	503.7	36	--	--	--	36
LHB 9	433836	0721517	N.H. Dept. of Transportation	11-00-67	575.2	16.5	--	--	--	16.5
LHB 10	433838	0721415	N.H. Dept. of Transportation	4-00-84	588.8	44.5	--	--	--	--
LHB 11	433815	0721629	N.H. Dept. of Transportation	11-00-75	471.1	39	--	--	--	39
LHB 12	433802	0721904	N.H. Dept. of Transportation	3-00-74	354.9	52	--	--	--	52
LHB 13	433808	0721708	--	3-00-64	577.2	40	--	--	--	20
LHB 14	433812	0721247	N.H. Dept. of Transportation	10-00-63	656.1	48	--	--	--	48
LHB 15	433843	0721403	N.H. Dept. of Transportation	3-00-64	620	22	--	--	--	22
LHB 16	433856	0721454	N.H. Dept. of Transportation	8-00-63	572.6	36	--	--	--	36
LHB 17	433816	0721250	N.H. Dept. of Transportation	7-00-63	656.2	27	--	--	--	27
LHB 18	433806	0721244	--	5-00-59	702	71.5	--	--	--	71.5
LHB 19	433826	0721316	N.H. Dept. of Transportation	4-00-64	653.7	63	--	--	--	63
LHB 20	433827	0721633	N.H. Dept. of Transportation	2-00-64	500.9	62	--	--	--	62
LHB 21	433821	0721645	N.H. Dept. of Transportation	4-00-64	465.1	21	--	--	--	21
LHB 22	433817	0721653	N.H. Dept. of Transportation	1900	490	42.5	--	--	--	27
LHW 1	433648	0721949	Lebanon Landfill	10-14-87	414.6	55.2	45	55	1.5	30
LHW 2	433704	0721940	Lebanon Landfill	11-10-87	418.5	122.5	117.2	122.5	1.5	--
LHW 3	433704	0721945	Lebanon Landfill	11-05-87	393.9	80.5	70.5	80.5	1.5	--
LHW 4	433702	0721940	Lebanon Landfill	12-01-87	418.6	100.8	90.6	100.2	1.5	--
LHW 5	433702	0721944	Lebanon Landfill	9-29-87	403.1	174	167	172	1.5	--
LHW 6	433702	0721949	Lebanon Landfill	11-03-87	387.4	76.3	65	75.5	1.5	--
LHW 7	433657	0721958	Lebanon Landfill	11-02-87	339.8	62	54.1	59.4	1.5	--
LHW 8	433656	0721944	Lebanon Landfill	10-21-87	411.6	101.5	90.4	100	1.5	--
LHW 9	433656	0721951	Lebanon Landfill	10-26-87	418.5	108.3	98.7	108.3	1.5	84
LHW 10	433649	0721939	Lebanon Landfill	10-16-87	426.9	103.1	90	95	1.5	96.1
LHW 11	433648	0721956	Lebanon Landfill	10-12-87	378.8	70.9	61.1	70.7	1.5	--
LHW 12	433704	0721948	Lebanon Landfill	10-11-83	382.2	70.4	60.4	70.4	1.5	--
LHW 13	433707	0721956	Lebanon Landfill	10-07-83	344.7	62	40	55	1.5	--
LHW 14	433712	0721956	Lebanon Landfill	10-18-84	344.4	--	15	45	1.5	--
LHW 15	433705	0721955	Lebanon Landfill	10-03-83	343.9	103	18	98	1.5	--
LHW 16	433717	0721940	Lebanon Landfill	10-23-84	384.3	76	64	74	1.5	--
LHW 17	433714	0721940	Lebanon Landfill	10-24-84	384.6	77	65	75	1.5	--
LHW 18	433715	0721947	Lebanon Landfill	4-30-86	368	62	48.5	58.5	1.5	--
LHW 20	433854	0721037	Buddeman, N.	1987	760	--	30	220	--	20

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
			GRAFTON COUNTY—*Continued*				
			Landaff—*Continued*				
LFW 5	X	--	--	H	3	NHWRD 3	--
LFW 6	X	--	--	H	5	Falcon	--
LFW 7	X	--	--	H	4	Falcon	--
LFW 10	X	--	--	H	1	Falcon	--
LFW 11	X	--	--	H	12	Cushing	--
LFW 15	X	--	--	H	.5	Falcon	--
LFW 21	X	--	--	H	.75	Cushing	--
			Lebanon				
LHA 1	TH	26.5	4-29-86	U	--	Con-Tec	L
LHB 1	BB	--	--	U	--	NHDOT	L
LHB 2	BB	--	--	U	--	NHDOT	L
LHB 3	BB	35	2-00-64	U	--	NHDOT	L
LHB 4	BB	--	--	U	--	NHDOT	L
LHB 5	BB	--	--	U	--	NHDOT	L
LHB 6	BB	--	--	U	--	NHDOT	L
LHB 9	BB	--	--	U	--	NHDOT	L
LHB 10	BB	--	--	U	--	NHDOT	L
LHB 11	BB	--	--	U	--	NHDOT	L
LHB 12	BB	--	--	U	--	NHDOT	L
LHB 13	BB	--	--	U	--	NHDOT	L
LHB 14	BB	--	--	U	--	NHDOT	L
LHB 15	BB	1	03-00-64	U	--	NHDOT	L
LHB 16	BB	1	08-00-63	U	--	NHDOT	L
LHB 17	BB	9	7-00-63	U	--	NHDOT	L
LHB 18	BB	2.5	5-00-59	-	--	NHDOT	L
LHB 19	BB	1	4-00-64	U	--	NHDOT	L
LHB 20	BB	--	--	U	--	NHDOT	L
LHB 21	BB	--	--	U	--	NHDOT	L
LHB 22	BB	--	--	U	--	NHDOT	L
LHW 1	O	--	--	-	--	Maine T.B.	L; dry hole
LHW 2	O	87.1	12-03-87	U	--	Maine T.B.	L; 1 of 2 wells. Other well is 90 feet deep
LHW 3	O	66.3	12-03-87	U	--	Maine T.B.	L
LHW 4	O	87.5	12-03-87	U	--	Maine T.B.	L
LHW 5	O	75.6	10-28-87	U	--	Maine T.B.	L; 1 of 2 wells. Other well is 80 feet deep
LHW 6	O	60.2	12-03-87	U	--	Maine T.B.	L
LHW 7	O	12.4	12-03-87	U	--	Maine T.B.	L; 1 of 2 wells. Other well is 23 feet deep
LHW 8	O	79.6	10-28-87	U	--	Maine T.B.	L
LHW 9	O	80.2	11-03-87	U	--	Maine T.B.	L
LHW 10	O	71	10-28-87	U	--	Maine T.B.	L; 1 of 2 wells. Other is bedrock well to 103 feet
LHW 11	O	53.2	10-28-87	U	--	Maine T.B.	L
LHW 12	O	58.5	10-12-83	U	--	Con-Tec	L
LHW 13	O	23	10-10-83	U	--	Con-Tec	L
LHW 14	O	23.8	10-22-84	U	--	Con-Tec	L
LHW 15	O	24	10-05-83	U	--	Con-Tec	L
LHW 16	O	60.9	10-24-84	U	--	Con-Tec	L
LHW 17	O	60.7	10-25-84	U	--	Con-Tec	L
LHW 18	O	35	5-01-86	U	--	Con-Tec	L
LHW 20	X	--	--	H	5	A+W	--

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Lebanon—*Continued*							
LHW 25	433639	0721940	Dutton, Herbert	8-16-61	405	--	20	127	--	15
LHW 26	433747	0721916	Bager, Theodore	1964	355	--	43	98	--	38
LHW 27	433758	0721847	Lozeau, Maurice	1961	370	--	21	107	--	16
LHW 30	434044	0721805	Chambers, W.	1948	400	--	20	122	--	15
LHW 31	434100	0721738	Haslam, John	1959	510	--	24	108	--	16
LHW 36	433900	0721022	LeBrun, Eugene	1962	805	--	109	185	--	104
LHW 40	433906	0721026	Dupuys	1963	827	--	20	125	--	15
LHW 41	433812	0721238	Fizette	1961	675	--	47	85	--	40
LHW 42	433812	0721243	Fizette, Emma	1961	670	--	41	85	--	34
LHW 66	434022	0721422	Haggerty	1964	640	--	21	130	--	15
LHW 67	434002	0721429	Lemay, Francis	1951	640	--	100	100	--	10
LHW 68	433954	0721435	Movelle	1963	630	--	45	160	--	37
LHW 76	434120	0721731	Granite State Broadcasting	1951	460	--	19	145	--	10
LHW 79	434104	0721626	Hanover Landfill	5-13-88	630	20.5	6	14	1.5	20.5
LHW 80	434103	0721624	Hanover Landfill	5-12-88	620	--	8	15	1.5	--
LHW 81	434102	0721622	Hanover Landfill	5-12-88	620	12.5	2.5	11.5	1.5	12.5
LHW 82	433842	0721453	Lebanon, town of	2-08-88	580	--	2	17	2	--
LHW 83	433821	0721706	Split Ball Bearing Co.	3-15-87	520	--	20	30	2	--
LHW 84	433824	0721656	Split Ball Bearing Co.	3-15-87	470	--	15	20	2	--
LHW 85	433909	0721514	Hodges Development Corp.	10-22-87	590	--	2	12	2	--
LHW 86	433904	0721515	Hodges Development Corp	10-21-87	588.8	16	2.5	12.5	2	--
LHW 87	433757	0721910	Johnson and Dix	8-25-88	358	25	14.5	24.5	4	--
LHW 88	433822	0721517	Kleen Laundry	5-02-89	510	29	--	24	--	24
LHW 94	433809	0721718	Bazilchuk, E.	1984	510	--	46	220	--	37
LHW 120	434010	0721414	Highway Patrol Shed	1985	615	--	39	260	--	8
LHW 128	433823	0721625	Longacre Nursery	1986	475	--	68	185	--	55
LHW 160	433724	0721345	Kelly, R.	1987	655	--	79	165	--	70
LHW 165	433810	0721229	Crump, C.	1987	675	--	101	220	--	90
LHW 168	433810	0721709	Gerrish Corp	1987	560	--	28	475	--	5
LHW 188	433843	0721445	Bailey	1988	590	--	39	100	6	30
LHW 209	433829	0721608	Burdick, B.	1988	540	--	29	305	--	19
LHW 217	433858	0721019	Church of Latter Day Saint	1988	800	--	101	400	--	87
LHW 233	433812	0721255	Exit 17 Partnership	1989	670	--	70	160	--	60
			Lisbon							
LLA 1	441320	0715419	--	4-17-78	575	17	--	--	--	17
LLA 7	441416	0715307	Moulton Construction, Inc.	11-19-90	590	71	--	--	--	71
LLB 1	441530	0714946	N.H. Dept. of Transportation	6-00-79	670.7	32	--	--	--	32
LLB 2	441439	0715320	N.H. Dept. of Transportation	1-00-74	605	45	--	--	--	45
LLB 3	441414	0715251	N.H. Dept. of Transportation	11-00-77	599.1	19.5	--	--	--	19.5
LLB 4	441416	0715248	N.H. Dept. of Transportation	10-00-77	596	34.5	--	--	--	34.5
LLB 7	441431	0715232	N.H. Dept. of Transportation	9-00-77	641.8	18	--	--	--	3
LLB 8	441446	0715205	N.H. Dept. of Transportation	7-00-78	616	29.5	--	--	--	29.5
LLB 9	441400	0715137	N.H. Dept. of Transportation	1-00-68	784.9	17	--	--	--	17
LLW 1	441313	0715409	Lisbon, town of	10-05-91	570	55	43	55	18	--

Local site No.	Type of site	Water level: Depth (feet)	Water level: Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
				GRAFTON COUNTY—*Continued*			
				Lebanon—*Continued*			
LHW 25	X	20	8-16-61	H	2	A+W	--
LHW 26	X	--	--	H	3	D. Herrick	--
LHW 27	X	--	--	H	15	A+W	--
LHW 30	X	--	--	H	2	D. Herrick	--
LHW 31	X	14	1959	H	9	A+W	--
LHW 36	X	20	1962	H	6	A+W	--
LHW 40	X	--	--	H	8	E-H	--
LHW 41	X	--	--	H	30	A+W	--
LHW 42	X	--	--	H	24	A+W	--
LHW 66	X	20	1964	H	10	A+W	--
LHW 67	X	--	--	H	20	O. Dube	--
LHW 68	X	--	--	H	3	A+W	--
LHW 76	X	80	1951	H	14	Chapman	--
LHW 79	O	6.3	5-13-88	U	--	Soils Eng.	VOC contamination reported
LHW 80	O	2.5	5-12-88	U	--	Soils Eng.	L
LHW 81	O	2.5	5-12-88	U	--	Soils Eng.	L
LHW 82	O	6.8	2-08-88	U	--	Green MTN.	L; 1 of 4 monitoring wells
LHW 83	O	19.9	3-31-87	U	--	--	L; 1 of 4 test borings
LHW 84	O	5.6	3-31-87	U	--	--	L; petroleum contamination reported here
LHW 85	O	4	10-22-87	U	--	NH Boring	L; petroleum contamination reported here
LHW 86	O	3.1	10-22-87	U	--	NH Boring	L; petroleum contamination reported here
LHW 87	O	18.3	8-25-88	U	--	Kennedy	L; 1 of 4 monitoring wells
LHW 88	O	9	5-02-89	U	--	Env. Drill.	L
LHW 94	X	--	--	C	42	A+W	--
LHW 120	X	20	5-20-85	H	12	NHWRD 204	--
LHW 128	X	--	--	Z	100	Valley Art.	--
LHW 160	X	--	--	H	20	Valley Art.	--
LHW 165	X	--	--	H	10	A+W	L
LHW 168	X	--	--	C	30	NHWRD 130	--
LHW 188	X	5	4-15-88	U	20	Valley Art.	
LHW 209	X	--	--	H	2	Valley Art.	--
LHW 217	X	--	--	T	30	Valley Art.	L
LHW 233	X	25	10-21-89	H	15	A+W	L
				Lisbon			
LLA 1	TH	--	--	U	--	--	--
LLA 7	TH	2	11-19-90	U	--	USGS	L
LLB 1	BB	19.5	6-00-79	U	--	NHDOT	L
LLB 2	BB	--	--	U	--	NHDOT	L
LLB 3	BB	7.8	11-00-77	U	--	NHDOT	L
LLB 4	BB	4.5	10-00-77	U	--	NHDOT	L
LLB 7	BB	--	--	U	--	NHDOT	L
LLB 8	BB	10.5	7-00-78	U	--	NHDOT	L
LLB 9	BB	--	--	U	--	NHDOT	--
LLW 1	GPW	7.74	10-05-91	P	439	D.L. Maher	Located 200 feet from LLW-2; well used as a backup supply to well LLW-2

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
				GRAFTON COUNTY—*Continued*						
				Lisbon—*Continued*						
LLW 2	441313	0715409	Lisbon, town of	7-17-78	570	49	39	49	12	--
LLW 3	441313	0715414	Lisbon, town of	4-26-78	570	60	49	59	2.5	60
LLW 4	441315	0715412	Lisbon, town of	4-18-78	572	47	35	40	2.5	47
LLW 5	441318	0715412	Lisbon, town of	4-17-78	575	52	45	50	2.5	52
LLW 6	441315	0715355	Lisbon, town of	7-13-78	570	57	40	45	2.5	--
LLW 7	441522	0715338	--	1951	655	--	--	3	36	--
LLW 8	441451	0715119	Spoaner	1960	630	--	--	35	--	6
LLW 9	441520	0715233	Coley	1962	760	--	80	385	--	75
LLW 10	441325	0715405	Finley	11-15-61	640	--	43	128	--	33
LLW 11	441249	0715344	Lisbon, town of	4-14-78	730	47	35	40	2.5	--
LLW 12	441248	0715342	Lisbon, town of	4-19-78	730	66	55	60	2.5	66
LLW 14	441216	0715532	Lisbon, town of	8-29-86	580	15.5	9.1	14.1	2	15.5
LLW 15	441215	0715529	Lisbon, town of	8-26-86	580	29	18.5	28.5	2	29
LLW 16	441212	0715526	Lisbon, town of	8-22-86	551.3	31	15.9	25.9	2	31
LLW 17	441207	0715533	Lisbon, town of	8-25-86	555	26.3	8.3	23.3	2	26.3
LLW 18	441207	0715537	Lisbon, town of	8-26-86	553	31.5	4.3	24.3	2	27
LLW 19	441401	0715315	Presby, Lester	11-16-90	590	42	39.5	42	2	--
LLW 20	441439	0715257	Rymph, T. Merton	10-02-90	640	119	116.5	119	2	--
LLW 21	441334	0715338	Clark	1984	585	--	74	175	--	60
LLW 22	441416	0715228	Locke, R.	1985	660	--	62	220	--	50
LLW 23	441511	0715146	Higgens, D.	1985	750	--	60	230	--	57
LLW 24	441459	0715315	Doubleday, C.	6-15-90	700	--	245	405	6	235
LLW 25	441443	0715314	McKown, K.	10-19-90	690	--	113	600	6	98
LLW 26	441515	0715228	Hesseltine, Eric	10-04-90	740	--	29	200	6	12
LLW 27	441608	0714851	Wallace, W.	1986	720	--	20	440	--	11
LLW 28	441321	0715430	Haywood, H.	1986	630	--	44	225	--	38
LLW 29	441321	0715342	Mossey, P.	1987	600	--	24	280	--	14
LLW 31	441320	0715427	Ingerson, S.	1987	620	--	41	300	--	36
LLW 33	441425	0715244	Simpson, R.	1987	640	--	19	140	--	16
LLW 36	441459	0715318	Barnes, W.	1988	660	--	204	600	--	190
LLW 42	441312	0715348	McKenna, M.	1988	630	--	24	230	--	15
LLW 44	441324	0715421	Mason, L.	1988	630	--	20	150	--	11
LLW 45	441358	0715432	Derocia, L.	1989	750	--	39	155	--	30
LLW 46	441439	0715337	Ober, G.	1989	790	--	39	405	--	8
LLW 48	441455	0715127	Collins, M.	1989	650	--	27	200	--	17
LLW 50	441540	0714907	Merz, J.	1989	790	--	72	300	--	61
LLW 52	441508	0715323	Gaffney, R.	1989	720	--	158	400	--	147
LLW 54	441407	0715334	Filias, A.	1989	640	--	21.5	205	--	3
LLW 55	441536	0714934	Robinson, M.	1989	680	--	34	155	--	25
				Littleton						
LNA 1	441840	0715203	--	1-19-88	810	52	--	--	--	52
LNA 2	441840	0715208	--	1-14-88	820	29	--	--	--	29
LNA 3	441837	0715211	--	1-18-88	810	42	--	--	--	--
LNA 4	441836	0715212	--	1-13-88	810	20	--	--	--	--
LNA 5	442136	0714821	--	1-28-88	840	9.5	--	--	--	--

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
						GRAFTON COUNTY—*Continued*	
						Lisbon—*Continued*	
LLW 2	GPW	6.6	7-17-78	P	75	Layne	L; CA; aquifer-test results reported in table 3. Also known as the Caswell Meadow Well
LLW 3	O	6	4-27-78	U	60	Layne	L
LLW 4	O	4.3	4-18-78	U	50	Layne	L
LLW 5	O	6.2	4-17-78	U	--	Layne	L
LLW 6	O	5	7-14-78	U	--	Layne	L
LLW 7	Dug	1.2	7-30-91	H	--	--	Water quality reported to be excellent
LLW 8	O	--	--	H	--	--	--
LLW 9	X	--	--	S	--	E-H	--
LLW 10	X	12	11-15-61	H	--	Tasker	--
LLW 11	O	.1	4-25-78	U	50	Layne	L
LLW 12	O	1.4	4-19-78	U	60	Layne	L
LLW 14	O	12.7	8-29-86	U	--	Miller	L; wells LLW-14 through LLW-18 located in towr landfill
LLW 15	O	19.2	8-29-86	U	--	Miller	L
LLW 16	O	9.93	8-29-86	U	--	Miller	L
LLW 17	O	14.1	8-29-86	U	--	Miller	L
LLW 18	O	12.4	8-29-86	U	--	Miller	L
LLW 19	O	12.3	12-27-90	U	--	USGS	L; H; CA
LLW 20	O	16.9	12-27-90	U	--	USGS	L; H; CA
LLW 21	X	--	--	H	12	NHWRD 192	--
LLW 22	X	--	--	H	50	Cushing	--
LLW 23	X	--	--	H	10	NHWRD 524	--
LLW 24	X	--	--	H	1	Falcon	L
LLW 25	X	--	--	H	1.5	Cushing	--
LLW 26	X	--	--	H	5	Cushing	L
LLW 27	X	100	6-20-86	H	1.5	Cushing	--
LLW 28	X	--	--	H	5	NHWRD 192	--
LLW 29	X	--	--	H	15	Falcon	--
LLW 31	X	--	--	H	1	Cushing	--
LLW 33	X	--	--	H	6	Cushing	--
LLW 36	X	--	--	H	.25	Cushing	--
LLW 42	X	--	--	H	6	Falcon	--
LLW 44	X	--	--	H	20	NHWRD 192	--
LLW 45	X	--	--	H	4.5	Falcon	--
LLW 46	X	--	--	H	.75	Falcon	--
LLW 48	X	--	--	H	3	Cushing	--
LLW 50	X	--	--	H	4	Cushing	--
LLW 52	X	--	--	H	5	Cushing	L
LLW 54	X	--	--	H	20	Falcon	--
LLW 55	X	--	--	H	11	Falcon	--
						Littleton	
LNA 1	TH	--	--	U	--	--	L
LNA 2	TH	12.8	1-18-88	U	--	--	L
LNA 3	TH	14.8	1-19-88	U	--	--	L
LNA 4	TH	14.3	1-13-88	U	--	--	L
LNA 5	TH	--	--	U	--	--	L

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date com-pleted (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Littleton—*Continued*							
LNA 6	442138	0714816	--	1-28-88	840	12	--	--	--	12
LNA 8	441829	0714649	Ross Oil Co.	7-19-88	830	13.8	--	--	--	13.8
LNA 9	441651	0714756	Littleton Water and Light Dept.	4-18-88	810	20	--	--	--	20
LNA 10	441726	0714817	Littleton Water and Light Dept.	5-07-80	700	29.3	--	--	--	29.3
LNA 11	441702	0714806	--	5-15-80	750	28	--	--	--	28
LNA 12	441716	0714810	Littleton Water and Light Dept.	5-14-80	720	31	--	--	--	31
LNA 13	441700	0714821	Littleton Water and Light Dept.	5-13-80	690	13.6	--	--	--	13.7
LNA 14	441702	0714818	Littleton Water and Light Dept.	5-13-80	695	15.4	--	--	--	15.4
LNA 15	441707	0714819	Littleton Water and Light Dept.	5-13-80	695	14	--	--	--	14
LNA 16	441707	0714822	Littleton Water and Light Dept.	5-13-80	690	13.8	--	--	--	13.8
LNA 17	441712	0714822	Littleton Water and Light Dept.	5-14-80	690	27.3	--	--	--	27.3
LNA 18	441727	0714815	Littleton Water and Light Dept.	5-07-80	700	23.6	--	--	--	23.6
LNA 19	441703	0714754	Littleton Water and Light Dept.	5-15-80	800	17.7	--	--	--	17.7
LNA 20	441742	0714818	Littleton Water and Light Dept.	5-08-80	715	13	--	--	--	13
LNA 21	441747	0714807	Littleton Water and Light Dept.	5-08-80	700	16.1	--	--	--	16.1
LNA 22	441744	0714802	Littleton Water and Light Dept.	5-15-80	740	31	--	--	--	31
LNA 23	441747	0714802	Littleton Water and Light Dept.	5-15-80	740	26	--	--	--	26
LNA 24	441850	0714717	Littleton Water and Light Dept.	5-15-80	840	6	--	--	--	--
LNA 25	441731	0714812	Littleton Water And Light Dept.	5-07-80	700	14.1	--	--	--	14.1
LNA 26	441718	0714815	Littleton Water and Light Dept.	5-14-80	705	17.8	--	--	--	17.8
LNA 27	441707	0714812	Littleton Water and Light Dept.	5-14-80	730	33.5	--	--	--	33.5
LNA 28	441703	0714810	Littleton Water and Light Dept.	5-15-80	730	28	--	--	--	28
LNB 1	441830	0714756	N.H. Dept. of Transportation	8-00-58	756.7	66	--	--	--	66
LNB 2	442036	0715326	N.H. Dept. of Transportation	7-00-72	654.6	35	--	--	--	--
LNB 3	442031	0715320	N.H. Dept. of Transportation	5-00-34	652.3	28	--	--	--	28
LNB 4	441820	0714614	N.H. Dept. of Transportation	8-00-48	790	13.5	--	--	--	12.5
LNB 5	442023	0715325	N.H. Dept. of Transportation	1900	692.8	42	--	--	--	42
LNB 10	441901	0714752	N.H. Dept. of Transportation	1979	821.1	46	--	--	--	46
LNB 11	441816	0714750	N.H. Dept. of Transportation	1958	719.3	37	--	--	--	--
LNB 12	441859	0715146	N.H. Dept. of Transportation	1978	805.3	76	--	--	--	--
LNB 13	441859	0715144	N.H. Dept. of Transportation	1978	804	83.2	--	--	--	--
LNB 14	441857	0715140	N.H. Dept. of Transportation	7-00-80	802.9	26	--	--	--	12.5
LNB 15	441855	0715134	N.H. Dept. of Transportation	1978	804.5	16.5	--	--	--	6.5
LNB 16	441817	0714748	N.H. Dept. of Transportation	1958	716.7	29.5	--	--	--	25
LNB 17	441853	0715130	N.H. Dept. of Transportation	1980	802.8	39.6	--	--	--	19
LNB 18	441852	0715126	N.H. Dept. of Transportation	1980	840	26	--	--	--	--
LNB 19	442031	0715327	N.H. Dept. of Transportation	7-00-72	657.2	44	--	--	--	--
LNB 20	441813	0714747	N.H. Dept. of Transportation	8-00-58	763.6	20.4	--	--	--	--
LNB 21	441814	0714744	N.H. Dept. of Transportation	1900	772.6	19.3	--	--	--	19.3
LNW 1	441907	0714750	Littleton Water and Light Dept.	1963	820	--	133	500	16	115
LNW 2	441854	0715148	--	10-11-88	830	90	--	90	--	--
LNW 3	441854	0715148	--	1-21-88	830	99	--	99	--	--
LNW 4	441852	0715149	--	2-12-88	830	96	--	92	--	--
LNW 5	441858	0715151	--	1-20-88	810	81	--	41	--	81
LNW 6	441834	0715212	--	1-13-88	810	59	--	42	--	--
LNW 7	441739	0714808	Littleton Water and Light Co.	5-06-80	700	18.2	13	18	--	18.2
LNW 8	441734	0714809	Littleton Water and Light Co.	5-07-80	700	19.5	14	19	--	19.5
LNW 27	441834	0714723	Littleton Water and Light Co.	5-06-88	770	14	--	13	--	--
LNW 29	441834	0714721	Littleton Water and Light Co.	5-06-88	769.9	14	4	14	2	--
LNW 31	441818	0714724	Littleton Landfill	11-30-84	758.5	15	10	15	2	15

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
				GRAFTON COUNTY—*Continued*			
				Littleton—*Continued*			
LNA 6	TH	--	--	U	--	--	L
LNA 8	TH	6.8	7-19-88	U	--	--	L
LNA 9	TH	--	--	U	--	--	L
LNA 10	TH	6.5	5-07-80	U	--	Chapman	L
LNA 11	TH	19.3	5-15-80	U	--	Chapman	L
LNA 12	TH	12.1	5-14-80	U	--	Chapman	L
LNA 13	TH	2.8	5-13-80	U	--	Chapman	L
LNA 14	TH	5.3	5-13-80	U	--	Chapman	L
LNA 15	TH	4.9	5-13-80	U	--	Chapman	L
LNA 16	TH	5.1	5-13-80	U	--	Chapman	L
LNA 17	TH	5.8	5-14-80	U	--	Chapman	L
LNA 18	TH	4.8	5-07-80	U	--	Chapman	L
LNA 19	TH	11.2	5-15-80	U	--	Chapman	L
LNA 20	TH	3.3	5-08-80	U	--	Chapman	L
LNA 21	TH	5.5	5-08-80	U	--	Chapman	L
LNA 22	TH	--	--	U	--	Chapman	L
LNA 23	TH	--	--	U	--	Chapman	L
LNA 24	TH	--	--	U	--	Chapman	L
LNA 25	TH	4.46	5-07-80	U	--	Chapman	L
LNA 26	TH	3.1	5-14-80	U	--	Chapman	L
LNA 27	TH	15.7	5-14-80	U	--	Chapman	L
LNA 28	TH	19.3	5-15-80	U	--	Chapman	L
LNB 1	BB	--	--	U	--	NHDOT	L
LNB 2	BB	--	--	U	--	NHDOT	L
LNB 3	BB	--	--	U	--	NHDOT	L
LNB 4	BB	--	--	U	--	NHDOT	L
LNB 5	BB	--	--	U	--	NHDOT	L
LNB 10	BB	31	1979	U	--	NHDOT	L
LNB 11	BB	--	--	U	--	NHDOT	L
LNB 12	BB	0	1978	U	--	Haley	L
LNB 13	BB	0	1978	U	--	Haley	L; bridge never built
LNB 14	BB	0	7-00-80	-	--	Haley	L
LNB 15	BB	--	--	U	--	Haley	L
LNB 16	BB	--	--	U	--	NHDOT	L
LNB 17	BB	--	--	U	--	Haley	L
LNB 18	BB	--	--	U	--	Haley	L
LNB 19	BB	--	--	U	--	NHDOT	L
LNB 20	BB	--	--	U	--	ADC	L
LNB 21	BB	--	--	U	--	NHDOT	L
LNW 1	X	0	1963	U	425	Chapman	Reportedly hard water; well was once used for municipal supply
LNW 2	TW	11.8	10-12-88	U	--	--	L; aquifer-test results reported in table 3
LNW 3	O	17.1	1-21-88	U	--	--	L
LNW 4	O	22.9	2-12-88	U	--	--	L
LNW 5	O	10.9	1-25-88	U	--	--	L
LNW 6	O	14.4	1-14-88	U	--	--	L
LNW 7	O	6	5-06-91	U	35	Chapman	L
LNW 8	O	4.58	5-07-80	U	15	Chapman	L
LNW 27	O	6.1	5-06-88	U	--	--	L
LNW 29	O	7.35	5-06-88	U	--	NH Boring	L
LNW 31	O	2.1	11-30-84	U	--	Soil Exp.	L

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Littleton—*Continued*							
LNW 32	441826	0714720	Littleton Landfill	11-29-84	745.6	18	13	18	2	18
LNW 33	441822	0714729	Littleton Landfill	11-29-84	728.8	15	2.5	12.5	2	--
LNW 34	441816	0714735	Littleton Landfill	11-29-84	752.9	28	23	28	2	--
LNW 35	441822	0714731	Littleton Landfill	5-13-86	728.7	--	25	100	--	14
LNW 36	441650	0714817	Littleton Water and Light Dept.	4-07-88	741.4	34	11	21	2	34
LNW 37	441656	0714813	Littleton Water and Light Dept.	4-08-88	720	10.6	--	10	--	--
LNW 38	441656	0714805	Littleton Water and Light Dept.	4-11-88	754.4	17	7	17	2	17
LNW 39	441646	0714814	Littleton Water and Light Dept.	4-06-88	757.5	17.5	3	13	2	17.5
LNW 40	441652	0714811	Littleton Water and Light Dept.	4-08-88	760	24	3.5	13.5	2	24
LNW 41	441715	0714818	Littleton Water and Light Dept.	5-13-80	690	--	21	30	--	30
LNW 42	441743	0714813	Littleton Water and Light Dept.	5-08-80	710	--	14	23	2.5	23
LNW 43	441742	0714807	Littleton Water and Light Dept.	5-06-80	700	--	7	16.7	2.5	16.8
LNW 44	441747	0714815	Littleton Water and Light Dept.	5-00-80	710	22	13	18	2.5	22
LNW 45	441738	0714817	Littleton Water and Light Dept.	5-12-80	710	24	13	18	2.5	24
LNW 46	441742	0714815	Littleton Water and Light Dept.	5-08-80	710	23.4	11	15	2.5	23.4
LNW 53	441854	0714340	Conley, W.	1985	945	--	142	255	--	131
LNW 56	441826	0715236	Twombly, A.	1984	860	--	63	70	--	--
LNW 60	441833	0715245	Savage, L.	1985	890	--	20	100	--	--
LNW 62	441828	0715248	Hight, S.	1985	880	--	104	360	--	90
LNW 69	441939	0715221	State of New Hampshire	1985	880	--	99	505	--	20
LNW 80	441926	0714742	Littleton Water and Light Dept.	1987	830	--	299	480	--	260
LNW 83	441823	0715323	Allen, R.	1987	850	--	45	280	--	36
LNW 84	441839	0715249	Colicchio, T.	1987	860	--	19	280	--	4
LNW 86	441921	0714745	Littleton Water and Light Dept.	1987	820	--	249	650	--	237
LNW 87	442134	0714813	Aldrich, C.	1987	900	--	179	280	--	--
LNW 97	441904	0715250	Wharem, P.	1987	980	--	19	200	--	10
LNW 106	441841	0714359	Persons, R.	1988	870	--	83	600	--	76
LNW 107	441825	0714719	Littleton Lumber Co	1988	750	--	32	165	--	25
LNW 111	441844	0715257	Reis, M.	1988	920	--	83	500	--	50
LNW 116	441857	0715535	Sherrard, J.	1988	970	--	29	260	--	17
LNW 117	441900	0715524	Legallee, S.	1988	940	--	77	400	--	50
LNW 121	441647	0714830	Hall, J.	1988	690	--	21	180	--	10
LNW 133	442135	0714811	Clark, E.	1989	900	--	41	120	--	--
LNW 140	441727	0714829	Towle Jr., L.	1989	780	--	20	240	--	6
			Lyman							
LXB 1	441343	0715749	N.H. Dept. of Transportation	9-00-83	717.5	39.5	--	--	--	39.5
LXB 2	441326	0715739	N.H. Dept. of Transportation	9-00-83	697.5	29	--	--	--	29
LXW 1	441653	0715528	Dodge, Clayton	9-10-60	830	--	20	100	--	10
LXW 2	441612	0715431	Huber, Bette	4-24-90	680	--	21	600	6	4
LXW 3	441534	0715348	Oates	8-11-90	680	--	140	200	6	125
LXW 4	441629	0715410	Branco, J.	10-04-90	740	--	88	200	6	48
LXW 5	441524	0715401	Huntington, W.	3-30-90	700	--	21	340	6	9
LXW 6	441548	0715359	Jelley, Ed	1971	680	--	--	5.9	36	--
LXW 7	441537	0715419	Clough	1956	720	--	--	3.3	36	--
LXW 8	441658	0715525	Howe	1982	830	--	--	7.3	36	--
LXW 9	441725	0715448	Cornicoll, B.	1984	840	--	46	685	--	32
LXW 10	441526	0715343	Morin, F.	1985	670	--	74	80	--	--
LXW 11	441631	0715409	Oliveira, P.	1985	770	--	62	180	--	50
LXW 12	441638	0715528	--	--	820	--	--	4.3	36	--
LXW 13	441551	0715439	Achilles, P.	1986	750	--	97	560	--	90

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
						GRAFTON COUNTY—*Continued*	
						Littleton—*Continued*	
LNW 32	O	10.2	11-30-84	U	--	Soil Exp.	L; hydraulic conductivity (k) = 19.34 feet per day
LNW 33	O	1.5	11-29-84	U	--	Soil Exp.	L
LNW 34	O	22.3	11-29-84	U	--	Soil Expl.	L
LNW 35	O	5	5-13-86	U	--	GAP MTN.	L
LNW 36	O	14	4-07-88	U	--	NH Boring	L
LNW 37	O	--	--	U	--	NH Boring	L
LNW 38	O	10	4-11-88	U	--	NH Boring	L
LNW 39	O	4.5	4-06-88	U	--	NH Boring	L
LNW 40	O	4	4-08-88	U	--	NH Boring	L
LNW 41	O	4.7	5-13-80	U	70	Chapman	L; pumped gray sand & cloudy water; well pulled
LNW 42	O	3.6	5-08-80	U	55	Chapman	L; 5-hour aquifer test on 5/9/80
LNW 43	O	5.3	5-06-80	U	20	Chapman	L
LNW 44	O	2.3	5-09-80	U	25	Chapman	L
LNW 45	O	6.3	5-12-80	U	30	Chapman	Well pulled
LNW 46	O	5.6	5-08-80	U	50	Chapman	L
LNW 53	X	--	--	H	1.5	NHWRD 524	--
LNW 56	Z	25	11-01-84	H	100	Cushing	--
LNW 60	Z	12	7-20-85	H	8	Cushing	--
LNW 62	X	--	--	H	20	Cushing	--
LNW 69	X	30	8-21-85	H	8.1	NHWRD 237	--
LNW 80	X	--	--	U	45	Cushing	--
LNW 83	X	--	--	H	4	NHWRD 68	--
LNW 84	X	--	--	H	6	NHWRD 68	--
LNW 86	X	--	--	P	200	Cushing	--
LNW 87	X	--	--	H	20	Cushing	--
LNW 97	X	--	--	H	3.5	Cushing	--
LNW 106	X	20	4-06-88	H	5	NHWRD 192	--
LNW 107	X	--	--	H	60	NHWRD 381	--
LNW 111	X	--	--	H	1.5	Cushing	--
LNW 116	X	--	--	H	4	Cushing	--
LNW 117	X	--	--	H	.5	Cushing	--
LNW 121	X	--	--	Z	5	Cushing	--
LNW 133	X	--	--	H	10	Cushing	--
LNW 140	X	--	--	H	6	Cushing	--
						Lyman	
LXB 1	BB	4	9-00-83	U	--	NHDOT	L
LXB 2	BB	--	--	U	--	NHDOT	L
LXW 1	X	--	--	H	50	Tasker	--
LXW 2	X	--	--	H	3	Cushing	L
LXW 3	X	30	8-11-90	H	12	Cushing	L
LXW 4	X	--	--	H	4	Cushing	L
LXW 5	X	--	--	H	2	Cushing	L
LXW 6	Dug	3.4	7-30-91	H	--	--	Water reported to have high iron
LXW 7	Dug	1.1	7-30-91	H	--	--	Water quality reported to be good
LXW 8	Dug	5.25	7-30-91	H	--	--	Water quality reported to be good
LXW 9	X	--	--	H	.5	NHWRD 381	--
LXW 10	Z	30	5-09-85	H	60	Cushing	--
LXW 11	X	--	--	H	6	Cushing	--
LXW 12	Dug	2.8	7-30-91	H	--	--	--
LXW 13	X	--	--	H	4	Cushing	--

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Ba-in,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Lyman—*Continued*							
LXW 14	441613	0715345	Stuart, H.	1986	740	--	99	260	--	55
LXW 16	441845	0715537	Gombas, A.	1989	1,020	--	76	240	--	60
LXW 18	441559	0715346	Hayes, R.	1987	740	--	39	100	--	10
LXW 19	441347	0715750	Dezan, M.	1987	720	--	--	11	--	--
LXW 23	441406	0715803	McPherson, P.	1987	750	--	77	380	--	70
LXW 29	441722	0715459	Trudell, J.	1988	850	--	53	460	--	42
LXW 36	441616	0715359	Williams, R.	1989	800	--	20	100	--	8
LXW 39	441626	0715400	Therien, J.	1989	720	--	62	360	--	48
LXW 41	441600	0715405	Kollett, S.	1989	760	--	133	240	--	80
LXW 42	441704	0715435	Lacoss, R.	1989	880	--	20	320	--	8
LXW 50	441701	0715512	Woodbury, G.	1988	840	--	24	180	--	13
			Lyme							
LYB 1	434844	0721058	N.H. Dept. of Transportation	1936	390	23.5	--	--	--	23.5
LYB 2	434826	0720948	N.H. Dept. of Transportation	05-00-59	480.8	19	--	--	--	19
LYB 3	434756	0720720	N.H. Dept. of Transportation	05-00-63	790	21	--	--	--	--
LYW 1	434839	0720936	Killam, Ben	10-30-92	540	--	70	420	6	55
LYW 2	434838	0721056	Bates, Wayne	05-20-92	390	--	56	220	6	42
LYW 4	434835	0720905	Abbott, Jim	06-13-90	620	56	48.5	51	2	56
LYW 5	434847	0720903	Fline, Millard	1959	580	--	57	230	--	52
LYW 6	434844	0720915	Woodward, Melvin	1954	560	--	53	130	--	45
LYW 7	434839	0720924	Horton	1957	550	--	105	175	--	95
LYW 8	434826	0720952	Jenks, Edward	1961	490	--	46	93	--	41
LYW 9	434557	0721052	Evans, J.	7-03-90	720	--	114	280	6	102
LYW 10	434837	0720933	Mayo, Julia	1951	540	--	--	158	--	65
LYW 11	434836	0720929	Chaffee	1951	540	--	91	155	--	83
LYW 12	434833	0720920	Claffin, Clayton	1956	550	--	--	135	--	101
LYW 13	434832	0720914	Horton, Walter	1961	550	--	37	82	--	32
LYW 14	435025	0720921	Goodrich, W.	4-04-91	430	--	20	220	6	6
LYW 15	435058	0721054	Tullar, B	5-01-90	410	--	195	625	6	175
LYW 16	435027	0720906	Lacasse, Charles	1953	430	--	--	149	--	86
LYW 17	434839	0720930	Dowd's Country Inn	4-13-90	550	--	90.5	220	6	67
LYW 18	434831	0720917	Bognolo, C.	3-14-90	540	--	54	380	6	41
LYW 20	435115	0721052	--	1975	455	--	90	90	6	90
LYW 21	434753	0721011	Kennedy	1960	510	--	--	100	--	61
LYW 22	434802	0721007	Wood	1951	510	--	40	217	--	32
LYW 23	434910	0721059	Mudge	10-24-62	440	--	123	390	--	113
LYW 31	434731	0720557	Dartmouth Ski Way	1956	900	--	--	68	--	30
LYW 39	434629	0721204	Materia, Perry	1959	400	--	--	152	--	69
LYW 43	434640	0721056	Bryon, Helen	1957	640	--	--	130	--	16
LYW 44	434757	0721005	Quinn	1950	530	--	--	132	--	110
LYW 47	434841	0720935	Piper, W.	1959	540	--	52	175	--	48
LYW 48	434842	0720857	Fline, Millard	1958	610	--	22	106	--	12
LYW 50	435017	0720912	Gile, A.	1984	440	--	66	200	--	55
LYW 57	434850	0720913	Balch, R.	1985	560	--	80	280	--	71
LYW 61	434546	0720753	Burgess, V.	1985	890	--	49	260	--	35
LYW 62	434953	0720912	Estes & Gallup	1985	430	--	19	120	--	8
LYW 67	434849	0720859	LaMott, D.	1986	600	--	49	145	--	38

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
GRAFTON COUNTY—*Continued*							
Lyman—*Continued*							
LXW 14	X	--	--	H	10	Cushing	--
LXW 16	X	--	--	H	3.5	Cushing	--
LXW 18	X	--	--	H	8	Cushing	--
LXW 19	Dug	4	6-29-87	H	--	NHWRD 671	L
LXW 23	X	--	--	H	1	Cushing	--
LXW 29	X	--	--	H	.5	Cushing	--
LXW 36	X	--	--	H	7	Cushing	--
LXW 39	X	--	--	H	3	Cushing	--
LXW 41	X	--	--	H	25	Cushing	--
LXW 42	X	--	--	H	10	Cushing	--
LXW 50	X	--	--	H	25	Falcon	--
Lyme							
LYB 1	BB	--	--	U	--	NHDOT	L
LYB 2	BB	-1	5-00-59	U	--	NHDOT	L
LYB 3	BB	--	--	U	--	NHDOT	L
LYW 1	X	20	11-02-92	H	3.5	Sargent	--
LYW 2	X	--	--	H	3	Sargent	--
LYW 4	O	31.5	8-09-90	U	--	USGS	L; H; CA
LYW 5	X	20	1959	H	8	A+W	--
LYW 6	X	--	--	H	14	A+W	--
LYW 7	X	28	1957	H	40	Chapman	--
LYW 8	X	--	--	H	8	Herrick	--
LYW 9	X	1	7-05-90	H	12	Sargent	L
LYW 10	X	--	--	H	8	O. Dube	--
LYW 11	X	23	1951	H	30	Chapman	--
LYW 12	X	--	--	H	7	O. Dube	--
LYW 13	X	--	--	H	2.5	Herrick	--
LYW 14	X	12	4-05-91	H	5	A+W	L
LYW 15	X	--	--	H	1	Valley	L
LYW 16	X	--	--	H	25	O. Dube	--
LYW 17	X	--	--	C	15	Green Mnt.	L
LYW 18	X	18	3-15-90	H	15	Sargent	L
LYW 20	Z	--	--	S	--	--	Water reported to have iron and some sulfur
LYW 21	X	--	--	H	20	--	--
LYW 22	X	19	1951	H	20	Chapman	--
LYW 23	X	35	10-24-62	H	5	Tasker	--
LYW 31	X	--	--	H	20	O. Dube	--
LYW 39	X	--	--	H	--	O. Dube	--
LYW 43	X	--	--	H	1	O. Dube	--
LYW 44	X	--	--	H	14	--	--
LYW 47	X	--	--	H	3	A+W	--
LYW 48	X	--	--	H	5	A+W	--
LYW 50	X	--	--	H	75	A+W	--
LYW 57	X	--	--	H	7.5	A+W	--
LYW 61	X	--	--	H	7	Valley Art.	--
LYW 62	X	--	--	H	10	A+W	--
LYW 67	X	--	--	H	7	Valley Art.	--

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ' "	Longitude ° ' "	Owner or user	Date com- pleted (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Lyme—*Continued*							
LYW 85	434825	0720918	Lacoss, N.	1988	530	--	47	140	--	38
LYW 96	434721	0721143	Craighead, L.	188	400	--	87	145	--	77
LYW 98	435009	0720856	Wagner Woodlands Inc.	1989	430	--	49	180	--	40
LYW 105	434835	0721055	Pearse, R.	1989	400	--	29	260	--	14
LYW 108	434636	0721203	Knight, R.	1989	400	--	59	405	--	40
LYW 109	435008	0720857	Wray, N.	1990	420	--	39	180	--	15
LYW 110	434703	0721051	Morin, D.	1989	650	--	79	285	--	70
			Monroe							
MUA 1	441528	0720303	Monroe, town of	12-19-56	551	110	--	--	--	110
MUA 2	441525	0720301	Monroe, town of	12-20-56	541	40	--	--	--	--
MUA 3	441522	0720302	Monroe, town of	12-20-56	541	34	--	--	--	--
MUB 1	441431	0720234	N.H. Dept. of Transportation	9-00-54	460	18	--	--	--	18
MUW 1	441531	0720304	Monroe, town of	12-19-56	551	95	46	51	8	95
MUW 2	441530	0720305	Monroe, town of	--	546	45	40	45	8	--
MUW 7	441626	0720326	Hanks, Franklin	1960	472	--	40	100	--	30
MUW 8	441702	0720317	Bedor, Oscar	1960	500	--	220	310	--	200
MUW 9	441452	0720300	Hammond, Ralph	1960	500	--	200	240	--	186
MUW 11	441732	0720205	Cole	1984	620	--	100	300	--	90
MUW 12	441905	0715938	New England Power Co.	1984	790	--	85	575	--	70
MUW 15	441529	0720303	Monroe, town of	1985	551	--	26	40	--	--
MUW 17	441751	0720203	Tyler, G.	1984	624	--	11	255	--	6
MUW 19	441741	0720144	Goss, S.	1985	620	--	142	143	--	--
MUW 23	441749	0720203	Bates, C.	1986	624	--	19	280	--	5
MUW 26	441814	0720120	Laflame Poultry Farms	1987	624	--	79	370	--	70
MUW 28	441357	0720241	& P. Wolfe, B.	1987	520	--	29	140	--	25
MUW 31	441755	0720201	Tyler, G.	1988	639	--	20	320	--	1.0
MUW 32	441318	0720256	McIntyre, C.	1988	500	--	20	100	--	15
MUW 33	441324	0720255	McIntyre, C.	1988	500	--	20	200	--	14
MUW 39	441754	0720101	Ward, L.	1988	679	--	39	40	--	--
MUW 43	441400	0720242	Milnor, E.	1989	520	--	67	260	--	45
MUW 46	441745	0720159	Myers, J.	1989	620	--	79	100	--	68
MUW 50	441748	0720136	McKay, D.	1989	620	--	114	400	--	103
MUW 52	441727	0720227	Carter, R.	1989	542	--	29	305	--	20
MUW 54	441757	0720104	Bird, D.	1989	690	--	101	160	--	87
			Orange							
ORB 1	433902	0715909	N.H. Dept. of Transportation	2-00-75	1,040.9	13	--	--	--	13
ORW 1	433906	0715859	Flemming, P.R.	8-03-54	1,100	--	106	311	--	100
ORW 2	433752	0715844	--	1965	980	--	--	12.8	36	--
ORW 3	433801	0715906	Rocke, V.	1985	1,030	--	19	200	--	10
ORW 4	433757	0715852	--	--	990	--	--	14.6	36	--
ORW 6	433912	0715828	Monica, K.	1987	1,190	--	43	272	--	25
ORW 7	433859	0715902	King, J.	1988	1,090	--	59	390	--	50
ORW 8	433756	0715858	--	--	970	--	--	8.1	36	--
ORW 9	433803	0715923	--	--	970	--	--	9.5	36	--
ORW 10	433909	0715838	Scotland	--	1,170	--	--	8.1	36	--

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
GRAFTON COUNTY—*Continued*							
Lyme—*Continued*							
LYW 85	X	--	--	H	30	A+W	Water flows 5 gal/min
LYW 96	X	--	--	H	15	Valley Art.	--
LYW 98	X	--	--	H	15	A+W	--
LYW 105	X	--	--	H	3	NHWRD 150	--
LYW 108	X	22	9-25-89	H	3	NHWRD 171	--
LYW 109	X	10	1-09-90	H	6	A+W	--
LYW 110	X	--	--	H	4	Valley Art.	--
Monroe							
MUA 1	TH	10	12-19-56	U	--	Chapman	L
MUA 2	TH	10	12-20-56	U	--	Chapman	L
MUA 3	TH	9	12-20-56	U	--	Chapman	L
MUB 1	BB	--	--	U	--	NHDOT	L
MUW 1	GPW	12	12-19-56	P	60	A+W	L; CA; aquifer-test results reported in table 3
MUW 2	GPW	--	--	P	35	--	CA
MUW 7	X	--	--	H	--	--	--
MUW 8	X	--	--	H	--	--	--
MUW 9	X	100	1960	H	--	--	--
MUW 11	X	--	--	H	6	A+W	--
MUW 12	X	90	8-28-84	N	150	NHWRD 3	--
MUW 15	Z	11	4-23-85	P	25	Cushing	L; drilled in gravel
MUW 17	X	--	--	H	2	NHWRD 524	--
MUW 19	Z	--	--	H	25	NHWRD 524	L; drilled in gravel
MUW 23	X	--	--	H	4	Cushing	--
MUW 26	X	--	--	H	3.5	Falcon	--
MUW 28	X	--	--	H	50	Cushing	--
MUW 31	X	--	--	H	3.5	Cushing	--
MUW 32	X	--	--	H	8	Cushing	L
MUW 33	X	--	--	H	3	Cushing	L
MUW 39	Z	--	--	H	40	Falcon	Drilled in gravel
MUW 43	X	--	--	H	1	Cushing	--
MUW 46	X	--	--	H	20	Cushing	--
MUW 50	X	--	--	H	3	Cushing	L
MUW 52	X	--	--	H	.75	Falcon	--
MUW 54	X	--	--	H	20	Cushing	--
Orange							
ORB 1	BB	--	--	U	--	NHDOT	L
ORW 1	X	20	8-03-54	H	4	A+B	--
ORW 2	Dug	6.3	6-12-91	H	--	--	Water is reported to be very good
ORW 3	X	--	--	H	12	A+W	--
ORW 4	Dug	5	6-12-91	H	--	--	--
ORW 6	X	6	8-20-87	H	1.5	NHWRD 130	--
ORW 7	X	--	--	H	7.5	Valley Art.	--
ORW 8	Dug	4.1	6-12-91	H	--	--	--
ORW 9	Dug	5	6-12-91	H	--	--	Water has iron, but tastes fair
ORW 10	Dug	4.2	6-13-91	H	--	--	--

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Orford							
OSA 1	435635	0720643	Wilson, George	1900	430	365	--	--	--	--
OSB 1	435424	0720822	N.H. Dept. of Transportation	1936	390	80	--	--	--	--
OSB 2	435434	0720738	N.H. Dept. of Transportation	2-00-38	395	22.3	--	--	--	--
OSB 3	435438	0720453	N.H. Dept. of Transportation	8-00-68	843.6	11	--	--	--	11
OSS 1	435426	0720724	--	--	470	--	--	6	--	--
OSS 2	435459	0720700	--	--	460	--	--	--	--	--
OSS 3	435531	0720649	--	--	400	--	--	--	--	--
OSS 4	435643	0720611	--	--	460	--	--	8	--	--
OSW 1	435354	0720813	Orford Water Supply Co.	1900	460	--	--	12	--	--
OSW 2	435409	0720849	Orford, town of	6-13-90	390	79	30	32.5	2	--
OSW 3	435258	0720441	--	--	860	--	11.2	11.2	36	--
OSW 6	435356	0720818	Dyer, Isabel	1959	430	--	--	169	--	19
OSW 7	435304	0720449	Canfield	--	840	--	--	6	46	--
OSW 8	435300	0720513	--	--	790	--	--	9	36	--
OSW 10	435427	0720728	Skinner, Harlon	1959	460	--	--	147	--	48
OSW 11	435337	0720726	Green, Peter	1960	600	--	--	98	--	8
OSW 13	435239	0720608	Bennett, Barnard	1960	740	--	--	185	--	53
OSW 14	435243	0720545	--	--	720	--	--	8.8	36	--
OSW 15	435249	0720605	--	--	700	--	--	6.9	36	--
OSW 16	435252	0720606	--	1960	690	--	--	14	36	--
OSW 18	435423	0720728	Culligan	--	490	--	60	180	6	--
OSW 20	435706	0720500	Goofliesh	1974	550	--	60	250	6	--
OSW 21	435411	0720710	--	1971	530	--	55	255	6	--
OSW 22	435242	0720925	Sanborn	--	430	--	--	15	--	--
OSW 23	435246	0720918	--	1975	434	--	--	22	--	--
OSW 24	435242	0720928	Sanborn	--	430	--	--	15	--	--
OSW 25	435556	0720656	Huntington, Harold	1963	400	--	--	180	--	16
OSW 26	435346	0720723	Orford. town of	7-18-88	620	--	--	81.5	1.5	--
OSW 27	435344	0720720	Orford. town of	7-14-88	619	--	--	51.9	1.5	51.9
OSW 28	435342	0720715	Orford. town of	4-20-89	540	--	4	10	2	--
OSW 29	435343	0720722	Orford. town of	7-14-88	604.3	42.5	--	42.4	1.5	42.5
OSW 30	435347	0720716	Orford. town of	4-17-89	517	--	5	19	2	--
OSW 32	435336	0720853	Lyon, Mitchell	1963	400	--	--	151	--	54
OSW 33	435409	0720817	Lawrence, Phyllis	1965	410	--	--	--	--	145
OSW 34	435424	0720734	--	--	480	--	--	20	36	--
OSW 35	435359	0720837	Nickels	1990	410	--	200	365	6	--
OSW 36	435353	0720844	--	1981	400	--	--	12.2	36	--
OSW 37	435432	0720731	--	1985	400	--	--	15	--	--
OSW 38	435637	0720536	McGoff, J.	1985	580	--	59	300	--	51
OSW 39	435351	0720759	Giroux, R.	1985	480	--	61	220	--	50
OSW 40	435409	0720839	The Pastures Campground	1980	390	--	--	24	2	--
OSW 41	435351	0720819	Mack, Virgil	7-26-90	430	--	120	400	6	105
OSW 43	435249	0720602	Tifft, D.	1986	710	--	40	100	--	31
OSW 47	435433	0720751	Dennis, R.	1986	420	--	79	83	--	--
OSW 48	435348	0720831	Dyke, R.	1986	410	--	79	500	--	70
OSW 49	435250	0720602	Brayshaw, L.	1987	710	--	34	120	--	25
OSW 51	435609	0720656	Conn River Marina Inc.	1986	400	--	214	215	--	--
OSW 53	435357	0720833	Nickels, H.	1987	410	--	179	605	--	168
OSW 54	435233	0720543	Brooks, C.	1987	785	--	29	221	--	6
OSW 55	435245	0720541	Wells, R.	1987	730	--	35	200	--	26

Local site No.	Type of site	Water level Depth (feet)	Water level Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
GRAFTON COUNTY—*Continued*							
Orford							
OSA 1	TH	--	--	U	--	--	L
OSB 1	BB	--	--	U	--	NHDOT	L
OSB 2	BB	--	--	U	--	NHDOT	L
OSB 3	BB	--	--	U	--	NHDOT	L
OSS 1	Spr	--	--	H	--	--	Water quality reported to be very good
OSS 2	Spr	--	--	H	--	--	Water reported to be very hard; tastes good
OSS 3	Spr	0	7-01-91	H	--	--	Water quality is reported to be very good
OSS 4	Spr	--	--	H	15	--	--
OSW 1	Dug	--	--	P	350	--	Battery of 6 dug wells supplies 30 families
OSW 2	O	9.18	7-26-90	U	--	USGS	L; H; CA
OSW 3	Dug	7.9	6-14-91	H	--	--	--
OSW 6	-	--	--	H	20	O. Dube	--
OSW 7	Dug	3.1	6-14-91	H	--	--	Water quality is reported good
OSW 8	Dug	4.6	6-14-91	H	--	--	--
OSW 10	X	--	--	H	20	O. Dube	--
OSW 11	X	--	--	H	7	O Dube	--
OSW 13	X	--	--	H	10	O. Dube	--
OSW 14	Dug	5.7	6-14-91	H	--	--	--
OSW 15	Dug	4.8	6-14-91	H	--	--	--
OSW 16	Dug	10	6-14-91	H	--	--	Water quality reported to be very good
OSW 18	X	--	--	H	--	--	Water reported to be hard; iron; tastes fair
OSW 20	X	--	--	H	--	--	Water quality is reported good
OSW 21	X	29	6-19-91	H	25	O. Dube	Water reported is hard; tastes good
OSW 22	V	10	6-17-91	H	--	--	Water reported high in iron and salt
OSW 23	V	18	6-17-91	H	--	--	Water quality reported to be good; good supply
OSW 24	V	10	6-17-91	H	--	--	--
OSW 25	X	--	--	H	10	O. Dube	--
OSW 26	O	75.8	7-18-88	U	--	GSE	L; wells OSW-26 to OSW-30 located in town landfill
OSW 27	O	51.6	7-18-88	U	--	GSE	L
OSW 28	O	6.55	5-10-89	U	--	Green MTN	L
OSW 29	O	42.4	7-18-88	U	--	GSE	L
OSW 30	O	3.7	5-10-89	U	--	Green MTN	L
OSW 32	X	--	--	H	30	O. Dube	--
OSW 33	--	--	--	H	20	--	--
OSW 34	Dug	13	6-19-91	H	--	--	Well goes dry during hot, dry summers
OSW 35	X	--	--	H	--	--	Water quality reported to be good
OSW 36	Dug	7	6-19-91	H	--	--	Water reported to be a little hard
OSW 37	Dug	--	--	H	--	--	Water quality reported to be very good; water to well is spring fed
OSW 38	X	--	--	H	0	A+W	--
OSW 39	X	--	--	H	20	A+W	--
OSW 40	V	8	6-28-91	P	55	--	Water quality reported to be very good
OSW 41	X	30	7-26-90	H	2	A+W	L
OSW 43	X	--	--	H	30	A+W	--
OSW 47	Z	--	--	H	10	A+W	L; drilled in sand
OSW 48	X	--	--	H	.5	A+W	--
OSW 49	X	--	--	H	15	A+W	--
OSW 51	Z	--	--	C	60	Valley Art.	L; drilled in gravel
OSW 53	X	--	--	H	.75	Falcon	L
OSW 54	X	--	--	H	12	NHWRD 3	--
OSW 55	X	--	--	H	5	A+W	--

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date com-pleted (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
GRAFTON COUNTY—*Continued*										
Orford—*Continued*										
OSW 59	435341	0720825	Haslam, E.	1988	480	--	74	555	--	58
OSW 61	435243	0720540	Marsh, M.	1988	730	--	29	120	--	18
OSW 63	435311	0720908	Reed, D.	1989	420	--	120	500	--	110
OSW 64	435612	0720657	Deford, W.	1988	410	--	106	110	--	--
OSW 68	435401	0720708	Norton, L.	1989	550	--	32	240	--	21
OSW 69	435358	0720727	Orford, town of	1989	580	--	126	400	--	115
OSW 72	435237	0720919	Sweet, B.	1989	420	--	101	340	--	90
OSW 73	435445	0720719	Daniels, E.	1989	430	--	39	260	--	22
OSW 74	435308	0720447	Marsh, F.	1989	850	--	41	140	--	28
OSW 76	435345	0720756	Mischissin, S.	1989	520	--	100	400	--	88
OSW 78	435444	0720720	Huntington, L.	1989	430	--	39	240	--	25
OSW 79	435348	0720714	Angwin, P.	1989	540	--	59	500	--	50
OSW 81	435342	0720835	Cloud, D.	1989	450	--	19	320	--	3
OSW 83	435414	0720827	Day, Ken	1954	410	--	--	283	--	230
OSW 103	435327	0720903	Mason, C.	1985	390	--	63	400	--	32
Piermont										
PDA 1	435809	0720540	Underhill, Lawrence	10-02-90	395	59	--	--	--	--
PDB 1	435836	0720243	N.H. Dept. of Transportation	5-00-64	736.8	20	--	--	--	--
PDW 1	435839	0720616	Kuntz, W. Donald	--	450	--	285	600	6	275
PDW 2	435736	0720537	Robie	1991	400	--	--	12.4	42	--
PDW 3	435722	0720213	Lutz	1962	1,090	--	--	150	--	31
PDW 4	435757	0720455	Piermont Fire Dept.	--	560	--	--	14	36	--
PDW 5	435806	0720446	--	1955	560	--	--	8.2	36	--
PDW 6	435840	0720458	--	--	660	--	--	10	36	--
PDW 7	435823	0720538	Underhill, Lawrence	1900	450	--	--	--	--	265
PDW 9	435838	0720328	Jenks	--	655	--	--	11	36	--
PDW 10	435815	0720450	Piermont Town Hall	--	590	--	--	6.5	36	--
PDW 11	435820	0720441	Webb	1976	630	--	--	6	36	--
PDW 12	435821	0720408	--	1976	620	--	--	10	36	--
PDW 13	440111	0720427	Lockwood, H.	1985	570	--	85	84	--	--
PDW 14	435816	0720348	--	1981	625	--	--	9.6	36	--
PDW 15	435833	0720335	--	--	650	--	--	7.4	36	--
PDW 16	435846	0720309	Cole	1989	730	--	--	10.5	36	--
PDW 17	435913	0720627	--	1985	460	--	--	13.8	36	--
PDW 18	435904	0720624	Evans	1960	450	--	--	80	6	--
PDW 19	435841	0720637	Putnam	1986	410	--	--	14	--	--
PDW 20	435835	0720609	--	1979	430	--	--	9.1	36	--
PDW 21	440017	0720558	--	1983	460	--	--	10.6	36	--
PDW 22	440016	0720601	Schmid	--	460	--	--	5.6	36	--
PDW 23	440030	0720543	Gould	--	460	--	--	12.9	36	--
PDW 24	440019	0720548	--	--	460	--	--	9.9	36	--
PDW 25	440021	0720537	--	--	480	--	--	15.9	36	--
PDW 26	440037	0720516	--	--	460	--	--	7.8	36	--
PDW 27	440047	0720510	Oaks, D.	1988	470	--	53	500	--	44
PDW 28	435958	0720537	Oakes, R.	1988	580	--	20	300	--	8
PDW 30	440017	0720503	--	--	640	--	30	462	--	3
PDW 31	440021	0720505	Mazzelli, P.	1989	630	--	34	422	--	6
PDW 36	435817	0720505	Johnson, K.	1989	460	--	66	400	--	57
PDW 52	435821	0720413	Gould, R.	1987	620	--	89	300	--	80

Local site No.	Type of site	Water level: Depth (feet)	Water level: Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
GRAFTON COUNTY—*Continued*							
Orford—*Continued*							
OSW 59	X	--	--	H	3	Valley Art.	--
OSW 61	X	--	--	H	40	Cushing	--
OSW 63	X	11	1-10-89	H	3	A+W	L
OSW 64	Z	--	--	H	100	A+W	L; drilled in gravel
OSW 68	X	20	8-15-89	H	60	A+W	--
OSW 69	X	40	7-26-89	-	1.5	A+W	L
OSW 72	X	8	6-10-89	H	30	NHWRD 150	--
OSW 73	X	50	9-16-89	H	--	A+W	L
OSW 74	X	--	--	H	--	Cushing	L
OSW 76	X	--	--	H	15	A+W	L
OSW 78	X	40	9-22-89	H	7	A+W	L
OSW 79	X	30	9-27-89	P	12	A+W	L
OSW 81	X	14	9-13-89	H	4	NHWRD 150	--
OSW 83	X	--	--	H	25	O. Dube	--
OSW 103	X	--	--	H	20	A+W	--
Piermont							
PDA 1	TH	2	10-02-90	U	--	--	L
PDB 1	BB	--	--	U	--	NHDOT	L
PDW 1	X	--	--	H	.25	A+W	--
PDW 2	Dug	2.31	7-08-91	H	--	--	--
PDW 3	X	--	--	H	20	O. Dube	--
PDW 4	Dug	7.3	7-08-91	F	--	--	--
PDW 5	Dug	4.9	7-08-91	H	--	--	Water quality reported to be good
PDW 6	Dug	8	7-16-91	H	--	--	--
PDW 7	X	--	--	H	--	--	--
PDW 9	Dug	9.47	7-16-91	H	--	--	--
PDW 10	Dug	6	7-15-91	H	--	--	--
PDW 11	Dug	1.5	7-15-91	H	--	--	Water reported to have elevated sodium level
PDW 12	Dug	3	7-15-91	H	--	--	Water reported to taste good
PDW 13	Z	20	5-20-85	H	25	Cushing	L; drilled in gravel
PDW 14	Dug	6.3	7-15-91	H	--	--	--
PDW 15	Dug	3.68	7-15-91	H	--	--	--
PDW 16	Dug	7.2	7-15-91	H	--	--	Water reported to taste good, but is hard
PDW 17	Dug	10.5	7-16-91	H	--	--	Water quality reported to be good
PDW 18	X	65	7-16-91	H	--	--	Water reported to have some iron
PDW 19	V	4	7-15-91	H	--	--	Water reported to be slighty hard, good taste
PDW 20	Dug	6.53	7-18-91	H	--	--	Water quality reported to be good
PDW 21	Dug	8.79	7-18-91	H	--	--	Owner reports yield is high; water quality is good
PDW 22	Dug	2.48	7-18-91	H	--	--	--
PDW 23	Dug	11.1	7-18-91	H	--	--	--
PDW 24	Dug	6.11	7-19-91	H	--	--	--
PDW 25	Dug	10.8	7-19-91	H	--	--	--
PDW 26	Dug	3.45	7-19-91	H	--	--	--
PDW 27	X	20	8-15-88	H	1	A+W	--
PDW 28	X	10	10-07-88	H	3	A+W	--
PDW 30	X	--	--	H	--	NHWRD 3	--
PDW 31	X	--	--	H	1.5	NHWRD 3	--
PDW 36	X	--	--	H	3	NHWRD 160	L
PDW 52	X	--	--	H	30	A+W	--

Table A1. Description of selected wells, borings, and springs in the middle Connecticut River Basin,

Local site No.	Latitude ° ′ ″	Longitude ° ′ ″	Owner or user	Date completed (mm-dd-yy)	Elevation above sea level (feet)	Depth of hole (feet)	Depth to bottom of casing (feet)	Depth of well (feet)	Diameter of casing (inches)	Depth to refusal or bedrock (feet)
			GRAFTON COUNTY—*Continued*							
			Sugar Hill							
SUA 1	441457	0714640	Hannah, Selden	7-11-90	870	29	--	--	--	--
SUB 1	441451	0714543	N.H. Dept. of Transportation	10-00-70	902.2	15	--	--	--	--
SUW 1	441410	0714537	Coffin Trust	7-20-89	906	16	3	13	2	--
SUW 2	441451	0714615	Hannah, Selden	7-11-90	870	70	48	50.5	2	70
SUW 3	441442	0714608	--	--	890	--	--	12	36	--
SUW 4	441502	0714652	Hannah, Selden	7-11-90	870	39	20.5	23	2	39
SUW 5	441432	0714540	--	--	900	--	--	11.5	36	--
SUW 20	441455	0714624	Hannah, Selden	1900	873	--	--	75	--	15
SUW 32	441444	0714542	Leonard, G.	1987	910	--	59	205	--	45
SUW 37	441435	0714541	& E. Spanhoff, H.	1987	910	--	41	300	--	37
SUW 46	441452	0714634	Cushing, J.	1988	880	--	94	150	--	72
SUW 68	441448	0714548	Burt, R.	1988	900	--	94	230	--	95
			VERMONT							
			Fairlee							
FLW 1	435454	0720752	Fairlee, Vt., town of	10-11-74	404	92	73	88	36	--
			Norwich							
NRW 42	434410	0721548	Norwich, Vt., town of	3-20-90	440	191	155	175	12	--

Local site No.	Type of site	Water level: Depth (feet)	Water level: Date (mm-dd-yy)	Use of water	Reported well yield (gallons per minute)	Driller or NHWRD No.	Remarks
			GRAFTON COUNTY—*Continued*				
			Sugar Hill				
SUA 1	TH	--	--	U	--	USGS	L
SUB 1	BB	4	10-00-70	U	--	NHDOT	L
SUW 1	O	3.91	8-10-89	U	--	Env. Drill.	L; 1 of 4 monitoring wells; petroleum contamination reported here
SUW 2	O	5.61	7-26-90	U	--	USGS	L; H; CA
SUW 3	Dug	11.3	8-01-91	H	--	--	Well runs dry during summer; water reported to be soft, tastes bad
SUW 4	O	4.35	7-26-90	U	--	USGS	L; H; CA
SUW 5	Dug	10.2	8-01-91	H	--	--	--
SUW 20	X	--	--	H	125	--	--
SUW 32	X	--	--	H	5	Falcon	--
SUW 37	X	--	--	H	3	Cushing	--
SUW 46	X	--	--	H	9	NHWRD 192	--
SUW 68	X	--	--	H	10	Falcon	--
			VERMONT				
			Fairlee				
FLW 1	GPW	16.1	10-11-74	P	70	Layne	L; aquifer-test results reported in table 3. Capable of yielding over 900 gal/min
			Norwich				
NRW 42	GPW	65	03-20-90	P	70	Hydrogroup	L; aquifer-test results reported in table 3. Capable of yielding over 700 gal/min

APPENDIX B

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont

[Proportions of materials in the lithologic descriptions are indicated be the following terms: and, 50 percent; some, 25-50 percent; little, 10-25 percent; trace, less than 10 percent; ft, foot; mm, millimeter; --, no data]

Lithology	Depth (ft) From	Depth (ft) To
COOS COUNTY		
Carroll		
Local site No. CFA 1		
Topsoil	0	1
Sand, fine to coarse, brown, and gravel, fine to medium; layer of clay; trace of silt	1	11
Sand, fine to medium, brown; some coarse sand and fine gravel	11	18
Silt; some brown sand and gravel	18	18.5
Sand, fine to coarse, brown and gravel, fine to medium, angular	18.5	25
Sand, brown, and gravel; some silt	25	26
Refusal	26	--
Local site No. CFA 2		
Sand and gravel, brown (topsoil)	0	6
Sand, fine to coarse, brown, and gravel, fine to medium; some clay	6	10
Sand, fine to medium, tan; traces of silt	10	13
Sand, fine to medium, light gray; some coarse sand and fine to medium gravel, angular	13	22
Sand, fine to coarse, light gray, and gravel, fine to medium, angular	22	28
End of hole	28	--
Local site No. CFA 3		
Sand, brown, and gravel (topsoil)	0	4.5
Sand, fine to coarse, brown and gray, and gravel, fine to medium, angular	4.5	17
Refusal	17	--
Local site No. CFA 4		
Topsoil	0	1
Sand, medium to coarse, grayish brown, and gravel, fine to medium, angular; some fine sand	1	14
Sand, fine to coarse, grayish brown, and gravel, fine to medium, angular; trace of silt	14	35
End of hole	35	--
Local site No. CFA 5		
Topsoil	0	.5
Sand, brown, fine, and gravel, fine to coarse; little medium to coarse sand	.5	8

Lithology	Depth (ft) From	Depth (ft) To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFA 5—*Continued*		
Sand, brown, fine to medium; trace of fine gravel	8	13
Silt, gray, clayey; little clay-silt; layers have low plasticity	13	18
Silt, gray, clayey; trace of clay-silt; layers have low to moderate plasticity	18	28
Silt, gray, clayey; trace of clay-silt; layers have low plasticity	28	33
Clay, with silty layers, and silt, gray, clayey	33	43
Silt and sand, gray, fine	43	48
Silt and sand, brown, fine, slightly micaceous	48	63
Silt and sand, brown, fine; trace of fine to medium gravel	63	68
Sand, gray, fine; trace of silt	68	73
Decomposed granite boulder on rock as light brown fine to coarse sand; little medium to coarse sand; trace of silt	73	83.5
Bedrock, hard granite (cored 5 ft)	83.5	--
Local site No. CFA 6		
Silt and sand, brown (topsoil); trace of organic matter	0	.5
Sand, rust brown, fine; some silt	.5	4
Sand, brown, fine to coarse, and gravel, fine to coarse; trace of silt	4	9.5
Sand, gray, fine; little fine to medium gravel; little medium to coarse sand	9.5	15
Sand, gray, fine; trace of silt; slightly micaceous	15	25
Sand, brown, fine; trace of silt	25	36
Sand, reddish brown, fine to medium; trace of coarse sand; trace of fine gravel	36	38
Sand, yellow brown, fine; trace of silt	38	43
Sand, gray, fine; little fine to medium sand; trace of silt	43	46
Sand, gray, fine to coarse, and gravel, fine to medium; little coarse gravel; trace of silt	46	50
Sand, gray, fine, and gravel, fine to coarse; some medium to coarse sand; some silt (till inclusion)	50	55

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft)	
	From	To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFA 6—*Continued*		
Sand, brown, coarse to fine, and gravel, fine to coarse; trace of silt (pervious)	55	60
Sand, brown, fine; some silt	60	61
Sand, gray, fine, and gravel, fine to coarse; little medium to coarse sand; little silt	61	64
Boulders	64	69
End of hole	69	--
Local site No. CFA 7		
Sand, light brown, fine to medium; trace of silt	0	3
Sand, rust brown to brown, fine to medium, and gravel; little coarse sand; trace of silt	3	8
Sand, gray, fine to medium; some coarse gravel; little coarse sand; trace of silt	8	18
Sand, light brown, fine to coarse; some gravel; trace of silt (pervious)	18	23
Sand, brown, fine to medium; some gravel; little coarse sand (pervious); trace of silt	23	28
Sand, brown, fine to coarse; some fine to coarse gravel; trace of silt (pervious)	28	38
Sand, brown, medium to fine; trace of fine gravel; trace of silt (pervious)	38	48
Sand, gray, medium to coarse (very clean and pervious)	48	53
Sand, gray, fine; some silt	53	58
Sand, light brown, fine to medium; trace of gravel (pervious)	58	61.5
Sand, brown, fine to coarse, and gravel; trace of silt	61.5	62.5
Bedrock (cored 5 ft)	62.5	--
Local site No. CFA 8		
Silt, dark brown, organic; little fine sand; topsoi	0	1.5
Sand, brown, medium to coarse and gravel, fine to coarse; little fine sand; trace of silt (pervious)	1.5	8
Sand, gray, fine to medium; some fine to medium gravel; trace of silt	8	13
Sand, gray, fine; some silt	13	23
Silt, gray, and sand, fine; trace of yellow-brown, fine sand; trace of silt layers	23	28
Sand, yellow brown, fine to medium; trace of silt	28	38

Lithology	Depth (ft)	
	From	To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFA 8—*Continued*		
Sand, brown, fine to coarse; some fine to medium gravel; trace of silt	38	41
Boulders (max. length 2.5 ft.); little sand and gravel	41	46
Sand, yellow brown, fine to coarse; some gravel; little silt	46	48
Sand, gray brown, fine to coarse and gravel; trace of silt	48	52
Sand, gray brown, fine; some silt; decomposed boulder or bedrock pieces	52	52.3
Refusal	52.3	--
Local site No. CFA 9		
Sand, dark brown; little organic matter (topsoil); little yellow-brown fine sand; little silt	0	3
Sand, fine to coarse, brown and gravel, fine to coarse; trace of silt	3	15
Sand, fine, gray; some silt	15	45
Sand, fine to coarse, light brown, and gravel, fine to coarse; trace of silt	45	50
Sand, fine to coarse, brown; some coarse gravel (granite pieces); little silt; trace of clumps of fine sand and silt	50	52
Bedrock: hard, green, fine to medium grained, slightly porphyritic granulite with local highly weathered joints	52	--
Local site No. CFA 10		
Sand, fine, gray; some silt	0	11.5
Silt and sand, fine, olive gray; some layers of silt; some fine sand	11.5	16.5
Sand, fine, brown with rust brown; some silt (laminated)	16.5	22
Sand, fine, light brown; some silt	22	30
Silt, gray; little fine sand	30	35
Sand, fine, gray; trace of medium sand; trace of silt	35	36.5
Silt and sand, fine, olive gray; interbedded with silt; little sand	36.5	43
Boulders: hard pink and gray, medium and coarse grained granites, 10-inch pieces with gabbro-diorite boulders	43	47
End of hole	47	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFA 11		
Loam, dark brown, and sand, fine to medium, brown; little silt and brown organic silt; trace of sand	0	3
Sand, fine, gray; little fine to medium gravel (some broken pieces); little medium to coarse sand, trace of silt	3	8
Sand, fine, gray; trace of silt	8	18
Sand, medium to coarse, gray brown, and gravel, fine to coarse; little fine sand; trace of silt	18	21.5
Sand, medium to coarse, gray brown, and gravel, fine, angular to subangular; trace of silt	21.5	26.5
Sand, medium to coarse, gray brown, and gravel, fine; little fine sand; trace of silt	26.5	31.5
Sand, medium to coarse, gray, and gravel, fine	31.5	38
Silt and sand, fine, olive gray; stratified with some silt; little fine sand	38	43
Sand, fine to medium, brown; trace of silt	43	51
Bedrock (cored 6 ft)	51	--
Local site No. CFA 12		
Topsoil and silt	0	2
Sand, fine to medium; trace of silt	2	5
Sand, fine to medium; some fine to medium gravel; trace of silt	5	10
Silt, olive gray, clayey; trace of sand	10	20
Sand, fine to medium, gray; trace of silt	20	30
Sand, fine to coarse, and gravel, fine to coarse, brown; trace of silt	30	35
Sand and gravel, fine to coarse, gray; some silt ("till inclusion ?")	35	40
Sand, fine to coarse; gravel, fine to coarse, gray; little silt	40	50
Sand, fine to coarse; gravel, coarse, brown; trace of silt	50	60
Gravel, fine to coarse; some fine to coarse sand; trace of silt	60	70
Bedrock (cored 5 ft); granite, white to gray	70	--
Local site No. CFA 13		
Sand, fine; some silt; little loam; trace of roots	0	3
Sand, fine to medium; some fine to coarse gravel	3	9

Lithology	Depth (ft) From	Depth (ft) To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFA 13—*Continued*		
Sand, fine; some silt; trace of gravel	9	15
Silt, sandy, gray, inorganic	15	20
Sand, fine; some silt	20	34
Silt, brown, inorganic, and very fine sand	34	53
Sand, fine; trace of silt	53	59
Sand, fine; some silt	59	64
Sand, fine to coarse; some fine to medium gravel	64	69.5
Refusal	69.5	--
Local site No. CFA 14		
Topsoil, loamy	0	1
Sand, fine, loamy	1	3
Sand, fine to medium; some fine to coarse gravel; trace of silt	3	16
Sand, very fine, silty	16	33
Silt, sandy, inorganic, brown	33	52
Sand, fine to medium; trace of silt	52	66
Sand, fine to medium; some fine to coarse gravel; some silt	66	71.5
Till; clay, silt, sand, and fine gravel	71.5	72
Refusal	72	--
Local site No. CFA 15		
Topsoil	0	.5
Sand, fine; some silt; trace of loam	.5	5
Sand, fine to coarse; some fine gravel; trace of silt	5	15.5
Sand, very fine, silty	15.5	35
Silt, sandy, inorganic, gray	35	39
Silt, sandy, inorganic, brown	39	52
Sand, very fine, silty	52	57
Sand, fine to coarse; some fine to medium gravel; some silt	57	65
Refusal	65	--
Local site No. CFA 16		
Sand, fine to coarse; little fine to coarse gravel	0	15
Silt, sandy, inorganic, brown	15	37
Sand, fine to coarse; some fine to medium gravel; some silt	37	43
Refusal	43	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFA 17		
Sand, fine to coarse; some fine to medium gravel	0	5
Sand, fine to coarse; some fine to coarse gravel	5	10.5
Silt, sandy, inorganic, brown	10.5	29
Sand, fine to coarse; some fine to medium gravel; little silt	29	35
Sand, fine to medium; some silt; little gravel; "till-like"	35	42
Refusal	42	--
Local site No. CFA 18		
Topsoil, sandy, loamy	0	2
Sand, fine	2	7
Sand, fine to coarse; some fine to coarse gravel; little silt	7	14.5
Silt, sandy, inorganic	14.5	20
Sand, fine to coarse; some fine to medium gravel; little silt	20	30
Sand, fine to medium; some silt	30	34
Boulder (cored)	34	35
Sand, fine to medium; some silt; little gravel; "till-like"	35	42
End of hole	42	--
Local site No. CFA 19		
Topsoil	0	.5
Sand, fine; little silt	.5	5
Sand, fine to coarse; little fine to coarse gravel	5	10
Sand and gravel, fine to coarse	10	13
Sand, fine; little silt	13	26
Sand, fine to coarse; some fine to medium gravel; little silt	26	30
Sand, fine; little silt	30	31.9
Refusal	31.9	--
Local site No. CFA 20		
Sand, fine; some silt; trace of gravel	0	3.5
Sand, fine to medium; little silt; trace of fine to coarse gravel	3.5	8
Sand, fine, silty	8	33.1
Refusal	33.1	--

Lithology	Depth (ft) From	Depth (ft) To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFA 21		
Fill (sand, gravel, silt, and loam)	0	3
Sand, fine to coarse; little silt and gravel; boulder	3	9.5
Sand, fine; some silt	9.5	27
Sand, fine to coarse; some fine to medium gravel	27	37
Boulder (weathered)	37	41
End of hole	41	--
Local site No. CFA 22		
Topsoil	0	1.5
Sand, fine to coarse; some fine to coarse gravel	1.5	12
Sand, fine; some silt	12	20
Sand, fine to medium	20	27.5
Sand, fine to coarse; trace of fine gravel	27.5	28
Sand, fine; some silt	28	33
Sand, fine; trace of silt	33	36
Sand, fine to coarse; some fine to medium gravel; weathered rock	36	40.2
Refusal	40.2	--
Local site No. CFA 23		
Sand, fine to coarse; some fine to medium gravel; boulders	0	14
Sand, very fine, silty	14	23
Sand, fine; some silt	23	35
Silt and sand, very fine, gray	35	52
Silt and sand, very fine, brown	52	69
Sand, very fine, silty	69	89
Sand, fine; little silt	89	92
Refusal	92	--
Local site No. CFA 24		
Topsoil	0	1
Sand, fine to coarse; trace of silt and gravel	1	9.5
Silt, sandy, gray	9.5	24
Sand, very fine, silty	24	30
Sand, fine; some silt	30	76
Sand, fine to medium; little fine gravel	76	80
Sand, fine; some silt	80	90
Sand, fine to coarse; little fine to medium gravel	90	93.8
Refusal	93.8	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFA 25		
Silt and cobbles, brown	0	5
Sand, coarse, and gravel, silty, red stained; poorly sorted	5	10
Sand, fine to coarse, gray brown, with thin silt layers; mostly fine sand	10	15
Sand, coarse, and gravel, silty; mostly fine gravel	15	18
Sand, very fine, and silt, blue	18	20
Silt, very soft, blue	20	25
Sand, very fine, very soft, blue	25	40
Sand, very fine, blue, with thin silt and clay layers	40	45
Silt and very fine sand, blue, "clumpy"	45	50
Sand, very fine, gray; some 2-inch silt layers	50	55
Sand, very fine, gray; trace of very coarse sand	55	58
Silt and fine sand, brown gray; mixed with broken rocks and coarse sand	58	62
Till, sandy, compact	62	63
Refusal	63	--
Local site No. CFA 26		
Sand, coarse, pebbles, and cobbles; rounded, poorly sorted	0	15
Clay, silty, massive, blue	15	30
Ablation till, very sandy, pebbly, gray, compact	30	38
End of hole (very tight drilling in till)	38	--
Local site No. CFA 27		
Sand, coarse to very coarse, brown (dry)	0	2
Sand, medium; trace of gravel	2	10
Sand, fine, brown	10	12
Silt to gravel, silty; mostly coarse sand	12	12.5
Sand, fine, clean, well-washed, uniform, gray brown	12.5	13
Sand, very fine, varved, stiff, gray brown	13	15
Silt, varved, stiff, olive gray	15	25
Silt and cobbles, "tight"	25	30
"Till?", sandy, gravelly; "loose"; partially washed, gray brown (ablation till?)	30	35
Silt to very coarse sand; very silty, iron stained; mostly coarse sand	35	40
Local site No. CFA 27—*Continued*		
Sand, medium, with very coarse sand and very fine sand layers; silty, compact	40	45
Sand, fine to very coarse; some granules; mostly coarse sand; some iron-stained layers	45	55
Sand, medium to coarse, iron stained, silty	55	80
Refusal (very tight drilling at 79 ft)	80	--
Local site No. CFA 28		
Sand, gravel, and loam (fill)	0	2
Sand, fine to medium; some fine to medium gravel; little silt; boulders	2	20
Till	20	21.5
End of hole	21.5	--
Local site No. CFB 1		
Gravel; boulders	0	25
End of hole	25	--
Local site No. CFB 2		
Muck	0	3
Gravel	3	6
Sand, fine; trace of silt	6	61
End of hole	61	--
Local site No. CFB 3		
Sand	0	6
Gravel and boulders	6	15
Sand, medium to coarse	15	20
Gravel and boulders	20	30
Refusal	30	--
Local site No. CFB 4		
Sand, medium to coarse	0	44
Till, sandy	44	50.5
Refusal on bedrock or boulder	50.5	--
Local site No. CFB 5		
Gravel	0	30
Sand, fine	30	36
Gravel	36	46
Sand, medium to coarse	46	56
Till, sandy	56	75
Refusal on boulder or bedrock	75	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft)	
	From	To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFB 6		
Sand, fine, loamy, "loose"	0	5
Sand, fine to medium, "loose to med. dense"; trace of silt	5	10
Gravel, "loose to dense"; trace of silt	10	20
Sand, fine to coarse; "loose"; a few stones	20	25
Gravel, sandy, "dense"	25	40
Sand, fine to coarse; very dense; some silt	40	50
Sand, fine, very dense; some silt	50	60
Till, gravelly, very dense	60	62
Refusal	62	--
Local site No. CFW 3		
Sand, fine, brown (topsoil)	0	5
Sand, fine to medium, brown; some coarse sand and fine gravel	5	12
Sand, fine to coarse, gray, and gravel, fine, angular; trace of silt	12	16.5
End of hole	16.5	--
Local site No. CFW 4		
Sand, fine, brown (topsoil)	0	3
Sand, fine to medium, brown; some coarse sand and fine gravel	3	5
Sand, fine to coarse, brown, and gravel, fine, angular	5	11
Sand, fine to medium, brown; some coarse sand	11	16
Sand, fine to coarse, gray, and gravel, fine to medium, angular; trace of silt	16	18
End of hole	18	--
Local site No. CFW 5		
Sand, fine to coarse, brown, and gravel, fine, angular, and boulders; some silt	0	7
End of hole	7	--
Local site No. CFW 6		
Sand, brown black, loamy, fine; trace medium to coarse sand; roots	0	2
Gravel, yellow brown, angular; little fine to coarse sand; trace of silt (some gravel may be shattered cobbles)	2	9.5
Sand, yellow brown, fine to medium; little coarse sand and gravel	9.5	28
Sand, yellow gray, fine to medium; some coarse sand and gravel	28	38

Lithology	Depth (ft)	
	From	To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFW 6—*Continued*		
Sand, yellow gray, coarse, and gravel, and fine to medium sand	38	43
Sand, yellow brown, fine; trace medium sand; trace of silt	43	48
Sand, yellow gray, fine to medium; layer or lens of fine sand	48	53
Sand, yellow gray brown; fine; trace medium sand; trace of silt	53	58
Sand, yellow gray, fine	58	63
Sand, yellow gray, fine; trace medium sand	63	68
Gravel, mottled blue gray and yellow gray; some fine to coarse sand; little silt	68	73
Sand, dark yellow gray, angular, fine to coarse; some silt; little to some fine gravel	73	76.5
Sand, dark yellow brown, angular, coarse and gravel; some fine to medium sand; little silt	76.5	78
Bedrock (cored 5 ft)	78	--
Local site No. CFW 10		
Gravel and boulders	0	105
Bedrock (granite)	105	--
Local site No. CFW 12		
Gravel and cobble fill	0	2
Sand, tan, dry, and gravel; some cobbles	2	7
Sand, gray, fine, dry	7	17
Sand, gray, fine to medium, wet	17	26
End of hole	26	--
Local site No. CFW 13		
Gravel and cobble fill	0	2
Sand, gray, dry, and gravel and cobbles	2	9.5
Gravel, gray, dry, and small cobbles	9.5	10.5
Sand, gray, fine, dry	10.5	11
Sand, gray, fine to medium, dry; little gravel	11	18
Sand, tan, coarse, dry, and gravel; little small cobbles	18	22
Sand, gray, fine, wet; little coarse silt	22	31
End of hole	31	--
Local site No. CFW 14		
Sand, brown, fine, dry; trace of fine gravel	.2	10

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFW 14—*Continued*		
Sand, light brown gray, dry, medium dense, fine; trace of fine gravel	10	15.5
Silt, light gray, wet, medium dense (petroleum odor)	15.5	21.5
End of hole	21.5	--
Local site No. CFW 15		
Sand, coarse and cobbles	0	2
Sand, fine, well sorted, brown	2	15
Sand, very fine, brown, uniform, well sorted	15	20
Silt and very fine sand, gray brown; some 1-inch silt layers	20	31
Sand, medium to coarse, clean, uniform, dry	31	35
Sand, medium to small gravel, gray white, clean; mostly coarse sand, dry	35	45
Sand, fine to very coarse, brown; mostly medium coarse sand; moderately sorted	45	60
Silt to very fine sand; alternating layers of red brown and olive brown material, soft	60	78
Sand, fine to very coarse, brown; mostly coarse to very coarse sand; slightly silty	78	92
Refusal on bedrock	92	--
Local site No. CFW 16		
Sand, fine to medium, tan, uniform	0	2
Sand, coarse, and gravel, large; mostly very coarse sand; trace of fine sand; slightly silty	2	7
Sand, coarse, well washed, gray white, uniform	7	8
Sand, coarse, and gravel, fine; mostly coarse to very coarse sand; slightly silty	8	10
Sand, coarse, and gravel, large, silty; mostly coarse to very coarse sand, gray black and white	10	18
Sand, very fine to fine, olive-gray	18	20
Sand, very fine, olive-gray, soft	20	30
Clay, silty, varved; some occasional coarse sand granules	30	37.8
Sand, fine to coarse (layered); trace of very coarse sand	37.8	40
Silt to sand, brown, poorly sorted; trace of very coarse sand	40	44
Refusal	44	--

Lithology	Depth (ft) From	Depth (ft) To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFW 18		
Sand, coarse, and fine gravel, clean; mostly very coarse sand	0	3
Sand, very coarse, to small cobbles, rounded, clean	3	10
Sand, coarse to very coarse; mostly coarse sand	10	20
Sand, very coarse to fine gravel; some thin layers of fine sand	20	25
Sand, very coarse, and fine gravel, gray brown, well-washed; trace of fine sand	25	30
Sand, very coarse, well washed, well sorted; trace of fine to coarse sand	30	35
Sand, coarse to very coarse, moderately sorted; trace of fine sand; trace of gravel (100 mm)	35	40
Sand, fine to gravel (50 mm), gray brown; silty; mostly coarse to very coarse sand	40	45
Sand, fine to very coarse, gray brown, very silty; mostly coarse sand	45	50
Sand, fine to fine gravel; mostly coarse to very coarse sand	50	53
Sand, fine to fine gravel, gray brown, clean; mostly medium to coarse sand	53	55
Sand, fine to very coarse, poorly sorted, very silty; compact	55	60
Sand, very fine to pebbles, very silty, "clumpy," compact	60	64
Refusal	64	--
Local site No. CFW 19		
Topsoil, sandy, dark brown	0	5
Sand, fine, tan, and cobbles	5	12
Sand, fine	12	27
Silt, uniform, tan	27	35
Silt, uniform, stiff, olive brown	35	45
Silt, tan, stiff, varved; with thin layers of medium sand (20 mm thick)	45	53
Silt to very coarse sand, brown; mostly coarse sand	53	55
Sand, fine to very coarse, clean, well washed; mostly coarse sand	55	60
Sand, fine, some pebbles (20 mm); many fine gravel; mostly medium coarse sand	60	65
Sand, medium to coarse, well sorted, clean; mostly coarse sand	65	75

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFW 19—*Continued*		
Sand, very coarse, clean, brown; many coarse sand; trace of fine sand; trace of small pebbles	75	85
Sand, fine to very coarse; some iron-stained layers; trace of gravel and pebbles (20 mm)	85	94
Refusal in tight till at 95 ft	94	--
Local site No. CFW 28		
Gravel, coarse	0	90
Sand	90	95
Sand and gravel	95	110
End of hole	110	--
Local site No. CFW 53		
Sand and gravel	0	70
Clay	70	120
Till	120	156
Bedrock	156	--
Local site No. CFW 60		
Sand, fine, brown, and silt	0	12
Sand, fine to coarse, brown	12	19
Sand, fine to coarse; gravel, and cobbles	19	26
Sand, coarse, and gravel, brown	26	42
Sand, fine to coarse, and gravel, brown; some silt	42	45
Refusal	45	--
Local site No. CFW 61		
Sand, fine to medium, brown; some coarse brown sand	0	19
Sand, fine to coarse, brown; some gravel	19	25
Sand, fine to medium, tan	25	30
Sand, fine to coarse, tan; some gravel and trace of silt	30	43
Sand, fine to coarse, tan; some gravel and silt	43	46
Refusal	46	--
Local site No. CFW 62		
Sand, fine to coarse, brown; gravel; cobbles	0	9
Sand, fine, brown; trace of silt	9	24
Sand, fine, brown, and clay	24	30
Sand, fine, brown; some medium brown sand	30	38
COOS COUNTY—*Continued*		
Carroll—*Continued*		
Local site No. CFW 62—*Continued*		
Sand, fine to coarse, brown, and sharp, angular gravel	38	46
Refusal	46	--
Local site No. CFW 63		
Sand, fine to medium, brown	0	7
Sand, fine to medium, brown; some coarse sand and gravel	7	22
Sand, fine to medium, brown; trace of silt	22	28
Sand, fine, and silt, gray	28	30
Sand, fine, brown	30	34
Sand, fine, brown; some medium sand	34	38
Sand, fine to medium, brown; some coarse sand	38	44
Sand, fine to coarse, brown; some gravel	44	49
Sand, fine, brown	49	53
Sand, fine to coarse, and gravel	53	60
Refusal	60	--
Local site No. CFW 64		
Sand, fine to coarse, brown, with sharp, angular gravel and cobbles	0	15
Sand, fine to coarse, brown; sharp, broken gravel and cobbles; trace of silt	15	31
End of hole	31	--
Dalton		
Local site No. DAA 1		
Peat	0	6
Sand, fine to coarse; gravel, fine to coarse	6	45
Till, "hardpan"	45	--
Local site No. DAB 1		
Muck, silt, wood, boulders	0	6
Sand; stones	6	12
Sand, silty	12	28
Sand; stones	28	33
Till, silty; boulders	33	41
Refusal on boulder or bedrock	41	--
Local site No. DAB 2		
Sand, coarse, gray; some gravel	0	6
Gravel, coarse; some boulders	6	9
Sand, coarse; some gravel	9	12
Sand, medium; little gravel	12	15

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft)	
	From	To
COOS COUNTY—*Continued*		
Dalton—*Continued*		
Local site No. DAB 2—*Continued*		
Gravel, coarse	15	16
End of hole	16	--
Local site No. DAW 1		
Silt to pebbles, very silty, dark brown; mostly coarse sand	0	7
Sand, fine, uniform, clean, soft, brown gray	7	10
Sand, fine to medium, clean, well sorted, gray	10	15
Sand, medium, gray; some coarse sand; trace of very coarse sand, clean	15	20
Sand, fine to coarse, gray, clean; mostly fine to medium sand	20	25
Sand, fine to fine gravel, gray, clean; mostly coarse sand, poorly sorted	25	28
Sand, fine, uniform, gray	28	30
Sand, fine to very coarse; mostly coarse sand, poorly sorted	30	34
Till, weathered rock, clay, pebbles, coarse sand	34	35
End of hole on boulder or tight till	35	--
Local site No. DAW 2		
Sand, coarse to large gravel, brown; poorly sorted	0	2
Sand, fine to large gravel (255 mm), silty, brown; mostly coarse sand to fine gravel	2	5
Sand, medium to coarse, brown, well sorted	5	10
Sand, fine to medium, gray brown, clean, well sorted	10	12.5
Sand, fine, uniform, clean, well sorted	12.5	15
Alternating layers of very fine, fine, and medium sand, gray	15	20
Sand, fine, gray; trace of very fine and medium sand layers	20	25
Sand, fine to very fine, gray, uniform; mostly very fine sand	25	30
Sand, very fine, gray, soft, uniform	30	62
Till, clayey, sandy	62	65
Refusal in tight till	65	--
Local site No. DAW 3		
Gravel	0	20
Boulders	20	30

Lithology	Depth (ft)	
	From	To
COOS COUNTY—*Continued*		
Dalton—*Continued*		
Local site No. DAW 3—*Continued*		
Sand and gravel	30	50
Boulders	50	60
Gravel	60	100
Boulders	100	120
Bedrock (soft, green and white)	120	--
Local site No. DAW 14		
Sand	0	95
Till	95	170
Bedrock	170	--
Local site No. DAW 17		
Sand	0	20
Clay	20	50
Sand and gravel	50	95
End of hole	95	--
Local site No. DAW 38		
Sand	0	75
Sand and gravel	75	80
End of hole	80	--
Local site No. DAW 54		
Clay and sand	0	80
Sand and gravel	80	97
Bedrock	97	--
Local site No. DAW 62		
Fill	0	8
Sand	8	15
Bedrock	15	--
Whitefield		
Local site No. WLA 1		
Sand, fine to coarse; gravel, fine to medium; trace of clay	0	49
Sand, fine; trace of clay	49	66
Refusal	66	--
Local site No. WLA 2		
Boulders; silty sand and clay	0	17
Sand, fine, silty; clay	17	72
End of hole	72	--
Local site No. WLA 3		
Sand, fine to coarse; gravel, fine to medium	0	24

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
COOS COUNTY—*Continued*		
Whitefield—*Continued*		
Local site No. WLA 3—*Continued*		
Sand, fine; silt	24	56
Sand, fine; silt; trace of clay	56	70
End of hole	70	--
Local site No. WLA 5		
Till, dense sand, gravel, silt, clay, and boulders	0	172
Bedrock (schist)	172	--
Local site No. WLB 1		
Sand, gravel, and wood	0	9.3
Sand, fine, hard, blue; little clay	9.3	11.5
Sand, hard; gravel; clay (till)	11.5	13
Refusal on boulder	13	--
Local site No. WLB 2		
Sand, gravelly, brown (fill)	0	3
Sand, fine, brown	3	7.4
Refusal	7.4	--
Local site No. WLB 3		
Sand, fine, brownish gray	0	8
End of hole	8	--
Local site No. WLB 5		
Sand, fine, gravelly, gray (fill)	0	6.6
Refusal	6.6	--
Local site No. WLB 6		
Silt and sand	0	6
Gravel and boulders	6	10
Refusal	10	--
Local site No. WLW 1		
Sand, fine to coarse; gravel, fine to medium	0	49
Refusal	49	--
Local site No. WLW 2		
Gravel	0	150
Refusal	150	--
Local site No. WLW 3		
Boulders, large	0	23
Bedrock, "rotten"	23	--
Local site No. WLW 6		
Silt and cobbles	0	8
Silt, sand, and gravel	8	10
Cobbles	10	14

Lithology	Depth (ft) From	Depth (ft) To
COOS COUNTY—*Continued*		
Whitefield—*Continued*		
Local site No. WLW 6—*Continued*		
Silt, sand, and gravel	14	18
Cobbles	18	24
Boulder	24	28
Silt, sand, and gravel	28	34
Sand and gravel	34	36
Sand, medium; coarse gravel, and cobbles	36	45
Cobbles, hard packed	45	54
Sand, medium-coarse, brown; some gravel and cobbles	54	60
Sand, fine to coarse, brown, and gravel	60	70
Sand, fine to medium, brown; some coarse gravel	70	77
Sand, medium coarse, brown; gravel, fine medium; boulder	77	80.5
Sand, fine to coarse; gravel, fine to medium; silt	80.5	89
Bedrock	89	--
Local site No. WLW 7		
Rocks and boulders	0	9
Silt, gray; some sand and gravel	9	19
Silt, gray	19	23
Refusal	23	--
Local site No. WLW 8		
Fill and tree stumps	0	4
Silt, sand, and gravel	4	7
Sand, fine to medium, and silt	7	18
Gravel, medium, and cobbles	18	23
Boulder	23	26
Sand, fine, and silt (loose)	26	45
Sand, medium to coarse, and gravel, fine	45	76
Bedrock	76	--
Local site No. WLW 9		
Till, clay and silt	0	10
Gravel	10	130
End of hole	130	--
Local site No. WLW 10		
Gravel and till?	0	120
Bedrock	120	--
Local site No. WLW 11		
Clay, silt, and gravel	0	81
End of hole	81	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft)	
	From	To
COOS COUNTY—*Continued*		
Whitefield—*Continued*		
Local site No. WLW 12		
Clay, silt, and gravel	0	75
End of hole	75	--
Local site No. WLW 26		
Sand, fine to coarse, brown and gray, and gravel with boulders	0	8
Sand, fine to medium, brown, and gravel; streaks of brown and gray silt and clay	8	25
Sand, fine to medium, brown, and gravel, coarse; streaks of gray clay	25	30
Sand, fine to coarse, red, and gravel, with streaks of gray clay	30	40
Sand, fine to coarse, red; some clay and silt; streaks of red clay; some fine gravel	40	55
Sand, fine to coarse, red; some clay and silt; increased amount of red clay streaks; some fine gravel	55	64
Sand, fine to coarse, and gravel; layers of silt and brown clay; very hard below 71.5 ft	64	71.5
End of hole	71.5	--
Local site No. WLW 27		
Sand, dark brown, fine to coarse; trace of fine gravel; oil-like odor; moist	0	1.5
Sand, dark brown, fine to medium; little silt; trace of organic matter; moist	1.5	9
Refusal	9	--
Local site No. WLW 28		
Sand, dark brown, medium to coarse; trace of fine to medium grave	0	1.5
Sand, brown, medium to coarse; trace of fine to medium gravel; dry	1.5	8
Sand, brown, fine to coarse; little silt; little fine to coarse gravel; wet	8	11
Refusal	11	--
Local site No. WLW 29		
Sand, brown, medium to coarse; trace of fine gravel; trace of silt; trace of organic matter	0	1.5
Sand, gray, fine to coarse; little gravel; trace of silt	1.5	7
Refusal	7	--

Lithology	Depth (ft)	
	From	To
COOS COUNTY—*Continued*		
Whitefield—*Continued*		
Local site No. WLW 30		
Sand, brown, fine to medium; trace of organic matter	0	1.5
Sand, gray, fine to coarse; little silt; trace of fine to coarse gravel	1.5	7
Sand, gray, fine to coarse; trace of silt	7	13
Sand, brown, fine to coarse; little silt	13	15.5
Silt, gray and sand, fine to medium	15.5	20
End of hole	20	--
GRAFTON COUNTY		
Bath		
Local site No. BDA 1		
Till	2	7
Refusal	7	--
Local site No. BDA 2		
Till, sand, clay	0	19
Refusal	19	--
Local site No. BDA 3		
Gravel; sand	0	7
Till, gravel, clay, silt	7	14
Refusal	14	--
Local site No. BDA 4		
Sand; gravel	0	14
Refusal	14	--
Local site No. BDA 5		
Sand; trace of silt	0	14
Sand; gravel	14	21
Sand, fine; some gravel; trace of silt	21	35
Sand, fine; some silt; some clay	35	49
Clay; some gravel and sand; possibly till	49	52.5
Refusal	52.5	--
Local site No. BDA 6		
Sand, fine	0	7
Sand; gravel	7	20
Till, gravel, silt, clay	20	28
Refusal	28	--
Local site No. BDA 7		
Till, sandy, gravelly	0	7
Refusal	7	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Bath—*Continued*		
Local site No. BDA 8		
Gravel; trace of silt	0	30
Silt, gray; trace of clay	30	70
Clay and silt	70	82
Clay, gray	82	117
End of hole	117	--
Local site No. BDA 9		
Sand, brown	0	5
Sand, fine, brown	5	7
Sand and cobbles	7	9
Sand, fine, brown	9	18
Silt, gray	18	24
End of hole	24	--
Local site No. BDA 10		
Gravel	0	7
Till	7	11
End of hole	11	--
Local site No. BDA 11		
Gravel	0	7
Till	7	8
End of hole	8	--
Local site No. BDA 12		
Sand, fine, brown; some broken gravel; trace of clay	0	28
Sand, fine, gray; with gray clay	28	84
End of hole	84	--
Local site No. BDA 15		
Sand, fine to medium; brown	0	5
Sand, fine to medium and cobbles, smooth, rounded (250-500 mm)	5	17.5
Clay and silt, blue, soft (no varved layers)	17.5	71
Till, clayey; some angular pebbles, blue	71	--
Local site No. BDA 16		
Sand, fine to cobbles; some silt layers; poorly sorted	0	17
Sand, very fine, blue, uniform	17	25
Silt, blue, uniform, soft	25	29
End of hole	29	--
Local site No. BDA 17		
Silt and sand, very fine, tan, "clumpy"	0	7
Silt, tan	7	7.9

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Bath—*Continued*		
Local site No. BDA 17—*Continued*		
Pebbles and broken cobbles; some coarse sand	7.9	15
Till, blue, clayey, compact	15	--
Local site No. BDA 18		
Sand, fine to medium	0	2
Sand, fine to coarse and large pebbles	2	10
Sand, fine to very coarse, brown, silty; some small gravel; mostly very coarse sand	10	17.5
Clay and silt, blue (no varved layers)	17.5	25
Clay, blue, silty, stiff, massive	25	29
End of hole	29	--
Local site No. BDW 1		
Sand, fine, brown; some gravel; trace of clay	0	28
Sand, fine, brown, and gravel; trace of clay	28	41
Refusal	41	--
Local site No. BDW 5		
Sand, fine, brown; some broken gravel; trace of clay	0	28
Sand, fine to medium, brown; some gravel; trace of clay	28	35
End of hole	35	--
Local site No. BDW 6		
Sand, fine, brown; some gravel; trace of clay	0	35
End of hole	35	--
Local site No. BDW 14		
Sand, medium to coarse	0	6
Gravel, coarse; cobbles and boulders	6	13
Clay and silt (bluish)	13	25
Cobbles	25	30
Gravel, fine, silty	30	41
Bedrock	41	--
Local site No. BDW 17		
Clay	0	3
Gravel, coarse	3	8
End of hole	8	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft)	
	From	To
GRAFTON COUNTY—*Continued*		
Bath—*Continued*		
Local site No. BDW 27		
Boulder	0	25
Till	25	80
Bedrock	150	--
Local site No. BDW 33		
Gravel	0	60
Clay	60	80
Till, sandy (?)	80	115
Bedrock	115	--
Local site No. BDW 44		
Gravel	0	90
Clay	90	100
Bedrock	100	--
Benton		
Local site No. BOB 1		
Sand, coarse	0	4
Gravel; "wood"	4	10
Sand, fine	10	14
Silt and clay	14	50
Gravel, silty; boulders	50	60
Refusal	60	--
Local site No. BOW 3		
Topsoil, "clumpy"	0	3
Silt to pebbles (40 mm); light brown; "clumpy"; poorly sorted	3	7
Silt to pebbles (20 mm), gray; mostly silt and very coarse sand; poorly sorted	7	12.8
Silt, gray; some gray clay layers (250 mm thick)	12.8	15
Clay and silt, blue; some coarse sand and pebbles	15	18
Sand, fine to medium, gray, "clean"; uniform; well sorted	18	20
Sand, fine, gray, "soft"; uniform	20	25
Sand, fine to medium, gray; uniform; trace of pebbles (40 mm)	25	33
Sand, very fine, gray; uniform	33	47
Till, gray, compact, "clayey"	47	--
Bethlehem		
Local site No. BSA 1		
Gravel; cobbles; boulders	0	11.5

Lithology	Depth (ft)	
	From	To
GRAFTON COUNTY—*Continued*		
Bethlehem—*Continued*		
Local site No. BSA 1—*Continued*		
Sand, silty; trace of gravel; some boulders	11.5	19
Sand, coarse; trace of gravel	19	30
End of hole	30	--
Local site No. BSA 2		
Sand, fine, silty; some gravel	0	22.5
Gravel, silty; cobbles	22.5	28
Sand, silty; trace of gravel	28	33
End of hole	33	--
Local site No. BSA 3		
Sand	0	103
Gravel and "hardpan"	103	225
Clay	225	240
Gravel	240	259
Bedrock	259	--
Local site No. BSA 4		
Silt to cobbles; mostly very coarse sand and gravel; poorly sorted	0	10
Silt to fine gravel, very "dirty," "soupy," dark brown	10	12
Silt to fine gravel, gray brown; very "dirty"; poorly sorted; some cobbles	12	17
Silt and medium sand	17	17.5
Silt and fine gravel	17.5	18
Till, cobbly, very compact	18	20
End of hole (very hard drilling in till)	20	--
Local site No. BSA 5		
Gravel and cobbles	0	2
Gravel, large (20 mm)	2	5
Sand, medium to small pebbles (20 mm); mostly coarse gravel	5	10
Sand, medium to large pebbles (30 mm); with a 25 mm thick layer of fine sand; mostly very coarse sand	10	15
Sand, fine; with a 20 mm-Thick layer of coarse to very coarse sand	15	18
Sand, very fine, soft, uniform, olive-gray	18	20
Sand, fine and large gravel	20	23
Silt, stiff; some medium sand layers	23	27
Till, sandy, gray, compact	27	35
Refusal	35	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Bethlehem—*Continued*		
Local site No. BSA 6		
Sand, coarse, and gravel (railroad fill)	0	5
Silt, gravel, and rocks	5	18
Refusal on boulder	18	--
Local site No. BSA 8		
Silt; very coarse sand; gravel and cobbles, brown, dry	0	13
Refusal on boulder	13	--
Local site No. BSB 1		
Sand, loamy, loose, brown	0	2
Silt, sandy, loose to medium dense, brown	2	7
Sand, silty, medium dense, brown	7	9
Sand, fine to medium, dense, brown; trace of stones	9	14
Till, sandy, very dense, brown; some boulders	14	22
Till, silty, very dense, gray; some boulders	22	40
End of hole	40	--
Local site No. BSW 1		
Sand and gravel	0	28
End of hole	28	--
Local site No. BSW 2		
Sand, very fine to gravel, very coarse	0	13
End of hole	13	--
Local site No. BSW 3		
Gravel and "hardpan"	0	38
Gravel, small, and "hardpan"	38	44
Gravel, medium	44	51
Gravel, small	51	54
Gravel and "hardpan"	54	83
Gravel, small	83	84
Gravel and "hardpan"	84	140
Bedrock	140	--
BSW 4		
Sand, silty, fine, gravelly with cobbles	0	35.5
Sand, medium to coarse, silty, gravelly, brown	35.5	58
Silt, sandy, gray and brown; with fine sand layers	58	71.5
End of hole	71.5	--

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Bethlehem—*Continued*		
Local site No. BSW 5		
Sand, fine, silty, brown	0	3
Sand, medium to coarse, gravelly, brown	3	10
Sand, medium to coarse, gravelly, brown, with cobbles	10	38
Silt, sandy, brown; trace of gravel	38	45
Silt, sandy, gravelly, gray	45	57
Silt, sandy, gray; trace of gravel	57	61
End of hole	61	--
Local site No. BSW 6		
Silt, sandy, gravelly, brown, with cobbles and boulders	0	8
Sand, fine to coarse, gravelly, brown; with cobbles	8	38
Silt, sandy, gravelly, brown	38	47
End of hole at 47 ft	47	--
Local site No. BSW 7		
Sand, fine to medium, brown with cobbles	0	7
Silt, fine, sandy, brown	7	16
Sand, fine to medium, gravelly, brown	16	34
Refusal (on boulder?)	34	--
Local site No. BSW 8		
Topsoil	0	1
Sand, fine to medium, very dense, olive brown; little gravel, trace of silt (possibly till)	1	31
Sand, fine to medium, very dense, gray, with thin clayey silt layers, 1 to 2 inches apart	31	41
Sand, fine to coarse, very dense, gray; little silt and gravel, stratified	41	43
End of hole	43	--
Local site No. BSW 9		
Sand, fine to medium, brown; little silt; with organic matter	0	1
Sand, fine to medium, very dense, gray; little silt; trace of fine gravel	1	6
Sand, fine, very dense, gray; little silt; trace of fine gravel	6	11
Sand, fine to coarse, very dense, gray; little silt; trace of gravel	11	16

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Bethlehem—*Continued*		
Local site No. BSW 9—*Continued*		
Sand, fine to coarse, and gravel, very dense, olive gray; trace of silt	16	21
Sand, fine to coarse, very dense, olive gray; some silt; little gravel, fine	21	29
Sand, fine to coarse, very dense, olive gray; little silt; trace of gravel	29	33
Boulder	33	34.2
Gravel and cobbles	34.2	40
End of hole	40	--
Local site No. BSW 10		
Sand, fine to medium, dark brown; some silt and boulders (1-3 ft in diameter)	0	1
Sand, fine to medium, very dense, olive gray; little silt; trace of gravel (possibly till)	1	15
Sand, fine to medium, very dense, olive gray; little silt; little gravel (possibly till)	15	20
Sand, fine to coarse, very dense, olive gray; some gravel; little silt (possibly till)	20	39
Sand, fine to coarse, and gravel, very dense, olive gray; little silt	39	43
Cobbles; with gravel	43	45
Sand, fine to coarse, very dense, brown gray; little gravel; trace of silt	45	51
End of hole	51	--
Local site No. BSW 11		
Sand, fine to medium, dark brown, and silt; with organic material	0	1
Sand, fine to medium, and silt, very dense, olive brown; trace of gravel (possibly till)	1	6
Sand, fine to medium, and silt, very dense, olive brown (possibly till)	6	11
Sand, fine to coarse, very dense, olive brown; some clayey silt; little gravel (possibly till)	11	16
Sand, fine to coarse, and gravel, very dense, olive brown; little silt (possibly till)	16	21
Sand, fine, very dense, olive brown; some silt; trace of gravel (possibly till)	21	27
Sand, fine to coarse, very dense, olive brown; little silt and gravel (possibly till)	27	33
Sand, fine to coarse, very dense, olive brown; some gravel; trace of silt	33	35.5

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Bethlehem—*Continued*		
Local site No. BSW 11—*Continued*		
Sand, fine to coarse, and gravel, very dense, olive brown; trace of silt	35.5	42
End of hole	42	--
Local site No. BSW 12		
Silt, olive brown, very dense; some fine sand; trace of gravel	0	8
Sand, fine, olive brown, very dense; some silt	8	12
Sand, fine to coarse, olive brown, very dense; little silt; trace of gravel	12	33
Sand, fine to coarse, and gravel, gray, very dense; trace of silt	33	44.9
Boulder	44.9	46.1
Sand, fine to coarse, and gravel, gray brown, very dense; some silt	46.1	78.9
Boulder	78.9	80.6
Gravel, cobbles, and boulders	80.6	87.5
End of hole	87.5	--
Local site No. BSW 23		
Sand, fine, silty, brown; trace of medium to coarse gravel	0	6.2
Sand, fine, brown	6.2	7.2
Sand, fine, silty, brown, with medium to coarse gravel; trace of cobbles	7.2	14
Sand, fine, silty, gray brown; with gravel, cobbles, and boulders (possibly till)	14	23
Sand, fine, silty, gray, with medium to coarse sand, gravel, cobbles, and boulders (possibly till)	23	28
Sand, fine, silty, gray, with fine, sandy silt	28	33.5
Sand, fine to medium, brown, with coarse, sandy gravel; trace of cobbles and silt	33.5	45
End of hole	45	--
Local site No. BSW 24		
Sand, fine, silty, brown; with medium to coarse sand; gravel and cobbles	0	11.5
Sand, fine to medium, silty, brown, with coarse, sandy gravel, and cobbles	11.5	28
Sand, fine to medium, brown, with gravel and cobbles; trace of silt and boulders	28	33
Gravel, fine to medium, sandy, brown, with silt and cobbles	33	44
Gravel, fine to coarse, silty, gray, with cobbles (possibly till)	44	69

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Bethlehem—*Continued*		
Local site No. BSW 24—*Continued*		
Cobbles, with fine, gray sand; trace of medium to coarse sand, silt and gravel	69	83
End of hole	83	--
Local site No. BSW 25		
Sand, fine, silty, brown; some medium to coarse sand, and gravel	0	4.8
Sand, fine to medium, brown; some coarse sand and gravel; trace of silt	4.8	7.2
Sand, fine, silty, gray brown; some medium to coarse sand, gravel and cobbles	7.2	28.5
Sand, fine to medium, silty, gray; some coarse sand; trace of silt layers	28.5	32.5
Sand, fine to medium, brown; some coarse, sandy gravel; trace of silt	32.5	38.5
Sand, fine to medium, brown; some coarse sand, and gravel; trace of silt and fine sand layers	38.5	41
End of hole	41	--
Local site No. BSW 26		
Silt, sandy, brown; some organic matter; trace of gravel	0	1.7
Sand, fine, silty, brown; trace of medium sand	1.7	3
Sand, fine, silty, gray brown; some medium to coarse sand, and gravel	3	4.8
Sand, fine, silty, gray; trace of medium sand layers	4.8	19.5
Sand, fine, silty, gray brown; some medium to coarse sand; trace of gravel and silt layers	19.5	22
Sand, fine to medium, brown; some coarse sand; trace of silt, gravel, and cobbles	22	37.5
Sand, fine, silty, gray; some cobbles; trace of medium to coarse sand, and gravel	37.5	50
End of hole	50	--
Local site No. BSW 27		
Sand, fine, silty, brown; some cobbles and medium to coarse gravel; trace of boulders	0	5.2
Silt and sand, fine, silty, gray brown; trace of coarse sand	5.2	16.2
Silt and sand, fine, brown; some medium to coarse sand; trace of gravel	16.2	24
GRAFTON COUNTY—*Continued*		
Bethlehem—*Continued*		
Local site No. BSW 27—*Continued*		
Silt, fine, sandy, gray; trace of silt and fine sand layers	24	36.5
End of hole	36.5	--
Local site No. BSW 28		
Sand, fine to medium, silty, brown; some gravel and coarse sand	0	2
Sand, fine, silty, gray	2	11
Sand, fine, silty, gray; trace of medium to coarse sand, gravel, and cobbles	11	15
End of hole	15	--
Local site No. BSW 29		
Silt, fine sand, and gravel, gray	0	25
Boulder	25	28
Silt, sand and gravel, hard packed, brown	28	78
Bedrock, very soft gray and pink	78	91
Bedrock, soft, with gray and pink seams	91	225
Bedrock, medium hard, with gray, white, and pink seams	225	--
Local site No. BSW 30		
Silt and sand, gray	0	16
Boulder	16	30
Silt, sand, and gravel, very hard packed, brown	30	73
Granitic bedrock, soft, gray, with pink and purple seams	73	--
Local site No. BSW 31		
Silt and sand, gray	0	24
Sand and gravel, hard packed, gray	24	46
Sand and gravel, very hard packed, brown	46	69
Bedrock, soft to medium hard, with gray, pink, and purple seams	69	250
Bedrock, very hard, gray	250	--
Local site No. BSW 32		
Silt, gray sand, and gravel	0	24
Sand and gravel, packed, gray	24	39
Sand and gravel, very hard packed, brown	39	60
Gravel, very hard packed	60	73
Bedrock, medium hard, gray	73	82
Bedrock, soft, gray and white	82	200
Bedrock, soft, gray, with pink and purple seams	200	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Bethlehem—*Continued*		
Local site No. BSW 33		
Silt and coarse gravel	0	17
Gravel, medium	17	24
Clay, blue	24	26
Clay, sandy silt, and boulders	26	30
Sand, fine; some silt and clay	30	33
Silt, fine sand, and medium gravel	33	38
Sand, fine, and gravel; trace of clay	38	42
Clay, silt, and coarse sand	42	48
Sand, fine to medium, and gravel	48	63
Sand, fine, and gravel	63	64.5
Bedrock, sedimentary	64.5	--
Local site No. BSW 39		
Sand, fine	0	11
Clay, blue	11	53
Boulder	53	56
Clay, blue	56	77
Silt	77	90
Bedrock	90	--
Local site No. BSW 40		
Clay and gravel	0	130
Bedrock (rose quartz)	130	--
Local site No. BSW 41		
Clay and gravel	0	126
Bedrock	126	--
Local site No. BSW 43		
Gravel, fine	0	65
Gravel, coarse	65	80
End of hole	80	--
Local site No. BSW 44		
Gravel	0	73
End of hole	73	--
Local site No. BSW 46		
Gravel	0	35
End of hole	35	--
Local site No. BSW 47		
Gravel	0	111
End of hole	111	--
Local site No. BSW 48		
Sand and gravel	0	58
GRAFTON COUNTY—*Continued*		
Bethlehem—*Continued*		
Local site No. BSW 48—*Continued*		
Gravel	58	60
End of hole	60	--
Local site No. BSW 49		
Sand and gravel	0	150
Bedrock	150	--
Local site No. BSW 50		
Sand and gravel	0	156
Bedrock	156	--
Local site No. BSW 51		
Gravel	0	60
End of hole	60	--
Local site No. BSW 52		
Gravel	0	60
End of hole	60	--
Local site No. BSW 53		
Driller reports material is "sandy till"	0	40
Gravel, fine	40	80
Gravel, coarse	80	100
End of hole	100	--
Local site No. BSW 57		
Driller reports "sandy till"	0	50
Gravel	50	120
Bedrock	120	--
Local site No. BSW 58		
Sand and gravel	0	300
End of hole	300	--
Local site No. BSW 59		
Sand	0	287
Gravel	287	300
End of hole	300	--
Local site No. BSW 60		
Sand and gravel	0	310
Bedrock	310	--
Local site No. BSW 62		
Sand	0	40
Hardpan	40	70
Bedrock	70	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Bethlehem—*Continued*		
Local site No. BSW 80		
Gravel (dry)	0	60
Sand, gravel, boulders	60	63
End of hole	63	--
Local site No. BSW 83		
Sand	0	20
Gravel	20	110
Bedrock	110	--
Local site No. BSW 84		
Sand, fine to coarse, olive brown, very dense; some silt; little gravel	0	15.1
Boulder	15.1	16.4
Silt, olive brown, very dense; little fine to coarse sand	16.4	23
Sand and gravel, fine to coarse, olive gray, very dense; little silt	23	45
Silt, olive brown and red, very dense; little fine sand	45	57
Sand and gravel, fine to coarse, very dense, little silt	57	76.5
End of hole	76.5	--
Local site No. BSW 85		
Sand, fine to medium, and silt, very dense; trace of gravel	0	19.8
Boulder	19.8	22.9
Sand, fine to coarse, some olive brown, very dense silt; trace of gravel	22.9	40
Sand, fine, olive brown, very dense; some silt	40	49
Silt, olive brown, very dense; little fine sand	49	60
Sand, fine to coarse, brown, very dense; trace of gravel	60	85
Sand, fine to coarse, and gravel, very dense; trace of silt	85	115
End of hole	115	--
Local site No. BSW 88		
Sand and gravel	0	20
Sand, "hardpan"	20	110
Sand and gravel	110	120
End of hole	120	--

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Bethlehem—*Continued*		
Local site No. BSW 106		
Clay, silt, gravel, and boulders	0	160
Bedrock	160	--
Local site No. BSW 111		
Sand	0	90
Gravel	90	95
End of hole	95	--
Canaan		
Local site No. CCA 1		
Sand, fine to medium, brown; little fine gravel; trace of silt	0	3
Sand, fine, light brown, medium dense; little medium sand	3	8
Sand, fine, brown, dense; some medium sand and fine to coarse gravel; little silt	8	10.5
Sand, medium; some fine to coarse sand; trace of fine gravel	10.5	16.5
Sand, fine, gray, very dense, damp; little medium sand, silt, strata of weathered rock	16.5	23.5
End of hole	23.5	--
Local site No. CCA 2		
Sand, fine, gray	0	5
Refusal	5	--
Local site No. CCA 3		
Topsoil, dark	0	3
Sand, fine, to gravel, coarse; mostly coarse to very coarse sand	3	15
Peat, dark brown	15	18.5
Silt, dark brown	18.5	25
Sand, medium, gray	25	28
Silt, stiff, dark brown	28	33
Sand, fine to medium; gray brown	33	38.5
Silt, soft, gray	38.5	45
Sand, very fine, soft, gray; uniform	45	55
Silt to small pebbles, gray; poorly sorted	55	65
Till, compact, sandy, gravelly, gray	65	--
Local site No. CCB 1		
Sand, loamy	0	4.3
Sand, silty, soft	4.3	17

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Canaan—*Continued*		
Local site No. CCB 1—*Continued*		
Sand, fine; trace of silt	17	43.5
Clay, soft, blue; sand	43.5	68
Sand, hard, gravel, and clay	68	75
Refusal on boulder	75	--
Local site No. CCB 2		
Sand, loamy, yellow	0	4
Sand, loose, "sharp"	4	9
Sand, coarse, loose; gravel	9	11.3
Sand, medium, "sharp," blue	11.3	51
Sand, coarse; gravel	51	53.3
Sand, fine; gravel	53.3	55
Refusal on boulder or bedrock	55	--
Local site No. CCB 3		
Sand, loamy	0	3.5
Sand, "sharp," loose, gray	3.5	13
Sand, "sharp"; trace of gravel	13	18.5
Sand and clay, soft	18.5	22.5
Sand and gravel, coarse	22.5	31
Till (sand, clay, gravel, boulders, hard)	31	36
Refusal	36	--
Local site No. CCB 4		
Sand, coarse	0	7
Till, sandy	7	16
Bedrock	16	--
Local site No. CCB 5		
Gravel	0	19
Sand, fine, silty	19	22
Till, sand; boulders	22	42
Refusal	42	--
Local site No. CCW 1		
Till, sandy, cobbly	0	58
Bedrock, weathered	58	--
Local site No. CCW 3		
Sand, fine to coarse, gray brown; trace of very coarse sand	0	7
Silt to coarse sand, red, "iron stained;" poorly sorted	7	7.5
Sand, very fine to fine, gray; uniform; well sorted	7.5	10
Sand, very fine to fine, gray brown; uniform; well sorted	10	15
GRAFTON COUNTY—*Continued*		
Canaan—*Continued*		
Local site No. CCW 3—*Continued*		
Sand, very fine, gray brown; uniform; well sorted	15	23.6
Sand, very fine to fine, gray brown; mostly fine sand	23.6	30
Clay, soft, gray	30	35
Sand, very fine	35	38
Sand, fine, gray	38	38.3
Clay, olive gray	38.3	39
Sand, fine, gray; well sorted	39	43
Sand, fine, brown; well sorted	43	47.6
Sand, very fine to small pebbles, angular; poorly sorted	47.6	48.2
Sand, fine to medium, brown; trace of coarse sand	48.2	48.6
Silt to very coarse sand; poorly sorted	48.6	50
Sand, medium to very coarse sand, brown; mostly coarse sand	50	54
Till, compact; poorly sorted	54	--
Local site No. CCW 4		
Sand, very coarse, and gravel, brown; some small cobbles	0	2
Sand, fine to medium, gray brown	2	7
Sand, fine to very coarse, gray brown; mostly coarse sand	7	8
Sand, very fine to very coarse, gray brown; mostly medium sand	8	10
Sand, fine to very coarse, gray brown; with 2-inch silt layer	10	13
Sand, very fine to fine, gray, uniform	13	15
Sand, fine to medium, gray brown; mostly fine sand	15	20
Sand, fine to very coarse, gray brown; mostly coarse sand; trace of cobbles; moderately sorted	20	24
Till, very compact, weathered, broken rocks, poorly sorted	24	35
Till, compact; with a 10-inch red brown fine sand layer at 38 to 39 ft	35	83.7
Refusal	83.7	--
Local site No. CCW 5		
Topsoil, organic, dark brown	0	2
Sand, fine to medium, brown, uniform	2	7
Sand, fine to large pebbles, mixed, brown; trace of small cobbles	7	12

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Canaan—*Continued*		
Local site No. CCW 5—*Continued*		
Sand, fine to coarse gravel, gray; mostly coarse sand; trace of small pebbles (60 mm)	12	15
Sand, fine to small pebbles; many fine to coarse gravel; gray	15	25
Sand, fine to very coarse, gray; mostly medium sand; well sorted	25	28
Sand, fine to very fine, gray; well sorted	28	35
Sand, fine, gray, uniform, well sorted	35	48
Sand, fine to very fine, gray; mostly fine sand; with a 4-inch silt layer	48	55
Clay and silt, blue gray	55	72
Till, silty, sandy, blue gray, very compact	72	--
Local site No. CCW 6		
Sand, medium to coarse, light brown	0	2
Sand, fine to trace of pebbles, gray brown; mostly coarse sand	2	7
Sand, fine to very coarse, brown; mostly medium to coarse sand	7	12
Sand, fine to coarse, brown; trace of fine gravel	12	13
Sand, fine to medium, gray; mostly fine sand	13	17
Sand, very fine to fine, blue gray, uniform; well sorted	17	22
Sand, very fine, blue gray, uniform; well sorted	22	25
Sand, fine, gray	25	28.5
Sand, very fine, gray	28.5	38
Clay, gray	38	41
Till, clayey with angular, broken rocks	41	--
Local site No. CCW 7		
Topsoil, black, "rich"	0	3
Silt, very dark brown, soft	3	7
Sand, fine, very dark brown	7	10
Peat, very dark brown, with 1-inch layer of gray fine sand	10	17.5
Silt, gray, soft	17.5	20
Silt and very fine sand, brown	20	22.5
Clay, gray, with thin very fine sand layers	22.5	28.5
Sand, medium to coarse, gray, clean, well washed; trace of pebbles (50-250 mm)	28.5	35

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Canaan—*Continued*		
Local site No. CCW 7—*Continued*		
Sand, fine to small pebble, gray, well washed; mostly coarse sand; moderately sorted	35	40
Sand, fine to coarse gravel, gray; some pebbles (250 mm); mostly medium sand	40	45
Sand, fine to pebbles (4mm), gray, clean; many large gravel (250 mm); mostly coarse to very coarse sand	45	50
Sand, fine to coarse gravel, gray, clean; many large pebbles (100-250 mm); mostly very coarse sand to coarse gravel	50	55
Till, silt to pebble, gray; with broken, angular rocks, coarse sand; poorly sorted	55	--
Local site No. CCW 30		
Topsoil	0	2
Sand, fine to coarse, brown, medium dense; some fine to coarse gravel; trace of to little silt	2	12
End of hole	12	--
Local site No. CCW 31		
Sand, fine, dark brown, silty; little to some medium sand; trace of organic matter	0	2
Sand, fine to medium, brown; little fine gravel; trace of silt	2	8
Sand, fine, brown, medium dense; little medium sand	8	12
End of hole	12	--
Local site No. CCW 32		
Sand, fine; some to little medium sand; trace of silt	0	7
Sand, fine, brown, loose; little medium sand; occasional layers of medium to coarse sand	7	14.5
Sand, fine to medium, brown, dense; some fine gravel; trace of silt	14.5	17.5
Sand, fine, silty; some medium sand, weathered rock	17.5	20.2
End of hole	20.2	--
Local site No. CCW 33		
Sand, fine; some medium sand; trace of fine gravel and silt	0	10.5

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Canaan—*Continued*		
Local site No. CCW 33—*Continued*		
Sand, medium, brown, medium dense; some fine to coarse sand; trace of fine gravel	10.5	16
Sand, very fine, brown gray, medium dense; trace of silt with layers of weathered rock	16	18.5
End of hole	18.5	--
Local site No. CCW 34		
Asphalt	0	.3
Silt and sand, fine to medium, gray brown, moist, medium dense; trace of fine gravel (petroleum odor)	.3	6
Sand, fine to coarse, gray, wet, medium dense; trace of fine to medium gravel (petroleum odor)	6	11
Silt, gray, wet, medium dense, and sand, fine	11	12
End of hole	12	--
Local site No. CCW 85		
Sand and gravel	0	10
Clay	10	45
Bedrock	45	--
Local site No. CCW 99		
Sand	0	10
Sand and gravel	10	33
Clay, sand, and gravel	33	60
Sand	60	90
Clay, sand, and gravel	90	100
End of hole	100	--
Local site No. CCW 128		
Sand	0	8
Sand and gravel	8	20
Bedrock	20	--
Local site No. CCW 135		
Sand	0	10
Sand and gravel	10	110
Bedrock	110	--
Local site No. CCW 152		
Sand and gravel	0	20
Till	20	160
Local site No. CCW 152—*Continued*		
Clay and hardpan	160	180
Bedrock	180	--
Local site No. CCW 159		
Clay	0	75
Sand and gravel	75	85
End of hole	85	--
Local site No. CCW 168		
Sand and gravel	0	15
Clay	15	50
Bedrock	50	--
Local site No. CCW 170		
Till (?)	0	25
Clay, sand and gravel	25	70
Bedrock	70	--
Local site No. CCW 194		
Sand and gravel	0	35
Till	35	103
Bedrock	103	--
Easton		
Local site No. EBW 1		
Sand, fine to small pebbles, brown; mostly medium sand	0	3
Sand, fine to coarse, gray; mostly medium sand	3	7
Sand, fine to pebbles (20 mm), gray brown; many small pebbles, well washed; poorly sorted	7	8.4
Sand, fine, gray, uniform	8.4	10
Sand, fine to coarse gravel, gray, well washed; mostly very coarse sand	10	18.5
Sand, very fine, gray	18.5	25
Sand, fine to coarse, gray brown, uniform; mostly medium sand	25	27.7
Sand, very fine, gray brown	27.7	28.5
Silt and very fine sand layers, gray brown, varved	28.5	30
Sand, fine to trace of fine gravel, gray brown; mostly fine to medium sand	30	33.1
Clay, silt, and very fine sand in 3-mm thick alternating layers, gray brown, varved	33.1	45
Sand, very fine and clay layers, blue gray	45	55

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Easton—*Continued*		
Local site No. EBW 1—*Continued*		
Sand, very fine, blue gray, uniform, soft	55	65
Sand, medium, brown gray	65	68
Till, compact	68	--
Local site No. EBW 17		
Sand	0	90
Sand and gravel	90	130
Bedrock	130	--
Enfield		
Local site No. ENA 1		
Sand, fine, silty; some gravel	0	5
Clay, soft, blue	5	30
Hardpan, brown	30	--
Local site No. ENA 2		
Sand, fine, silty, brown	0	3
Clay, gray	3	14
Clay, soft, blue	14	33
Hardpan, brown	33	--
Local site No. ENA 3		
Sand, coarse and cobbles; many pebbles (250-500 mm)	0	12
Sand, medium to trace of very coarse sand, brown; mostly medium sand	12	18.5
Till	18.5	--
Local site No. ENB 1		
Sand, loamy	0	3
Gravel, sandy, slightly silty	3	9
Sand, silty	9	20
End of hole	20	--
Local site No. ENB 2		
Sand, coarse, and gravel, "firm"	0	31
Silt (fill)	31	33
Clay, blue, and sand	33	60
Sand and gravel "and mica"	60	61
Refusal	61	--
Local site No. ENB 3		
Sand, "loose," and gravel	0	2.3
Silt	2.3	9
Clay, blue, and sand	9	49
Sand and gravel	49	51
Refusal	51	--
GRAFTON COUNTY—*Continued*		
Enfield—*Continued*		
Local site No. ENB 4		
Stones, loose (riprap)	0	8
Silt	8	13
Clay, blue and sand	13	54
Sand and gravel	54	56
Refusal	56	--
Local site No. ENB 5		
Riprap	0	3.1
Sand, fine "mud"	3.1	4.9
Sand, coarse, "loose, dirty," and gravel	4.9	26
Sand, silty, "soft"	26	30.3
Clay, blue, "soft," and sand	30.3	62
Clay and sand and gravel "mica"	62	64
End of hole	64	--
Local site No. ENB 6		
Sand and gravel	0	3
Silt, "medium to hard," and sand, fine, and "small stones"	3	9
Silt "soft," and sand, fine, and "stones"	9	27
Silt, "hard." and sand, fine, and "stones"	27	32
Bedrock	32	--
Local site No. ENB 7		
Sand, silty; hardpan, boulder	0	24
Hardpan; clay, very silty; boulder	24	34.5
Refusal	34.5	--
Local site No. ENB 8		
Silt and sand	0	5
Sand, fine to medium, slightly silty	5	10
Sand, gravelly, slightly silty	10	16
Sand, slightly loamy and silty	16	23.5
Bedrock (phyllitic schist with few seams)	23.5	--
Local site No. ENW 1		
Clay, blue; some fine sand	0	17
Clay; some fine silt	17	20
Clay	20	40
Boulder (ice rafted?)	40	46
Clay	46	48
Interbedded lacustrine clays and coarse sand	48	77
Gravel, small (channel fill deposit?)	77	80
Lacustrine clays and coarse sand, interbedded (distal fluvial-deltaic deposit)	80	107

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Enfield—*Continued*		
Local site No. ENW 1—*Continued*		
Hardpan, "stony," medium sand with compact silty clay matrix	107	116
Strongly foliated, biotite-rich schistose facies of Mascoma Group	116	--
Local site No. ENW 29		
Sand, fine to medium, brown and gravel; some silt	0	14
Sand, fine to medium, brown, silty and gravel, fine to medium, broken, sharp	14	20
Sand, fine to coarse and gravel, broken, sharp, silty	20	35
Sand, fine and gravel, broken, sharp, silty	35	36
Sand, fine to coarse and gravel, broken and sharp; some silt	36	38
Sand, fine, silty; some gravel	38	39.8
End of hole	39.8	--
Local site No. ENW 30		
Topsoil	0	1
Sand, fine to pebbles; mostly coarse sand	1	2
Sand, fine to small cobbles; many small gravel	2	7
Sand, fine to small pebbles, gray brown; mostly very coarse sand	7	15
Sand, fine to coarse gravel, gray brown; mostly coarse sand; trace of large gravel (250 mm)	15	25
Sand, fine to large pebbles (250 mm), gray brown; mostly coarse to very coarse sand	25	35
Sand, fine to trace of coarse gravel, gray brown; mostly coarse sand	35	38.6
Clay and silt, gray	38.6	45
Clay, blue; with alternate (and thin) fine, blue sand layers	45	50
Till	50	--
Local site No. ENW 31		
Sand, gray and gravel, broken, sharp	0	27
Clay, gray, and silt; few stones at bottom of well	27	48
End of hole	48	--
Local site No. ENW 32		
Sand, fine to gravel, coarse, brown; mostly coarse sand	0	7
Sand, trace of fine to cobbles, gray brown; many small pebbles; mostly very coarse sand	7	15
Sand, medium to coarse; some fine gravel; trace of small pebbles	15	18.5
Till	18.5	--
Local site No. ENW 33		
Sand, fine, gray brown, uniform	0	3
Sand, fine, brown, uniform; well sorted	3	7
Sand, fine, brown; very well sorted	7	8.6
Sand, fine to very coarse sand; mostly medium sand	8.6	11
Sand, medium to fine gravel, brown, clean, well washed; mostly coarse to very coarse sand	11	13.5
Sand, fine	13.5	15
Sand, fine to gravel, fine, clean, well washed; well sorted; mostly coarse to very coarse sand	15	20
Sand, fine to coarse gravel; trace of small pebble (4 mm); moderately sorted	20	25
Sand, fine to pebbles (150 mm); many small pebbles (4 mm), clean; mostly very coarse sand to fine gravel	25	35
Sand, medium to coarse gravel, clean, well washed, brown; mostly very coarse sand; moderately sorted	35	38
Silt and very fine sand, with 1-inch layers of very coarse sand	38	41
Till, silty, cobbly, red brown, compact	41	--
Local site No. ENW 34		
Sand, gray, silty	0	25
Gravel, broken, sharp	25	30
Clay, gray and silt	30	64
Gravel, broken, sharp	64	69
End of hole	69	--
Local site No. ENW 177		
Sand and gravel	0	8
Till	8	60
Bedrock	60	--
Local site No. ENW 191		
Sand and gravel	0	15

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Enfield—*Continued*		
Local site No. ENW 191—*Continued*		
Till	15	70
Bedrock	70	--
Franconia		
Local site No. FDA 3		
Silt to small cobbles, brown, "clumpy"; poorly sorted	0	3
Sand, medium to pebbles, brown, silty; mostly coarse sand; moderately sorted	3	15
Sand, medium to small pebbles; mostly coarse sand (dry)	15	19
Refusal in cobbles	19	--
Local site No. FDA 4		
Sand, fine to medium, brown; occasional cobble; well sorted	0	3
Sand, fine to medium, light brown, with cobbles; mostly fine sand	3	10
Sand, fine to fine gravel, gray; mostly very coarse sand; moderately sorted	10	15
Sand, very fine to pebble (4 mm); many small cobbles; mostly very coarse sand; moderately sorted	15	30
Refusal on boulder	30	--
Local site No. FDA 5		
Silt to cobbles, dark brown	0	3
Silt to large pebbles, grayish; mostly coarse sand	3	7
Silt to broken cobbles, brown, compact; poorly sorted	7	15
Silt to small pebble (4 mm), brown; much fine gravel; mostly coarse to very coarse sand; poorly sorted	15	20
Sand, fine, brown, uniform	20	35
Sand, fine, gray brown	35	38.3
Silt and very fine sand, gray brown	38.3	47
Till, silty, clayey, olive gray; compact	47	--
Local site No. FDB 1		
Sand, loamy	0	3
Sand, fine to coarse; gravel	3	17
Till; bouldery, silty, gravelly sand	17	21
Refusal on bedrock or boulder	21	--
Local site No. FDB 2		
Sand, loamy	0	2

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Franconia—*Continued*		
Local site No. FDB 2—*Continued*		
Sand, fine to medium	2	16
Sand, fine to coarse; gravel	16	24
Sand, gravelly	24	28
Sand (till), bouldery, silty, gravelly	28	33
Refusal on bedrock or boulder	33	--
Local site No. FDB 3		
Gravel	0	10
Sand, coarse	10	15
Till, sandy, and boulders	15	23
Refusal	23	--
Local site No. FDB 6		
Sand, fine to medium, gray brown; little silt; trace of coarse sand and fine gravel	0	4
Gravel, brown; some cobbles and boulders	4	9.5
Silt, light gray brown; layers of fine sand	9.5	16
Bedrock (Franconia Breccia)	16	--
Local site No. FDB 7		
Topsoil and muck	0	2
Sand, fine to coarse, slightly silty	2	12
Sand, fine, uniform, silty	12	21
Hardpan, compact, bouldery	21	27
Bedrock	27	--
Local site No. FDB 10		
Sand and cobbles	0	5
Sand, fine	5	26
Gravel	26	35
Till, sandy	35	51
Refusal	51	--
Local site No. FDB 11		
Sand and gravel	0	10
Gravel	10	18
Till, gravelly; boulders	18	26
End of hole	26	--
Local site No. FDW 1		
Sand, medium to very coarse; gravel	0	16.3
End of hole	16.3	--
Local site No. FDW 2		
Sand, fine to coarse	0	15.9
End of hole	15.9	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Franconia—*Continued*		
Local site No. FDW 3		
Topsoil and silt	0	2
Silt to cobbles, gray brown, "clumpy"; compact	2	10
Sand, coarse to small pebbles, well washed; mostly fine gravel; well sorted	10	20
Sand, fine to very coarse, gray; mostly medium sand; moderately sorted	20	25
Sand, coarse to small pebbles (10 mm), gray, well washed; mostly fine gravel; well sorted	25	30
Sand, fine to small pebbles; mostly very coarse sand to fine gravel	30	35
Silt to small pebbles, gray; mostly very coarse sand	35	45
Sand, fine to fine gravel, brown; mostly coarse to very coarse sand; moderately sorted	45	55
Sand, fine to very coarse, brown; mostly coarse sand; moderately sorted	55	68
Sand, very fine, brown	68	74
Refusal	74	--
Local site No. FDW 4		
Topsoil, silty	0	2
Sand, fine to coarse; mostly coarse sand	2	7
Silt to coarse gravel, brown gray; many pebbles (24-40 mm); mostly coarse to very coarse sand	7	10
Sand, fine to coarse, gray; mostly coarse sand; moderately sorted	10	13
Sand, medium, gray, uniform	13	13.2
Sand, very fine, gray	13.2	14
Sand, fine to medium; mostly medium sand	14	17
Sand, fine to coarse, black brown; mostly medium sand	17	18
Sand, fine, brown; with iron stained layers	18	20
Sand, fine to coarse, gray; mostly medium sand	20	23
Silt, olive gray	23	25
Sand, fine to coarse, gray; mostly fine sand	25	28
Silt; with occasional thin layers (1 mm) of medium sand	28	30
Sand, medium, gray, uniform	30	33.1
Sand, fine, gray uniform	33.1	35
Sand, fine; some coarse sand	35	38.5

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Franconia—*Continued*		
Local site No. FDW 4—*Continued*		
Sand, fine to pebbles (10 mm), iron stained, "silty"; mostly fine gravel	38.5	40
Sand, fine to coarse gravel, gray, silty; mostly very coarse sand	40	55
Sand, coarse to coarse gravel, gray; mostly fine gravel	55	65
Sand, medium, gray, uniform	65	67.8
Gravel, fine, gray, silty	67.8	68.2
Sand, fine to medium, gray	68.2	76
Refusal	76	--
Local site No. FDW 7		
Fill	0	2
Peat and boulders	2	4
Gravel, coarse, brown, and boulders	4	25
Clay, brown; silt, and cobbles	25	35
Gravel, coarse, brown, and boulders	35	57
Sand, fine to coarse, brown, and cobbles	57	76
End of hole	76	--
Local site No. FDW 8		
Boulders	0	2
Peat and boulders	2	4
Sand, medium to coarse, brown, and cobbles	4	40
Silt and sand, fine; reddish streak at 53 ft	40	55
Sand, coarse, brown, and gravel	55	57
Sand, fine, brown	57	59
Sand, fine to coarse, brown and broken cobbles	59	76
End of hole	76	--
Local site No. FDW 14		
Sand and gravel, coarse; some large cobbles	0	8.5
Refusal on large boulder(s)	8.5	--
Local site No. FDW 15		
Sand, medium to coarse; gravel	0	16
End of hole	16	--
Local site No. FDW 19		
Sediments (till-like)	0	40
Sand	40	50
Sand and gravel	50	80

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Franconia—*Continued*		
Local site No. FDW 19—*Continued*		
Till	80	105
Bedrock	105	--
Local site No. FDW 39		
Sand and gravel	0	60
Clay	60	70
Sand and gravel	70	96
Bedrock	97	--
Local site No. FDW 51		
Sand and gravel	0	55
End of hole	55	--
Hanover		
Local site No. HHA 1		
Sand, coarse, olive brown and gravel (fill)	0	4
Silt and sand, fine, olive-green, dry	4	5.5
Gravel	5.5	6
Sand, very fine, olive-tan, dry, bedded; trace of silt	6	12
Sand, fine, olive-tan, damp; little silt; trace of clay (bedded)	12	18
Sand, fine, olive-tan, dry; little silt; trace of clay (bedded)	18	22
Sand, fine to very fine, olive-tan, dry, laminated	22	26
Sand, fine to very fine, olive-tan, dry (laminated and cross-stratified throughout)	26	38
Sand, medium to fine, tan gray, dry (laminated and cross-stratified throughout)	38	48
Sand, medium to fine, tan gray, dry (laminated and cross-stratified throughout); trace of silt	48	61
End of hole	61	--
Local site No. HHA 2		
Topsoil (firm, brown silt with tree roots)	0	0.8
Silt, fine, stiff, brown; trace of medium to fine sand	0.8	3
Silt, green gray, stiff to very stiff, varved; clayey silt	3	5
Silt, brown, stiff to very stiff, varved; trace of fine sand, nonplastic to slightly plastic	5	10
Silt, brown, very stiff, varved; trace of fine sand; trace of dark brown clayey silt	10	30

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Hanover—*Continued*		
Local site No. HHA 2—*Continued*		
Silt, fine, gray brown, very dense, sandy and sand, fine, silty; quartzitic, subangular, nonplastic	30	35
Sand, fine, gray brown, very dense and sand, fine, silty	35	40
Silt, fine, sandy, slightly plastic to nonplastic with thin clayey silt laminae and sand, fine, brown gray, dense to very dense, silty	40	45
Sand, fine, brown gray, dense to very dense, silty, nonplastic	45	49
Sand, fine, gray, very dense, silty, with thin slightly varved sandy silt, nonplastic to slightly plastic layers	49	55
Sand, medium to fine, dark gray to black, very dense; little silt; trace of fine gravel and coarse sand; thin layer of medium to fine sand	55	60
End of hole	60	--
Local site No. HHA 3		
Sand and gravel	0	16
Sand and gravel	16	24
Sand and broken stones	24	32
Hardpan	32	38
Refusal	38	--
Local site No. HHB 1		
Sand, loamy	0	5.6
Sand, coarse, and gravel	5.6	11.6
Sand, fine, blue; little clay	11.6	62.3
Till?; angular sand, gravel, boulders	62.3	76.5
Refusal on boulder or bedrock	76.5	--
Local site No. HHW 1		
Sand and topsoil	0	15
Sand and gravel, brown	15	35
Sand and gravel, coarse	35	55
Sand and gravel, hard packed	55	100
Sand and silt, hard packed	100	113
Sand and gravel, medium	113	125
Sand, medium to coarse	125	132
Gravel, medium	132	153
Hardpan; ledge (?) at 156.5 ft	153	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Hanover—*Continued*		
Local site No. HHW 2		
Clay, silty, and silt and sand, fine	0	71
Sand, coarse to fine	71	82
Sand, medium to fine, silty	82	86
Cobbles	86	88
Sand, silty, gravelly; some cobbles	88	91
Sand, coarse to fine, silty	91	93
Sand, silty, gravelly	93	97
Sand, medium to fine, silty	97	106
Sand, silty, gravelly	106	116
Sand, medium to fine, silty	116	121
Sand, coarse to fine, silty	121	125
Sand, medium to fine, silty	125	140
Sand, silty, gravelly	140	150
End of hole	150	--
Local site No. HHW 3		
Clay and silt	0	15
Sand, silty	15	25
Clay and fine sand	25	45
Clay, sandy	45	80
Sand, silty	80	145
Silt, fine	145	159
Gravel, coarse	159	162
Bedrock	162	--
Local site No. HHW 4		
Clay, gray	0	70
Clay; some sand	70	90
Sand, hard packed	90	95
Sand, fine, silty, dirty	95	105
Sand, coarse	105	115
Gravel, medium, gray	115	120
Sand, medium	120	140
Sand, medium; some stones	140	147
End of hole	147	--
Local site No. HHW 5		
Clay, gray	0	80
Clay, grayish brown; some silt and fine sand	80	90
Sand, medium to very coarse, brown; some gravel	90	105
Sand, medium to coarse, gray; some gravel	105	125

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Hanover—*Continued*		
Local site No. HHW 5—*Continued*		
Sand, medium to coarse, gray	125	145
Sand, very coarse, gray; some gravel	145	155
Clay, brown	155	156
Sand, very coarse, gray; some gravel	156	167
Bedrock (Orfordville Formation)	167	--
Local site No. HHW 6		
Topsoil	0	1.5
Silt, stiff to very stiff, brown gray, to clayey silt, nonplastic to slightly plastic, occasional thin fine sand layers	1.5	60
Silt, very stiff, green gray, varved, vertical clay laminae	60	70
Silt, very stiff, green gray, varved, medium plastic, vertical clay laminae	70	80
Sand, fine; little silt	80	84.5
Silt, very stiff, green gray, varved; silt, fine, sandy; sand, fine, silty	84.5	88
Sand, fine, green gray, dense to very dense, silty	88	90
Sand, fine, green gray, dense to very dense, silty; trace of medium, fine sand	102	108
Sand, fine, green gray, dense to very dense, silty; little medium fine sand; trace of coarse sand	108	115
Sand, medium to fine, gray, dense to very dense; trace of silt, brown,, saturated, subangular quartzitic	115	121
Sand, medium to fine, brown gray, dense; little coarse sand; trace of silt, saturated, subangular, quartzitic	121	131
Sand, coarse to fine, white-black gray speckled, dense; trace of silt, well-graded, subangular, quartzitic	131	171
Bedrock (soft phyllite of Orfordville Formation)	171	--
Local site No. HHW 7		
Sand, dark	0	24
Sand and gravel	24	64
Sand, fine; gravel, sharp	64	72
Refusal	72	--
Local site No. HHW 8		
Sand	0	32
Sand and gravel	32	60

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Hanover—*Continued*		
Local site No. HHW 8—*Continued*		
Sand, fine and gravel, sharp	60	68
Refusal	68	--
Local site No. HHW 20		
Sand and gravel, medium dense	0	10.5
Silt and gravel, very dense	10.5	35.6
End of hole	35.6	--
Local site No. HHW 22		
Silt and clay	0	3
Sand, silt, and clay	3	14
Silt and clay	14	30.5
Sand, silt, clay, and gravel	30.5	35
End of hole	35	--
Local site No. HHW 24		
Topsoil	0	.8
Silt and sand	.8	3.5
Silt, sand, and gravel	3.5	47
End of hole	47	--
Local site No. HHW 25		
Silt, brown	0	23
Sand, very fine, silty	23	60
Gravel	60	78
Sand, fine to medium, brown	78	158
Sand, medium to coarse	158	160
Silt and very fine sand, gray	160	181
Bedrock, phyllite of Orfordville formation (cored 5 ft)	181	--
Local site No. HHW 26		
Silt, brown; some silty clay layers; some very fine sand layers	0	38
Sand, very fine; some silt	38	99
Sand, fine, and silt	99	139
Sand, fine to medium; trace of silt	139	149
End of hole	149	--
Local site No. HHW 27		
Silt; some clay; little sand	0	38
Clay; some silt	38	58
Sand, very fine, silty	58	98
Sand, fine, silty	98	129
Sand, fine to medium	129	131

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Hanover—*Continued*		
Local site No. HHW 27—*Continued*		
Sand, fine	131	139
End of hole	139	--
Local site No. HHW 28		
Sand, very fine to coarse; some gravel (subrounded); trace of silt	0	44.5
Sand, fine; trace of silt	44.5	49.5
Sand, very fine to medium, little rounded gravel	49.5	57.5
Sand, fine	57.5	62.5
Cobbles, broken (made of chlorite rich metamorphic rock)	62.5	65
Bedrock (cored 38 ft; phyllite of the Orfordville formation with interbedded quartz-rich chlorite)	65	--
Local site No. HHW 88		
Bark mulch and topsoil	0	1
Sand, very fine, olive brown; little silt	1	5
Clay and silt, olive gray, varved	5	11
Silt, very fine, brown, sandy	11	12
End of hole	12	--
Local site No. HHW 89		
Topsoil	0	.5
Sand fill, medium to fine, brown, gravelly	.5	3
Clay and silt, very fine, olive gray, varved	3	10
Silt, very fine, olive brown and sand	10	12
End of hole	12	--
Local site No. HHW 175		
Sand	0	6
Hardpan and gravel	6	27
Bedrock	27	--
Local site No. HHW 211		
Sand	0	60
Sand and gravel	60	110
Bedrock	110	--
Local site No. HHW 217		
Sand	0	20
Sand and gravel	20	70
Hardpan and clay	70	85
Bedrock	85	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Hanover—*Continued*		
Local site No. HHW 269		
Clay and sand	0	95
Sand and gravel	95	110
End of hole	110	--
Haverhill		
Local site No. HKA 1		
Silt; sand, fine	0	14
Sand, fine	14	21
Sand, medium to coarse	21	28
Till, sand, silt	28	35
Refusal	35	--
Local site No. HKA 2		
Sand, fine, brown; some clay	0	21
Sand, fine, brown; some gravel and clay	21	35
Sand, fine, and clay, gray	35	147
End of hole	147	--
Local site No. HKA 3		
Sand and gravel, brown	0	30
Sand, fine, brown; trace of silt	30	57
Clay and silt, gray	57	59
End of hole	59	--
Local site No. HKA 4		
Sand, fine, brown; some gravel and clay	0	35
Sand, fine, gray; some clay, gray	35	135
End of hole	135	--
Local site No. HKA 5		
Sand; some gravel	0	13
Sand and gravel, rocky	13	21
End of hole	21	--
Local site No. HKA 6		
Sand, fine; some silt; rocky	0	14
Gravel	14	20
Silt and gravel	20	27
End of hole (turning to blue clay)	27	--
Local site No. HKA 7		
Sand	0	7
Sand and gravel	7	14
Gravel and rock	14	21
Gravel and rock; trace of clay	21	28

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Haverhill—*Continued*		
Local site No. HKA 7—*Continued*		
Clay	28	30
End of hole	30	--
Local site No. HKA 8		
Sand, fine	0	14
Gravel	14	21
Silt; sand, fine; clay	21	28
Clay (end of hole)	28	--
Local site No. HKA 9		
Sand, fine, brown; some gravel; trace of clay	0	14
Sand, fine, gray; some clay	14	64
Sand, fine, brown; trace of clay	64	71
Refusal	71	--
Local site No. HKA 10		
Silt; sand, fine; some gravel	0	19
Refusal	19	--
Local site No. HKA 11		
Till	0	5
Refusal	5	--
Local site No. HKA 12		
Sand, coarse; gravel	0	9
Till, clay, gravel	9	20.5
Possible refusal	20.5	--
Local site No. HKA 13		
Sand, coarse; gravel	0	14
Silt; sand, fine; clay	14	48
Till, "hardpan"	48	58
Refusal	58	--
Local site No. HKA 14		
Sand, coarse; gravel	0	20
Sand, fine	20	29
Silt; sand, fine; clay	29	51
Till, clay, gravel	51	61.5
Refusal	61.5	--
Local site No. HKA 15		
Sand, coarse; gravel	0	16
Silt; clay; some gravel	16	25
Till	25	31
Refusal	31	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft)	
	From	To
GRAFTON COUNTY—*Continued*		
Haverhill—*Continued*		
Local site No. HKA 16		
Sand, coarse; gravel	4	17
Silt; sand, fine; some clay	17	26
Till	26	34
Refusal	34	--
Local site No. HKA 17		
Sand, coarse; gravel	4	17
Silt; sand, fine; clay	17	27
Till	27	33
Refusal	33	--
Local site No. HKA 18		
Sand, coarse; gravel	0	21
Sand, fine; gravel; clay; probably till	21	32.5
Refusal	32.5	--
Local site No. HKA 19		
Sand, coarse; gravel	0	20
Sand, fine; gravel; clay; probably till	20	31.5
Refusal	31.5	--
Local site No. HKA 20		
Boulders	4	11
Sand; clay	11	24
Refusal	24	--
Local site No. HKA 21		
Silt to pebbles, dark brown; mostly silt	0	3
Sand, fine, brown, "stiff"	3	7.5
Clay, blue gray	7.5	10
Sand, very fine to pebbles (40 mm) gray, angular; mostly fine sand	10	15
Till, silty, sandy, gray; with broken rocks	15	--
Local site No. HKA 22		
Rocks and boulders	0	22
Refusal (on boulder)	22	--
Local site No. HKA 23		
Boulders	0	12
Refusal (on boulder)	12	--
Local site No. HKB 1		
Sand, fine	0	18
Sand, fine; silt	18	41
Silt; clay	41	74
Local site No. HKB 1—*Continued*		
Till, sandy	74	81
Refusal	81	--
Local site No. HKB 2		
Sand, fine to coarse; fill material	0	3
Gravel, coarse, and cobbles	3	8
Sand, coarse, uniform	8	14
End of hole	14	--
Local site No. HKB 3		
Clay, blue and sand, medium	0	7.4
Sand, "hard," gravel, and boulders	7.4	14.5
Sand, fine, "hard"	14.5	25
Sand; little gravel	25	26.7
Sand, fine, "hard"; little gravel	26.7	45.7
Refusal	45.7	--
Local site No. HKB 4		
Sand and gravel; little clay "and wood fill"	0	17.5
Sand, fine; very little clay	17.5	23.3
Sand, "hard, compact," trace of clay	23.5	62
Refusal	62	--
Local site No. HKW 1		
Sand, fine, brown and gravel; trace of clay	0	28
Sand, fine, brown; trace of clay	28	42
End of hole	42	--
Local site No. HKW 2		
Topsoil, fine, sandy, brown and gray	0	4
Sand, coarse, brown	4	10
Sand, coarse, and gravel, fine	10	15
Sand, medium to coarse	15	35
Sand, medium to coarse, brown	35	41.5
Sand, coarse, well-rounded	41.5	42
Sand, coarse (hard drilling)	42	47
Till	47	--
Local site No. HKW 3		
Sand, medium to coarse; gravel, fine	0	30
Till	30	--
Local site No. HKW 5		
Sand and gravel	0	8
Silt and clay	8	45

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Haverhill—*Continued*		
Local site No. HKW 5—*Continued*		
Gravel	45	105
Bedrock	105	--
Local site No. HKW 13		
Sand, coarse; gravel, fine to medium	0	35
Sand, medium to coarse; gravel, fine	35	42
Till	42	46.5
Refusal	46.5	--
Local site No. HKW 14		
Sand	0	7
Sand; some fine sand	7	14
Sand; some silt and fine sand	14	21
Sand; some gravel and "rocks"	21	28
Sand, fine, silty, gray; gravel, angular, rocky	28	35
Gravel, angular, rocky; some fine sand, gray	35	42
Sand, fine, gray; some angular, rocky gravel	42	49
Sand, gray; some fine sand	49	54
Refusal	54	--
Local site No. HKW 15		
Sand; gravel	0	42
Sand, fine	42	49
Refusal (possibly)	49	--
Local site No. HKW 16		
Sand, fine to medium	0	14
Sand, medium; gravel	14	28
Sand, fine to medium	28	42
Sand, fine; silt; clay	42	55
Refusal	55	--
Local site No. HKW 17		
Sand, fine to medium	0	21
Sand, fine	21	35
End of hole	35	--
Local site No. HKW 18		
Sand, coarse; gravel	0	11
Sand, fine; clay	11	27
Silt; sand, fine; clay	27	37
Sand, fine; gravel; clay; possibly till	37	47.5
Refusal	47.5	--

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Haverhill—*Continued*		
Local site No. HKW 19		
Sand, coarse; gravel	0	23
Till, fine sand, gravel, clay	23	34
Refusal	34	--
Local site No. HKW 21		
Silt to pebbles, brown; mostly fine to medium sand	0	10
Silt to coarse sand, brown; mostly fine sand; moderately sorted	10	30
Sand, fine to medium, brown; changing to gray	30	38.8
Sand, fine to medium, gray, clean	38.8	48
Silt to cobbles, gray, "clumpy," with angular pebbles; mostly silt and coarse sand	48	55
Silt and very fine sand, gray; very "tight"	55	62
End of hole	62	--
Local site No. HKW 22		
Sand and cobbles(rounded)	0	2
Silt to large pebbles, brown; poorly sorted	2	7
Sand, fine, to coarse gravel, brown, clean; mostly coarse sand; moderately sorted	7	15
Sand, fine, to coarse gravel; mostly coarse sand	15	18.5
Silt and cobbles; very poorly sorted; "till-like"	18.5	20
Silt to coarse gravel, gray, silty; mostly coarse sand	20	30
Silt, blue and very fine sand; trace of coarse sand; well sorted	30	45
Silt to pebbles (angular), blue gray; mostly coarse sand; poorly sorted	45	52
Till, gray, pebbly, clayey, very "tight"	52	--
Local site No. HKW 26		
Sand, fine, brown; some gravel and clay	0	21
Sand, fine, gray and clay	21	71
Sand, fine, gray; some gravel and clay	71	104
End of hole	104	--
Local site No. HKW 27		
Sand, fine, brown, with gravel; trace of clay	0	28
Sand, fine, brown; little gravel	28	35
Sand, fine, brown, with "specks" of clay	35	105
End of hole	105	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Haverhill—*Continued*		
Local site No. HKW 35		
Sand	0	30
Hardpan	30	223
End of hole	223	--
Local site No. HKW 36		
Sand	0	30
Hardpan	30	202
Bedrock	202	--
Local site No. HKW 42		
Sand and gravel	0	220
End of hole	220	--
Local site No. HKW 47		
Sand	0	8
Bedrock	8	--
Local site No. HKW 63		
Sand	0	30
Sand and gravel	30	65
Bedrock	65	--
Local site No. HKW 68		
Gravel	0	10
Boulder	11	35
Clay	35	41
Bedrock	41	--
Local site No. HKW 69		
Sand and gravel	0	10
Clay	10	30
Bedrock	30	--
Local site No. HKW 71		
Sand and gravel	0	50
Hardpan and clay	50	99
Bedrock	99	--
Local site No. HKW 77		
Sand	0	50
Hardpan and gravel	50	105
Local site No. HKW 79		
Bedrock	105	--
Sand	0	30
Clay, silt, and gravel	30	48
Bedrock	48	--
GRAFTON COUNTY—*Continued*		
Haverhill—*Continued*		
Local site No. HKW 80		
Sand and gravel	0	20
Hardpan and gravel (till?)	20	200
Gravel	200	215
End of hole	215	--
Local site No. HKW 85		
Sand	0	60
Hardpan	60	100
Bedrock	100	--
Local site No. HKW 96		
Sand	0	10
Clay	10	28
Bedrock	28	--
Local site No. HKW 113		
Sand and hardpan?	0	2
Gravel	2	3
Sand	3	24
Boulder	24	29
Sand and gravel	29	174
End of hole	174	--
Landaff		
Local site No. LFB 1		
Till and boulders	0	24
Refusal on bedrock or boulders	24	--
Lebanon		
Local site No. LHA 1		
Sand, fine to medium, gray, dry, medium dense	0	25
Sand, fine, brown, medium dense; little silt; trace of fine to medium gravel	25	40
Sand, medium to fine, gray, wet, loose to medium dense; little silt	40	80
End of hole	80	--
Local site No. LHB 1		
Sand, fine; silt	0	10
Sand, fine	10	15
Gravel	15	30
Sand, medium	30	70
Sand, coarse	70	80
End of hole	80	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHB 2		
Gravel	0	13
Sand, fine	13	75
End of hole	75	--
Local site No. LHB 3		
Gravel	0	13
Sand, fine	13	35
Silt; clay	35	45
Silt	45	54
Clay	54	86
Till, sandy	86	88
Refusal	88	--
Local site No. LHB 4		
Sand, fine to medium	0	29
Gravel, coarse	29	36
Sand, medium; gravel	36	62
End of hole	62	--
Local site No. LHB 5		
Sand, slightly gravelly	0	11
Silt, sandy	11	16
Clay and silt	16	40
Till	40	44
Refusal	44	--
Local site No. LHB 6		
Road fill	0	5
Boulders	5	15
Till, sandy, and boulders	15	36
Refusal	36	--
Local site No. LHB 9		
Sand; some sandy gravel	0	9
Sand, coarse	9	12
Till, sandy	12	16.5
Refusal	16.5	--
Local site No. LHB 10		
Loam	0	2
Silt, sandy	2	4
Sand, fine to medium, with silt layers	4	7
Silt and sand	7	8
Till, stony, silty	8	14
Silt, sandy; with thin clay layers	14	28

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHB 10—*Continued*		
Till, silty	28	35.5
Bedrock	35.5	--
Local site No. LHB 11		
Sand and boulders (fill)	0	9
Sand, silty	9	19
Clay and silt	19	35
Till, silty and boulders	35	39
Refusal	39	--
Local site No. LHB 12		
Gravel (fill)	0	9
Sand, silty, and "stones"	9	20
Sand, fine	20	40
Sand, coarse	40	50
Till, sandy	50	52
Refusal	52	--
Local site No. LHB 13		
Till, sandy	0	12.5
Weathered rock	12.5	20
Bedrock	20	--
Local site No. LHB 14		
Gravel	0	10
Clay	10	27
Silt and sand, fine	27	43
Till, silty	43	48
Refusal	48	--
Local site No. LHB 15		
Topsoil	0	1
Sand, silty and stones	1	6
Sand, fine	6	13
Clay and sand	13	15
Till, silty	15	22
Refusal	22	--
Local site No. LHB 16		
Topsoil	0	1
Silt and sand, fine	1	12
Clay and silt	12	26
Till, sandy	26	36
Refusal on bedrock or boulder	36	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHB 17		
Railroad fill	0	5
Till, sandy	5	12
Silt and sand and small "stones"	12	16
Till, silty	16	27
Refusal	27	--
Local site No. LHB 18		
Loam	0	1
Gravel, sandy, silty	1	20
Clay and silt	20	48
Silt and sand and "stones"	48	68
Hardpan, sandy	68	71.5
Refusal	71.5	--
Local site No. LHB 19		
Topsoil	0	1
Sand, loamy	1	6
Clay and silt	6	55
Sandy till	55	63
Refusal	63	--
Local site No. LHB 20		
Railroad fil	0	2
Sand, silty, and "stones"	2	20
Silt and sand, fine	20	35
Silt and sand, fine; trace of clay	35	36
Silt and sand, fine	36	47
Till, sandy	47	62
Refusal	62	--
Local site No. LHB 21		
Topsoil	0	1
Sand, loamy	1	4
Gravel, sandy	4	10
Till, sandy	10	21
Refusal	21	--
Local site No. LHB 22		
Loam	0	1
Sand, fine to medium, brown	1	5
Clay, gray	5	17
Sand, fine to medium, brown, and gravel, fine to medium, brown	17	27
Bedrock (granite schist)	27	--
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHW 1		
Sand, fine to medium, brown, silty; little gravel	0	8
Sand, fine to medium, brown, silty; some coarse sand and gravel; trace of cobbles	8	24
Sand, fine to medium, brown, silty	24	30
Bedrock (cored 25 ft)	30	--
Local site No. LHW 2		
Sand, fine to medium, brown, silty	0	10
Sand, fine to medium, brown	10	14
Silt, fine, brown, sandy	14	35
Sand, fine, brown, silty	35	50
Sand, fine, brown, silty; trace of gravel	50	55
Sand, fine, brown, silty; sandy silt layers	55	58
Silt, fine, brown, sandy	58	64
Sand, fine, brown, silty	64	70
Sand, fine, gray brown; some silt; trace of medium sand	70	80
Sand, fine to medium, gray brown; some silt; trace of coarse sand	80	90
Sand, fine to medium, gray brown; little silt; trace of coarse sand and gravel	90	103
Sand, fine, gray brown, silty; some coarse sand and gravel	103	107
Sand, fine to medium, gray brown, silty; some coarse sand and gravel; few cobbles	107	116
Sand, fine to medium, gray, silty; some coarse sand and gravel; few cobbles	116	120
Sand, fine to medium, gray brown, silty and sand, coarse and gravel; trace of cobbles	120	122
End of hole	122	--
Local site No. LHW 3		
Gravel, brown, sandy, and cobbles and boulders	0	35
Gravel, gray brown, silty, sandy and cobbles	35	59
Gravel, gray brown, sandy, and cobbles and boulders	59	75
Gravel, gray, sandy and cobbles and boulders; some silt	75	80.5
End of hole	80.5	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHW 4		
Sand, fine to medium, brown	0	4
Silt, fine, brown, sandy, with fine sand and clayey layers	4	8
Sand, fine, brown, silty	8	23
Sand, fine, gray brown; some silt	23	44
Sand, fine to medium, brown; little silt	44	60.5
Sand, fine, brown; little silt	60.5	75
Sand, medium to fine, brown; little silt	75	85
Sand, medium to fine, brown; trace of coarse silt and sand	85	101
End of hole	101	--
Local site No. LHW 5		
Sand, fine to medium, brown, silty; little coarse sand and gravel	0	10.5
Sand, fine to medium, brown, silty; some coarse sand and gravel; trace of cobbles	10.5	21
Sand, brown, silty and gravelly; some cobbles	21	87
Silt, fine, gray, sandy	87	95.5
Sand, fine to medium, brown, silty	95.5	103
Sand, fine to medium, brown, silty; some coarse sand and gravel; trace of cobbles	103	108
Sand, fine to medium, brown, silty	108	113
Sand, gray brown, silty gravelly; some cobbles	113	118
Sand, fine to medium, brown, silty; trace of gravel and cobbles	118	125
Sand, fine to medium, brown, silty; some coarse sand and gravel; trace of cobbles	125	131
Sand, brown, silty; some gravel and cobbles and boulders	131	138
Sand, gray brown, silty and gravelly; some cobbles; trace of boulders	138	174
End of hole	174	--
Local site No. LHW 6		
Sand, fine, brown, silty	0	18
Sand, fine to medium, brown, silty; some coarse sand and gravel; trace of cobbles	18	23
Sand, brown, silty, gravelly; some cobbles and boulders	23	38
Sand, fine to medium, brown, silty; some gravel; little cobbles	38	49

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHW 6—*Continued*		
Sand, fine, brown, silty; little gravel and cobbles	49	60
Sand, fine to medium, brown, silty; trace of coarse sand and gravel	60	70
Sand, gray brown, silty, gravelly; some cobbles	70	76.3
End of hole	76.3	--
Local site No. LHW 7		
Sand, fine to medium, brown; little silt	0	13
Sand, brown, silty and gravelly; some cobbles	13	23
Sand, fine to medium, brown, silty; little gravel; trace of coarse sand	23	30
Sand, fine to medium, brown, silty; some coarse sand and gravel	30	33
Sand, fine to medium, gray brown, silty; little coarse sand and gravel	33	40
Sand, fine to coarse, gray brown; little gravel and silt	40	44
Sand, fine to medium, gray; some silt	44	48
Sand, gray, silty and gravelly	48	52
Sand, fine to medium, gray, silty; trace of gravel and cobbles	52	58
Sand, fine to coarse, gray, silty; some gravel and cobbles	58	62
End of hole	62	--
Local site No. LHW 8		
Sand, fine to medium, brown, silty; trace of gravel	0	14
Sand, fine to medium, brown, silty	14	19
Sand, fine to medium, brown, silty; some coarse sand	19	34
Sand, fine to medium, brown, silty; trace of cobbles	34	40
Sand, fine, brown, silty; some medium sand	40	50
Sand, fine to medium, brown, silty, with silty fine sand layers	50	54
Sand, fine to medium, brown, silty; trace of gravel	54	60
Sand, fine to medium, brown, silty	60	70
Sand, fine to medium, brown, silty; trace of coarse sand and gravel	70	73

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHW 8—*Continued*		
Sand, gray brown, silty and gravelly	73	85
Sand, fine to coarse, gray brown, silty; little gravel	85	88
Sand, fine to coarse, brown, silty, with silty fine sand layers	88	95
Sand, fine, brown, silty, with fine to medium sand layers; trace of gravel	95	97
Sand, gray brown, silty and gravelly	97	101
End of hole	101	--
Local site No. LHW 9		
Sand, fine to medium, brown, silty	0	10
Sand, fine to medium, light brown; little silt	10	15
Sand, fine to medium, light brown; some coarse sand; little silt	15	24
Sand, fine, brown, silty; some gravel and cobbles and boulders	24	33
Sand, fine to medium, brown, silty; little gravel; few cobbles	33	40
Sand, fine to medium, brown, silty	40	45
Sand, medium to fine, brown, silty; some coarse sand	45	48
Gravel, brown, silty sandy; some cobbles	48	63
Sand, fine to medium, brown, silty	63	68
Sand, brown, silty, gravelly; some cobbles and boulders	68	73.1
Boulders	73.1	74.1
Sand, brown, silty, gravelly; some cobbles and boulders	74.1	84
Bedrock (cored 24 ft)	84	--
Local site No. LHW 10		
Sand, medium to fine, brown; trace of coarse silt and sand	0	9
Sand, medium to fine, brown; some coarse sand and gravel; trace of silt	9	14
Sand, fine, brown, silty	14	25
Sand, fine to medium, gray, silty	25	30
Sand, fine to medium, brown, silty	30	65
Sand, fine to medium, brown, silty; little coarse sand and gravel	65	68
Sand, fine to medium, brown, silty; some coarse sand and gravel	68	75

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHW 10—*Continued*		
Sand, fine to medium, brown, silty; some coarse sand; little gravel	75	80
Sand, fine to medium, brown, silty; little coarse sand; trace of gravel	80	83
Sand, fine to medium, brown, silty; some coarse sand and gravel; trace of cobbles	83	89
Sand, fine, brown, silty; some medium sand; trace of gravel	89	92
Sand, fine to medium, gray brown; some coarse sand and gravel; few cobbles	92	96.1
Bedrock (cored 7 ft)	96.1	--
Local site No. LHW 11		
Sand, fine, brown, silty; trace of gravel	0	8
Sand, fine to medium, brown, silty; little gravel	8	23
Sand, brown, silty, gravelly; some cobbles; boulder	23	53.3
Boulders; some cobble and gravel	53.3	55.8
Sand, gray brown, silty, gravelly; some cobbles; boulder	55.8	70.9
End of hole	70.9	--
Local site No. LHW 12		
Topsoil	0	0.2
Silt and sand, fine, light brown, dry, loose	0.2	1.5
Sand, fine, light brown, dry, very loose; trace of silt in occasional layers	1.5	11
Sand, fine, brown gray, wet, loose; some silt	11	13
Sand, fine to medium, light brown, dry, dense; little fine to medium gravel	13	14.5
Sand, medium to fine, light brown, dry, loose	14.5	24
Sand, medium to fine, light brown, dry, medium-dense; little fine to medium gravel	24	29.5
Sand, medium to fine, light brown, dry, very dense, and gravel, coarse to fine; some cobbles	29.5	39
Sand, medium to fine, light brown, dry, dense; trace of fine to medium gravel	39	49
Sand, fine to medium, light brown, dry, very dense; little fine to coarse gravel	49	59

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHW 12—*Continued*		
Sand, fine to coarse, brown gray, wet, very dense; little fine to medium gravel; trace of silt	59	63
Sand, fine to medium, gray, wet, dense; trace of silt; trace of fine to medium gravel	63	70.4
End of hole	70.4	--
Local site No. LHW 13		
Silt and sand	0	17
Sand, medium to coarse and gravel, fine to coarse, brown, wet, very dense	17	26
Silt, gray, wet, medium-dense; trace of fine sand	26	43
Sand, fine, gray, wet, dense	43	62
End of hole	62	--
Local site No. LHW 14		
Silt and fine sand, dark brown, loose, dry	0	1
Sand, fine; little silt; trace of fine to coarse gravel	1	5.5
Sand, fine, light brown; trace of silt in occasional layers	5.5	21
Sand, fine to medium, trace of silt; trace of fine to medium gravel	21	22
Sand, fine to coarse, light brown; some fine to coarse gravel	22	28
Sand, fine	28	34
Sand, fine, brown and gray	34	45
End of hole	45	--
Local site No. LHW 15		
Sand, fine, light brown	0	2
Silt, light brown; little fine sand	2	7
Sand, fine, light brown	7	9
Sand, fine to medium, light brown	9	11.5
Sand, fine, light brown; little silt	11.5	14
Sand, fine, brown gray; trace of silt	14	17
Sand, medium to coarse, light brown; some fine to coarse gravel	17	23.5
Sand, medium to coarse, and gravel, fine to coarse; trace of silt	23.5	29
Sand, fine, gray; trace of fine gravel	29	49
Sand, fine, gray	49	65
Gravel, coarse and cobbles	65	66.5

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHW 15—*Continued*		
Sand, fine, gray; trace of silt and fine to medium gravel	66.5	80
Sand, fine, gray	80	90
Sand, fine to medium, gray; trace of silt and fine gravel	90	103
End of hole	103	--
Local site No. LHW 16		
Sand, loose medium to fine, light brown	0	2
Sand, fine to medium, light brown, dry, medium dense; trace of fine to medium gravel; trace of silt	2	7
Sand, medium to fine, light brown, dry, medium dense; little fine to medium gravel	7	18
Sand, fine, light brown, dry, medium dense; trace of silt in occasional layers	18	25
Sand, fine to medium, light brown, dry, medium dense; little to some fine to medium gravel	25	32
Sand, fine to medium, light gray brown, dry, medium dense	32	42
Sand, medium to fine, light brown, dry, medium dense; some fine to coarse gravel	42	45
Sand, fine to medium, light brown, dry, dense; some fine to coarse gravel	45	49
Sand, medium to fine, light brown, dry, dense; little fine to medium gravel	49	58
Sand, fine, brown, wet, medium dense	58	64
Sand, coarse to fine, brown, wet, dense; some fine to medium gravel	64	76
End of hole	76	--
Local site No. LHW 17		
Sand, fine to medium, light brown, dry, dense and gravel, fine to coarse; trace of cobbles	0	8
Sand, fine to medium, light brown, dry, dense and gravel, fine to medium	8	26
Gravel, coarse to fine and cobbles	26	28
Sand, fine to medium, light brown, dry, medium dense; some fine to medium gravel; trace of cobbles	28	40
Sand, medium to fine, light brown, dry, medium dense; trace of fine gravel	40	44

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHW 17—*Continued*		
Sand, coarse to fine, light brown, dry, dense to medium dense; trace of fine gravel	44	59
Sand, medium to fine, light brown, wet, medium dense; trace of fine gravel	59	68
Gravel, coarse to fine, brown and gray, wet, dense; some fine to coarse sand and cobbles	68	73
Sand, fine to medium, gray, wet, medium dense; some fine to medium gravel; trace of silt	73	77
End of hole	77	--
Local site No. LHW 18		
Sand, medium to fine and gravel, coarse to medium, brown, dry, loose	0	1
Sand, fine, gray, dry, loose; little silt	1	5
Silt, gray, dry, medium dense	5	16
Sand, fine, light brown, dry, medium dense; trace of silt; trace of coarse gravel	16	29
Sand, fine, light brown, dry, medium dense	29	33.5
Sand, fine, gray, wet, medium dense and gravel, fine to medium; trace of silt	33.5	40
Sand, fine to medium, brown and gray; wet, dense to loose (0.06- to 3-inch layers of fine sand and silt)	40	62
End of hole	62	--
Local site No. LHW 80		
Topsoil (very loose, dark brown humus)	0	2.5
Silt, brown, medium dense, with thin layers of clay and fine sand	2.5	7
Sand, fine to medium, brown, medium dense, silty; some gravel and cobbles	7	13.3
Silt, extremely dense, gravelly (glacial till)	13.3	15
End of hole	15	--
Local site No. LHW 81		
Topsoil (loose brown humus	0	.3
Sand, fine to coarse, brown, medium dense, silty and gravel	.3	6
Silt, brown, medium dense, with clay layers	6	12.5
Refusal	12.5	--
Local site No. LHW 82		
Sand, coarse to medium, dry, brown	0	5.5
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHW 82—*Continued*		
Silt, wet, gray; some coarse to medium sand	5.5	14
Silt, wet, gray; trace of clay	14	17
End of hole	17	--
Local site No. LHW 83		
Sand, dark gray brown, silty and gravel and cobbles (fill)	0	3.3
Silt, dark gray (sludge); some mixed-in sand, gravel, and asphalt	3.3	7.3
Silt, dark gray, clayey	7.3	30
End of hole	30	--
Local site No. LHW 84		
Silt, dark gray, clayey	0	20
End of hole	20	--
Local site No. LHW 85		
Sand, medium to coarse, grayish black and gravel; little fine sand, brick debris-fil	0	1.5
Sand, fine, grayish black; some silt and medium sand (wet)	1.5	8.5
Silt and sand, fine, light gray; little clay (wet)	8.5	12
End of hole	12	--
Local site No. LHW 86		
Sand, fine, dark brownish black; little silt and medium sand; strong petroleum odor (moist); 1-foot layer crushed brick debris-fill	0	2
Sand, fine to medium, brownish gray; little silt; strong petroleum odor (wet)	2	7
Sand, fine to medium, dark greenish gray; little silt; strong petroleum odor and visible oil deposits (wet)	7	13
Silt, light gray; some clay (wet); slight gas odor in upper part of strata	13	16
End of hole	16	--
Local site No. LHW 87		
Sand, fine to coarse, medium brown to gray brown; trace of silt, loose, damp, no odor	0	6.5
Sand, fine to medium, medium olive brown and gravel; loose, dry, no odor	6.5	11.5
Sand, fine, medium olive brown, well sorted, loose, damp; slight gas odor	11.5	16.5

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lebanon—*Continued*		
Local site No. LHW 87—*Continued*		
Sand, fine, medium brown, silty, micaceous, loose, wet, no odor	16.5	25
End of hole	25	--
Local site No. LHW 88		
Fill	0	4.5
Sand, fine to medium, brown; some silt and pebbles	4.5	9.5
Sand, fine to medium, dark brown, with pebbles	9.5	13
Cobbles, large	13	19
Gravel, fine	19	20
Till, weathered rock, very friable; some fine sand and silt	20	24
Bedrock, granite, gray-green	24	--
Local site No. LHW 165		
Sand and gravel	0	10
Clay and sand	10	30
Till	30	90
Bedrock	90	--
Local site No. LHW 217		
Gravel, coarse	0	30
Clay and silt	30	87
Bedrock	87	--
Local site No. LHW 233		
Sand and gravel	0	25
Till	25	60
Bedrock	60	--
Lisbon		
Local site No. LLA 7		
Sand, very coarse, and gravel; some silt and fine sand; mostly very coarse sand	0	2
Silt to large pebbles (smooth, round), gray brown; poorly sorted	2	7
Silt to fine gravel, gray brown; mostly coarse sand	7	7.5
Sand, fine to medium, gray, clean; well sorted	7.5	15
Sand, very fine to fine, gray; trace of large pebbles; 1-inch layer of coarse sand	15	25
Sand, very fine to coarse, gray brown, clean; mostly coarse sand; moderately well sorted	25	35
GRAFTON COUNTY—*Continued*		
Lisbon—*Continued*		
Local site No. LLA 7—*Continued*		
Sand, fine, gray, clean; some thin, very fine sand layers; with one 5-mm thick clay layer	35	45
Sand, fine to medium, gray, clean, well washed; well sorted	45	55
Sand, coarse, gray, clean; some fine sand; well sorted	55	71
Refusal	71	--
Local site No. LLB 1		
Gravel, silty, brown	0	2
Gravel, sandy, brown	2	4
Sand, gravelly, brown	4	7
Till, gravelly, brown	7	12
Till, sandy, brown	12	20
Till, silty, olive	20	32
Refusal	32	--
Local site No. LLB 2		
Boulders	0	3
Silt and sand, fine	3	45
Refusal	45	--
Local site No. LLB 3		
Sand, fine	0	5
Sand, fine, and organics	5	15
Till, sandy	15	19.5
Refusal	19.5	--
Local site No. LLB 4		
Topsoil and sand; trace of organics	0	6
Till, gravelly, and boulders	6	32
Till, sandy	32	34.5
Refusal	34.5	--
Local site No. LLB 7		
Topsoil; tilly, sandy	0	3
Bedrock	3	--
Local site No. LLB 8		
Fill and boulders	0	5
Sand, fine to medium, silty, brown	5	7
Till and boulders	7	9
Till, gravelly, gray brown	9	12
Till, sandy, gray brown; little silt	12	23
Till, sandy, gray; trace of clay	23	29.5
Refusal	29.5	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft)	
	From	To
GRAFTON COUNTY—*Continued*		
Lisbon—*Continued*		
Local site No. LLB 9		
Till, silty, and boulders	0	17
Refusal	17	--
Local site No. LLW 1		
Sand, fine to coarse, and gravel; some cobbles and boulders	0	30
Sand, medium to coarse, and gravel; cobbles	30	35
Sand, fine to coarse, and gravel, brown; some cobbles	35	55
End of hole	55	--
Local site No. LLW 2		
Sand, fine, hard packed, brown	0	5
Sand, fine to coarse, and gravel, brown	5	17
Sand, fine to coarse, and gravel; rocks (4- to 21-inch diameter)	17	35
Sand, fine to coarse; 6-inch rocks; silt and clay, very "silty"	35	49
End of hole	49	--
Local site No. LLW 3		
Sand; gravel	5	20
Sand, fine; silt; gravel	20	60
Refusal	60	--
Local site No. LLW 4		
Gravel	4	40
Clay	40	47
Refusal	47	--
Local site No. LLW 5		
Silt; trace of clay	5	45
Gravel, fine	45	52
Refusal	52	--
Local site No. LLW 6		
Silt; gravel	0	20
Silt	20	40
Sand	40	45
Silt	45	57
End of hole	57	--
Local site No. LLW 11		
Boulders	0	10
Sand, medium; gravel; trace of clay	10	25
Sand, medium; gravel; silt	25	45
Local site No. LLW 11—*Continued*		
Gravel, sharp; boulders	45	47
End of hole	47	--
Local site No. LLW 12		
Boulders	0	10
Sand; silt; gravel	10	30
Boulders; trace of clay	30	35
Gravel	35	60
Gravel; trace of silt and clay	60	66
Refusal	66	--
Local site No. LLW 14		
Sand, fine to medium	0	11.3
Cobbles; sand, fine to medium	11.3	15.5
Refusal	15.5	--
Local site No. LLW 15		
Sand, fine to medium	0	21
Sand, medium to very coarse; some silt	21	26.8
Clay; silt	26.8	29
Refusal	29	--
Local site No. LLW 16		
Sand, fine to coarse, silty	0	21.6
Gravel, fine; sand; fine silty	21.6	26.5
Till, clay, silt, gravel	26.5	31
Refusal	31	--
Local site No. LLW 17		
Sand, fine to coarse, silty; gravel	0	26
Till, sandy, silty clay	26	26.3
Refusal	26.3	--
Local site No. LLW 18		
Sand, fine to coarse, silty	0	15.5
Sand, medium to very coarse; gravel	15.5	26.3
Till, silty clay	26.3	27
Bedrock (cored 4.5 ft)	27	--
Local site No. LLW 19		
Topsoil, sandy	0	2
Sand, fine, brown	2	5
Sand, fine, to large pebbles (smooth, rounded); poorly sorted	5	12
Sand, coarse and gravel, silty	12	17

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lisbon—*Continued*		
Local site No. LLW 19—*Continued*		
Silt to cobbles, red brown, iron stained; many very coarse sand grains; poorly sorted	17	35
Sand, fine to medium, gray, clean; well sorted	35	42
End of hole	42	--
Local site No. LLW 20		
Sand, fine to coarse, brown	0	10
Sand, fine to coarse, brown; some gravel	10	15
Sand, fine, tan	15	20
Sand, fine to fine gravel, brown gray; mostly fine to medium sand	20	22
Silt to gravel (10 mm), brown; mostly very coarse sand	22	23
Sand, fine, brown, uniform	23	25
Sand, fine, brown, uniform; trace of fine gravel	25	45
Sand, fine, brown, uniform; well sorted	45	85
Sand, fine to medium, brown; moderately well sorted	85	95
Sand, very fine, brown; with a 20-mm layer of medium to coarse sand; well sorted	95	115
Sand, very fine, brown; well sorted	115	119
End of hole	119	--
Local site No. LLW 24		
Sand	0	10
Silt and sand	10	225
Gravel	225	235
Bedrock	235	--
Local site No. LLW 26		
Gravel	0	12
Bedrock (green and white granite)	12	--
Local site No. LLW 52		
Sand	0	110
Till	110	147
Bedrock	147	--
Littleton		
Local site No. LNA 1		
Sand, fine; silt	1	52
Refusal	52	--

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Littleton—*Continued*		
Local site No. LNA 2		
Sand, fine to medium; silt	1	4
Sand, fine to coarse; gravel	4	29
Refusal	29	--
Local site No. LNA 3		
Sand, fine to coarse; gravel, fine to medium	0	37
Sand, fine to coarse; gravel; some silt	37	42
End of hole	42	--
Local site No. LNA 4		
Boulders	0	20
End of hole	20	--
Local site No. LNA 5		
Boulders	0	9.5
End of hole	9.5	--
Local site No. LNA 6		
Boulders	0	12
End of hole	12	--
Local site No. LNA 8		
Gravel, coarse, sandy	0	7
Sand, fine; silt; gravel; possibly till	7	13.8
Refusal	13.8	--
Local site No. LNA 9		
Till	4	20
Refusal	20	--
Local site No. LNA 10		
Clay and sand, loamy	0	8
Sand, coarse, and gravel and cobbles	8	14
Sand, fine, brown	14	16
Clay and silt, gray	16	24.6
Hardpan	24.6	29.3
Refusal	29.3	--
Local site No. LNA 11		
Sand, brown, and gravel	0	3
Clay and silt, brown	3	9
Clay, silty, gray	9	24
Hardpan	24	28
Refusal	28	--
Local site No. LNA 12		
Sand, brown, and gravel	0	7
Clay and sand, brown and gray	7	10

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft)	
	From	To
GRAFTON COUNTY—*Continued*		
Littleton—*Continued*		
Local site No. LNA 12—*Continued*		
Silt, gray	10	29
Hardpan	29	31
Refusal	31	--
Local site No. LNA 13		
Clay and sand, loamy	0	5.5
Gravel, coarse and cobbles	5.5	8
Clay and silt, gray	8	12
Hardpan and boulders	12	13.6
Refusal	13.6	--
Local site No. LNA 14		
Clay and sand, loamy	0	7
Gravel, coarse, and cobbles	7	12
Hardpan	12	15.4
Refusal	15.4	--
Local site No. LNA 15		
Clay and sand, loamy	0	5
Sand, brown, and gravel and cobbles	5	10
Clay and sand, gray and gravel	10	14
Refusal	14	--
Local site No. LNA 16		
Sand, fine, brown; trace of clay	0	7
Gravel, coarse, and cobbles	7	9
Clay and silt, gray	9	12
Hardpan	12	13.8
Refusal	13.8	--
Local site No. LNA 17		
Clay and sand, loamy, brown	0	2.5
Sand, brown, and gravel and cobbles	2.5	8
Sand, silty, brown and gray; some angular gravel	8	15
Clay and silt, gray	15	25
Hardpan	25	27.3
Refusal	27.3	--
Local site No. LNA 18		
Sand, brown; some clay	0	7
Sand, brown, and gravel and cobbles	7	11
Clay and sand, fine, gray	11	19
Hardpan	19	23.6
Refusal	23.6	--

Lithology	Depth (ft)	
	From	To
GRAFTON COUNTY—*Continued*		
Littleton—*Continued*		
Local site No. LNA 19		
Sand and gravel, tightly packed	0	7
Clay and silt, gray	7	16
Hardpan	16	17.7
Refusal	17.7	--
Local site No. LNA 20		
Clay, loamy	0	4
Sand and gravel and cobbles	4	10
Hardpan	10	13
Refusal	13	--
Local site No. LNA 21		
Clay and sand, loamy	0	4.4
Sand, coarse and gravel and cobbles	4.4	8.5
Sand, fine, brown; some gravel	8.5	10
Clay and sand, silty, gray	10	16.1
Refusal	16.1	--
Local site No. LNA 22		
Sand and gravel, brown	0	3
Sand, fine, brown; trace of clay	3	8
Clay and silt, gray	8	14
Hardpan	14	27
Hardpan and boulders	27	31
Refusal	31	--
Local site No. LNA 23		
Sand, fine, and gravel, brown	0	5
Sand, gray; trace of clay mixed with angular gravel	5	15
Hardpan	15	26
Refusal	26	--
Local site No. LNA 24		
Hardpan and boulders	0	6
Refusal on hardpan and boulders	6	--
Local site No. LNA 25		
Clay, brown sand, and loam	0	6
Sand, coarse, gravel, and cobbles	6	9.5
Sand and gravel, brown	9.5	11.5
Hardpan	11.5	14.1
Refusal	14.1	--
Local site No. LNA 26		
Clay, sand, and loam	0	7

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Littleton—*Continued*		
Local site No. LNA 26—*Continued*		
Gravel, coarse, and cobbles	7	14
Hardpan	14	17.8
Refusal	17.8	--
Local site No. LNA 27		
Sand, fine, silty, brown, and clay	0	9.5
Gravel, coarse, and cobbles	9.5	11
Clay, gray, mixed with angular gravel	11	31
Hardpan	31	33.5
Refusal	33.5	--
Local site No. LNA 28		
Sand and gravel, brown	0	3
Clay and silt, brown	3	9
Clay, silty, gray	9	24
Hardpan	24	28
Refusal	28	--
Local site No. LNB 1		
Loam	0	3
Sand, fine to coarse; some gravel, fine to medium; trace of silt	3	15
Sand, fine; trace of silt	15	59
Sand, fine; some gravel, fine to medium; little silt	59	62
Till	62	66
Refusal	66	--
Local site No. LNB 2		
Sand, fine; silt; small pebbles	0	22
Till, silty; boulders	22	35
End of hole	35	--
Local site No. LNB 3		
Sand, loamy	0	2
Sand, coarse; gravel; boulders	2	7.5
Sand and gravel, coarse	7.5	10.3
Clay, yellow	10.3	12
Sand, coarse, and gravel	12	15.2
Sand, fine; clay	15.2	24.3
Sand, fine; little gravel, coarse	24.3	28
Refusal on bedrock or boulder	28	--
Local site No. LNB 4		
Gravel and boulders	0	8

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Littleton—*Continued*		
Local site No. LNB 4—*Continued*		
Boulders and clay hardpan, alternating layers	8	12.5
Bedrock	12.5	--
Local site No. LNB 5		
Sand, fine to medium, brown; trace of silt and gravel	0	2
Clay, silty, olive; trace of sand	2	4
Clay, silty, "plastic," olive	4	6
Silt, clayey, "plastic," olive	6	10
Silt, clayey, olive; trace of gravel	10	12
Till, silty and boulders	12	42
Refusal on bedrock or boulders	42	--
Local site No. LNB 10		
"Till," silty; trace of organic matter	0	4
Silt, clayey	4	7
Silt, clayey, with lenses of sand	7	9
Sand, fine to medium, silty	9	12
Sand, silty; some clay lenses	12	19
Sand, fine to medium; some silt	19	22
Silt, clayey	22	27
Sand, fine to medium; some silt	27	29
Silt, clayey; some sand lenses	29	32
Sand, silty; trace of clay	32	34
Till, gravelly	34	39
Till, silty	39	42
Till, clayey	42	46
Refusal on boulder or bedrock	46	--
Local site No. LNB 11		
Topsoil and loam, brown	0	2
Sand, fine, brown; some fine to medium gravel; trace of silt	2	9
Sand and gravel, fine to medium	9	15
Sand, fine to medium, gray	15	19
Sand, fine, brown; some fine to medium gravel; trace of silt	19	23
Sand, fine, gray; some fine gravel; little silt	23	27
Bedrock (gray-white-black gneiss)	27	--
Local site No. LNB 12		
Silt, organic	0	1
Sand, fine	1	2
Sand, fine to medium	2	8.5

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Littleton—*Continued*		
Local site No. LNB 12—*Continued*		
Sand, fine to coarse	8.5	26.5
Gravel	26.5	30
Sand, fine to coarse	30	70
Bedrock (schist)	70	--
Local site No. LNB 13		
Sand, fine	0	5
Sand, fine to coarse	5	73.5
Boulder, granite	73.5	74.5
Bedrock (schistose gneiss)	74.5	--
Local site No. LNB 14		
Silt, organic	0	3
Sand, fine to medium	3	4
Till	4	12.5
Bedrock (schistose gneiss)	12.5	--
Local site No. LNB 15		
Silt	0	2.5
Sand, fine to coarse	2.5	6.5
Bedrock (chlorite epidote gneiss)	6.5	--
Local site No. LNB 16		
Sand, fine, gray; some medium to coarse gravel	0	4
Sand, fine to medium and gravel, medium to coarse, brown	4	8
Sand, very fine, gray brown; trace of silt	8	13
Sand, fine, brown; trace of silt	13	18
Sand, very fine, gray; trace of silt	18	25
Rock fragments	25	29.5
Refusal on bedrock	29.5	--
Local site No. LNB 17		
Silt, organic	0	4
Silt	4	8
Sand, fine to medium	8	12.5
Sand, fine to coarse	12.5	16.5
Silt	16.5	19
Bedrock (chlorite epidote gneiss; cored 20 ft)	19	--
Local site No. LNB 18		
Cobbles	0	2
Silt	2	6
Bedrock (chlorite epidote gneiss)	6	--
Local site No. LNB 19		
Sand, fine, and silt and small "stones"	0	28
Till, silty and boulders	28	44
End of hole	44	--
Local site No. LNB 20		
Sand, fine, brown; trace of silt	0	3
Sand, fine, gray; some fine gravel; trace of silt	3	7
Sand, fine, gray; some fine to medium gravel; little silt	7	10.5
Bedrock (gray schist)	10.5	--
Local site No. LNB 21		
Sand, very fine, brown; trace of fine gravel	0	8
Sand, fine, brown; little fine gravel; trace of silt	8	12
Sand, very fine, brown; trace of silt	12	17
Sand, very fine, gray; little fine gravel; trace of silt	17	19.3
Refusal	19.3	--
Local site No. LNW 2		
Sediment, glacial, undifferentiated	0	50
Sand, coarse, and gravel	50	60
Sand, fine to medium	60	68
Sand, medium to coarse, and gravel	68	80
Sand, fine to coarse	80	90
End of hole	90	--
Local site No. LNW 3		
Sand, fine to medium; some silt	0	27
Sand, fine to coarse; gravel	27	55
Sand, fine	55	60
Sand, fine to coarse; gravel	60	84
Sand, fine to medium	84	97
Sand, fine to coarse; gravel, fine	97	99
End of hole	99	--
Local site No. LMW 4		
Sand, fine to medium; some silt	1	25
Sand, fine to coarse; gravel, coarse	25	45
Sand, fine to medium, some coarse	45	92
Till	92	--
Local site No. LNW 5		
Sand, fine	1	12

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Littleton—*Continued*		
Local site No. LNW 5—*Continued*		
Sand, fine to coarse; gravel, fine	12	23
Sand, fine	23	26
Sand, fine to coarse; gravel, fine	26	35
Sand, fine to medium	35	41
Sand, fine	41	59
Sand, fine to coarse	59	64
Sand, fine	64	77
Sand, fine to coarse; gravel, fine; trace of silt	77	81
Refusal	81	--
Local site No. LNW 6		
Sand, fine to coarse	0	32
Sand, fine to coarse; gravel	32	59
Till	59	--
Local site No. LNW 7		
Clay, sand, and loam	0	6
Sand, gravel, and cobbles; brown	6	11
Sand and medium gravel, brown	11	18.2
Refusal	18.2	--
Local site No. LNW 8		
Clay, sand, and loam	0	5
Gravel, coarse, and cobbles	5	12
Sand, brown to angular, coarse gravel; trace of clay	12	19.5
Refusal	19.5	--
Local site No. LNW 27		
Sand, fine to coarse; silt; gravel	0	14
End of hole	14	--
Local site No. LNW 29		
Sand, fine to coarse; gravel	0	14
End of hole	14	--
Local site No. LNW 31		
Sand, fine, firm; some gravel; little inorganic silt	0	9
Sand, fine; some inorganic silt; some fine to coarse sand, compact to very compact gravel; little cobbles	9	15
End of hole	15	--
Local site No. LNW 32		
Sand, fine, loose and landfill debris, (paving, concrete, demolition debris)	0	13
Sand, fine, hard to compact; some organic silt; little fine to medium gravel	13	17
Cobbles and boulders	17	18
End of hole	18	--
Local site No. LNW 33		
Sand, fine; very compact; some silt and fine to medium gravel; little medium to coarse sand and cobbles	0	15
End of hole	15	--
Local site No. LNW 34		
Sand, fine, loose and silt, inorganic; some landfill debris (leather hide, wood, paper)	0	22
Sand, fine, very compact; little inorganic silt and fine to medium gravel; trace of cobbles	22	28
End of hole	28	--
Local site No. LNW 35		
Sand, fine to medium, brown; some silt; little coarse gravel	0	6
Sand, medium to coarse, brown, and gravel, coarse; many small angular cobbles; some silt	6	14
Bedrock, weathered	14	15
Bedrock (hard gray-green crystalline; cored 5 ft)	15	--
Local site No. LNW 36		
Sand, fine to medium, some coarse; some silt	0	34
Refusal	34	--
Local site No. LNW 37		
Sand, coarse to fine, dark brown, loose; some silt; tittle to trace of organics	0	0.2
Sand, coarse to fine, dark brown, medium loose; some silt; little cobbles and pebbles	.2	.9
Sand, medium to fine, brown, loose; some silt; trace of pebbles	.9	10.6
Refusal	10.6	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Littleton—*Continued*		
Local site No. LNW 38		
Sand, fine to coarse; some silt; pebbles; cobbles	0	17
Refusal on boulder	17	--
Local site No. LNW 39		
Sand, fine to coarse; silt; pebbles	0	17.5
Refusal	17.5	--
Local site No. LNW 40		
Sand, fine to medium, light brown; trace of pebbles and cobbles	0	6.5
Till	6.5	24
Refusal	24	--
Local site No. LNW 41		
Clay and sand, fine, silty	0	8
Sand and gravel and cobbles	8	11
Sand, gray and brown, silty, and gravel, fine, angular	11	20
Sand, fine, gray; some fine, angular gravel; trace of clay	20	26
Sand, gray; some silt and medium, angular gravel	26	30
Refusal	30	--
Local site No. LNW 42		
Clay and loam	0	5
Gravel, coarse and cobbles	5	9
Sand, brown, and gravel, medium, angular	9	20
Sand, brown and gray, and gravel, medium, angular	20	23
Refusal	23	--
Local site No. LNW 43		
Clay, brown, and loam and sand, fine, brown	0	5
Sand, coarse, and gravel and cobbles	5	9
Sand, brown, and gravel, medium, angular	9	16.8
Refusal	16.8	--
Local site No. LNW 44		
Clay and loam	0	6
Sand, coarse, and gravel and cobbles	6	10
Sand, fine, and gravel, medium	10	19
Hardpan	19	22
Refusal	22	--
Local site No. LNW 45		
Sand, brown, and loam and clay	0	6
Sand, brown, and gravel and cobbles	6	11
Sand, brown, and gravel, medium, angular	11	18
Sand, gray, and clay	18	21
Hardpan	21	24
Refusal	24	--
Local site No. LNW 46		
Clay and loam and sand	0	5
Gravel, coarse, and cobbles	5	11
Sand, brown, and gravel, medium, angular; some shale	11	15
Clay and sand, brown and gray	15	18
Clay, gray; some fine, angular gravel	18	21
Hardpan	21	23.4
Refusal	23.4	--
Lyman		
Local site No. LXB 1		
Till, silty, dense	0	4
Gravel, silty, dense	4	9
Silt, sandy, very stiff	9	14
Silt, clayey, very stiff	14	27
Sand, fine, silty, very "loose"	27	30
Sand, silty, dense	30	34
Till, silty, dense	34	39.5
Refusal	39.5	--
Local site No. LXB 2		
Sand and gravel, loamy	0	2
Till, gravelly	2	5
Till, silty	5	29
Refusal	29	--
Local site No. LXW 2		
Gravel	0	4
Bedrock	4	--
Local site No. LXW 3		
Sand and fine gravel	0	100
Hardpan	100	125
Bedrock	125	--
Local site No. LXW 4		
Gravel	0	48
Bedrock	48	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Lyman—*Continued*		
Local site No. LXW 5		
Sand	0	9
Bedrock	9	--
Local site No. LXW 19		
Gravel, coarse	0	4
Clay	4	6
Sand, medium to coarse	6	11
End of hole	11	--
Lyme		
Local site No. LYB 1		
Sand and gravel	0	4.8
Sand, fine, and gravel, coarse	4.8	9.5
Sand, medium; gravel; clay	9.5	11.7
Sand, coarse, and gravel	11.7	14.5
Sand, fine, and gravel; coarse	14.5	17.8
Sand, fine, compact, and gravel, coarse	17.8	23.5
Refusal on bedrock or boulder	23.5	--
Local site No. LYB 2		
Gravel, silty	0	10
Till, compact hardpan	10	19
Refusal on bedrock or boulder	19	--
Local site No. LYB 3		
Topsoil	0	1
Silt and sand and stones	1	4
Silt and small stones	4	14
Silty till and boulders	14	21
End of hole	21	--
Local site No. LYW 4		
Sand, fine, brown	0	7
Sand, fine to very coarse, brown; mostly fine sand	7	15
Sand, fine, brown, uniform; well sorted	15	20
Silt to small pebbles, very silty; mostly coarse to very coarse sand; poorly sorted	20	23
Sand, fine to medium, brown; mostly medium sand; well sorted	23	25
Sand, fine, to coarse gravel, brown; trace of pebbles; mostly medium to coarse sand	25	28.3
Clay, olive brown, varved	28.3	28.6
Sand, very fine, brown	28.6	33.5
Lyme—*Continued*		
Local site No. LYW 4—*Continued*		
Clay, silt, and very fine sand layers (1 in. thick)	33.5	35
Sand, fine, brown, with 0.5-inch layers of silt	35	45
Clay, olive gray	45	47.5
Sand, very fine, brown, uniform, soft	47.5	52.9
Till, silty, extremely compact; broken rocks	52.9	--
Local site No. LYW 9		
Gravel (fill)	0	2
Clay, silt, gravel, and large boulders	2	102
Bedrock (gray schist)	102	--
Local site No. LYW 14		
Sand and gravel	0	6
Bedrock	6	--
Local site No. LYW 15		
Sand	0	175
Bedrock (granite)	175	--
Local site No. LYW 17		
Clay	0	67
Bedrock	67	--
Local site No. LYW 18		
Gravel (fill)	0	2
Peat	2	6
Boulder	6	9
Sand and gravel	9	41
Bedrock (schist and granite)	41	--
Monroe		
Local site No. MUA 1		
Sand, medium, brown	0	27
Clay, blue	27	110
Refusal	110	--
Local site No. MUA 2		
Sand, medium	0	20
Clay, brown and silt, brown	20	38
Clay, blue	38	40
End of hole	40	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Monroe—*Continued*		
Local site No. MUA 3		
Sand, medium, brown, and grave	0	16
Silt, gray, and sand (no circulation)	16	32
Clay, blue	32	34
End of hole	34	--
Local site No. MUB 1		
Sand and gravel	0	3
Silt and sand, soft	3	10
Sand, fine	10	12
Silt and sand and stones	12	18
Refusal	18	--
Local site No. MUW 1		
Sand, medium, brown	0	32
Sand, medium, brown; little medium gravel	32	45
Clay and sand, fine, brown	45	50
Clay, blue	50	95
Refusal	95	--
Local site No. MUW 15		
Sand	0	40
End of hole	40	--
Local site No. MUW 19		
Sand	0	65
Clay	65	137
Sand and gravel	137	143
End of hole	143	--
Local site No. MUW 32		
Clay	0	10
Sand and gravel	10	15
Bedrock	15	--
Local site No. MUW 33		
Clay	0	45
Sand and gravel	4	14
Bedrock	14	--
Local site No. MUW 50		
Sand	0	50
Clay	50	103
Bedrock	103	--
GRAFTON COUNTY—*Continued*		
Orange		
Local site No. ORB 1		
Till, sandy and boulders	0	13
Refusal	13	--
Orford		
Local site No. OSA 1		
Clay	0	365
End of hole	365	--
Local site No. OSB 1		
Sand, fine, loamy	0	13.3
Sand, fine, yellow; little gravel	13.3	27.5
Sand, firm, angular, dark gray	27.5	53.3
Sand, firm, angular, blue; fine gravel	53.3	72.4
Sand, compact, angular, blue	72.4	80
End of hole	80	--
OLocal site No. SB 2		
Sand, loamy	0	1.8
Sand, coarse, gray; fine gravel	1.8	9.7
Sand, fine, firm, yellow	9.7	22.3
End of hole	22.3	--
Local site No. OSB 3		
Sand and stones	0	4
Sand, stones, muck, wood	4	7
Till, silty	7	11
Refusal	11	--
Local site No. OSW 1		
Sand	0	12
End of hole	12	--
Local site No. OSW 2		
Topsoil	0	3
Sand, very fine, dark brown; some silt	3	12
Sand, fine, brown, uniform, soft	12	15
Silt to fine sand, brown, soft; mostly very fine sand	15	27
Sand, coarse, to fine gravel, very clean; mostly very coarse sand; well sorted	27	28.5
Sand, coarse, to fine gravel, clean; mostly very coarse sand and fine gravel	28.5	30
Sand, fine, to pebbles (10 mm), brown; some large pebbles (20-25 mm); mostly coarse sand	30	33

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Orford—*Continued*		
Local site No. OSW 2—Continued		
Sand, very fine to fine, gray, soft	33	35
Sand, coarse, to pebbles (rounded), clean, well washed; mostly very coarse sand	35	38
Sand, very fine to fine, gray, uniform, soft	38	40
Sand, fine, gray; trace of coarse sand	40	45
Sand, very fine, gray	45	65
Alternating layers (50 mm thick) of clay and medium sand, gray	65	75
Alternating layers (100 mm thick) of clay and fine sand, gray	75	79
End of hole	79	--
Local site No. OSW 26		
Sand, fine to coarse, gravelly, brown	0	15
Sand, fine to medium, gravelly, brown	15	40
Sand, fine, gray brown	40	50
Sand, fine, silty, gray brown	50	70
Silt, fine, sandy, gray	70	81.5
End of hole	81.5	--
Local site No. OSW 27		
Sand, fine, brown	0	20
Sand, fine, grayish brown	20	35
Sand, fine, silty, grayish brown	35	40
Silt, fine, sandy, gray	40	51.9
Refusal	51.9	--
Local site No. OSW 28		
Sand, fine, silty	0	10
End of hole	10	--
Local site No. OSW 29		
Sand, fine to medium, brown	0	35
Silt, fine, sandy, gray	35	42.5
Refusal	42.5	--
Local site No. OSW 30		
Till, sandy, and fine sand	0	19
Refusal	19	--
Local site No. OSW 38		
Sand and gravel	0	30
Hardpan and gravel	30	51
Bedrock	51	--
Local site No. OSW 41		
Gravel	1	20
Till	20	105
Bedrock (shale)	105	--
Local site No. OSW 47		
Sand	0	83
End of hole	83	--
Local site No. OSW 51		
Sand	0	180
Gravel, coarse	180	215
End of hole	215	--
Local site No. OSW 53		
Sand, and gravel (hardpan?)	0	50
Clay	50	160
Sand and gravel	160	168
Bedrock	168	--
Local site No. OSW 63		
Sand and gravel	0	20
Clay	20	50
Hardpan and gravel	50	110
Bedrock	110	--
Local site No. OSW 64		
Sand	0	20
Clay, silt, and sand	20	100
Gravel	100	110
End of hole	110	--
Local site No. OSW 69		
Sand	0	90
Hardpan and gravel	90	115
Bedrock	115	--
Local site No. OSW 73		
Clay	0	4
Sand	4	22
Bedrock	22	--
Local site No. OSW 74		
Sand and gravel	0	18
Till	18	28
Bedrock	28	--

Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Orford—*Continued*		
Local site No. OSW 76		
Sand and gravel	0	50
Till	50	88
Bedrock	88	--
Local site No. OSW 78		
Clay	0	4
Sand	4	25
Bedrock	25	--
Local site No. OSW 79		
Sand and gravel	0	20
Gravel	20	30
Till	30	50
Bedrock	50	--
Piermont		
Local site No. PDA 1		
Sand, fine, dark brown, clean, uniform; well sorted	0	10
Sand, very fine to fine, very dark brown, silty; well sorted	10	15
Sand, fine, gray brown, uniform; much mica schist	15	20
Sand, fine, gray, clean, uniform; trace of fine gravel and pebbles (20 mm, subangular)	20	25
Sand, fine, gray, clean, uniform; trace of fine gravel and pebbles (20 mm, subangular)	20	25
Sand, fine, uniform; well sorted	25	28.8
Clay, blue, stiff, massive; very thin fine sand layers 5-mm apart	28.8	59
End of hole	59	--
Local site No. PDB 1		
Gravel, sandy	0	13
Sand, silty; stones	13	20
End of hole	20	--
Local site No. PDW 13		
Sand	0	15
Till(?)	15	80
Sand and gravel	80	84
End of hole	84	--

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Piermont—*Continued*		
Local site No. PDW 36		
Sand and gravel	0	10
Sand	10	50
Sand and gravel	50	57
Bedrock	57	--
Local site No. PDW 52		
Sand	0	20
Hardpan	20	80
Bedrock	80	--
Sugar Hill		
Local site No. SUA 1		
Topsoil, dark brown, and cobbles (rounded)	0	2
Silt, fine sand, and pebbles (60-80 mm), gray; some cobbles (0.5 ft in diameter)	2	12
Silt to large pebbles (250 mm), silty, gray brown; poorly sorted	12	15
Silt to pebbles (4 mm), olive brown, compact, angular; possibly till	15	20
Till, clayey, very compact	20	--
Local site No. SUB 1		
Gravel	0	4
Sand, silty	4	12
Gravel	12	15
End of hole	15	--
Local site No. SUW 1		
Sand, fine to medium, poorly sorted; some silt; trace of organics	0	1.5
Sand, fine to coarse, well sorted, and gravel; some silt	1.5	12
Sand, fine to medium, well sorted, brown; some silt; trace of gravel	12	16
End of hole	16	--
Local site No. SUW 2		
Sand, fine, brown	0	3
Sand, fine, gray	3	5
Sand, fine, and cobbles (smooth, round)	5	12
Sand, fine to coarse	12	13.5
Sand, fine, to small pebbles, gray; mostly very coarse sand	13.5	15

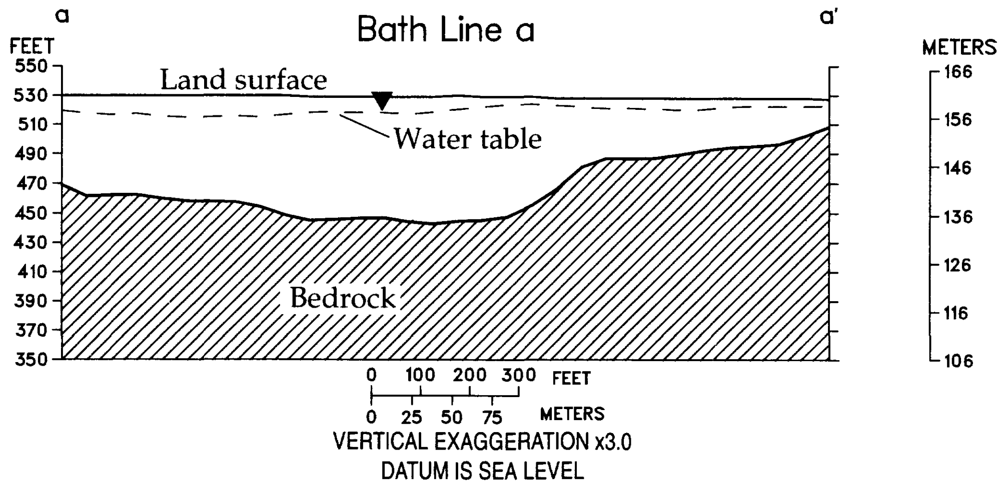
Table B1. Stratigraphic logs of selected wells and borings, west-central New Hampshire and eastern Vermont—*Continued*

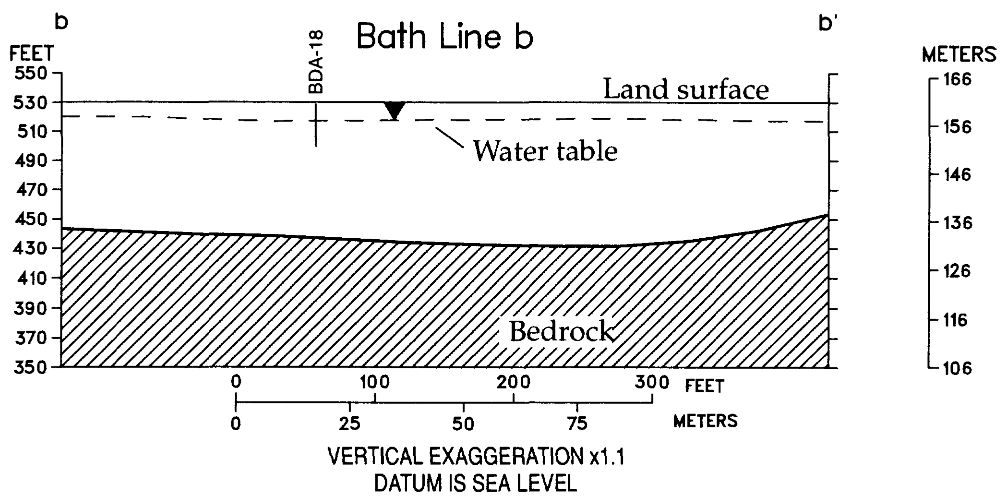
Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Sugar Hill—*Continued*		
Local site No. SUW 2—Continued		
Sand, fine, to small pebbles; mostly coarse sand, poorly sorted	15	18
Sand, fine, brown	18	20
Sand, fine to very coarse, clean; mostly coarse sand, with a 5-inch layer of fine gravel	20	25
Sand, fine to coarse, brown; trace of fine gravel; mostly medium sand	25	28.5
Sand, fine, brown, uniform	28.5	35
Sand, very fine, to small pebbles, silty, poorly sorted	35	38
Sand, medium, brown, uniform	38	40
Silt to pebbles (40 mm), brown; mostly coarse sand; poorly sorted	40	45
Sand, fine, to pebble (20 mm), brown; mostly very coarse sand; moderately sorted	45	50
Sand, fine, to small pebbles, slightly silty; mostly very coarse sand	50	53.2
Till, silt to broken rocks, olive gray; compact;	53.2	70
Refusal in hard till	70	--
Local site No. SUW 4		
Sand, fine, to large cobbles, brown; many pebbles (250 mm)	0	10
Sand, fine, to pebbles (20 mm); many small pebbles; mostly coarse sand; some iron stained layers	10	20
Sand, fine, to pebbles (10 mm), clean; mostly coarse to very coarse sand; poorly sorted	20	23
Silt to pebbles (40 mm), very silty; many fine gravel; somewhat "tight"	23	25
Silt to pebbles (30 mm), gray, very silty; many fine gravel and very coarse sand; poorly sorted	25	39
Refusal in very compact till	39	--

Lithology	Depth (ft) From	Depth (ft) To
GRAFTON COUNTY—*Continued*		
Fairlee		
Local site No. FLW 1		
Topsoil	0	5
Sand, fine to medium, and gravel	5	21
Sand, silty, gray; some clay	21	64
Sand, fine to coarse, and fine to very coarse gravel; some cobbles	64	92
End of hole	92	--
Norwich		
Local site No. NRW 42		
Sand, fine to medium, and gravel, brown	0	20
Sand, fine to coarse, and gravel, brown	20	25
Sand, fine to coarse, brown; some gravel	25	46
Sand, fine to coarse, brown, and gravel	46	50
Sand, fine to coarse, and gravel, brown; boulders	50	68
Sand, fine to coarse; fine gravel; silt; trace of clay	68	85
Gravel, coarse, brown	85	87
Sand, fine to medium, silty, and fine gravel; trace of clay	87	100
Sand, fine to coarse, gray brown, and gravel	100	113
Sand, fine to coarse, silty, gray brown, and gravel; compact	113	116
Sand and gravel, fine to medium, silty, reddish brown	116	120
Sand and gravel, fine to coarse, gray brown; some silt	120	143
Sand and gravel, fine to coarse, silty, very dirty; boulders	143	180
Sand and gravel, fine to coarse, brown, very silty; trace of clay; very silty	180	191
End of hole	191	--

APPENDIX C

LIST OF FIGURES IN APPENDIX C





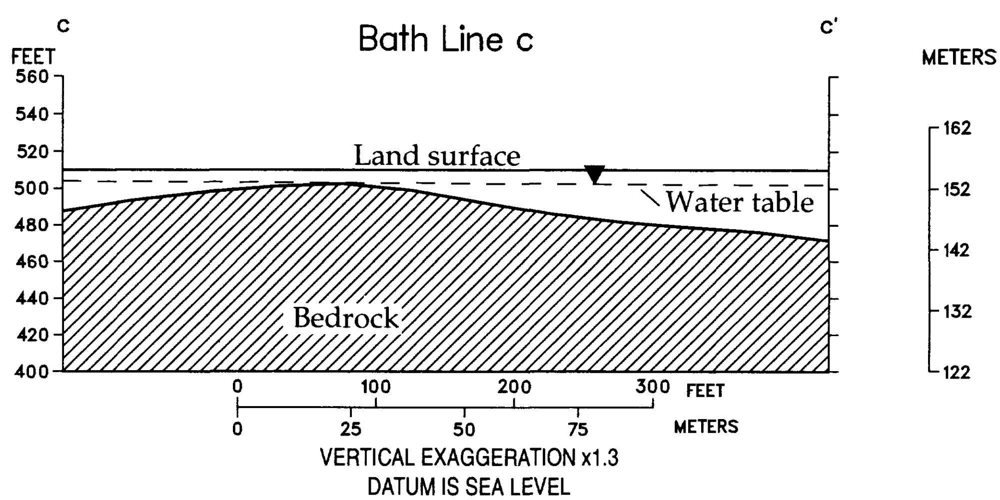


Figure C1. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Bath lines a-c. Lines of section are shown on plates 2 and 4.

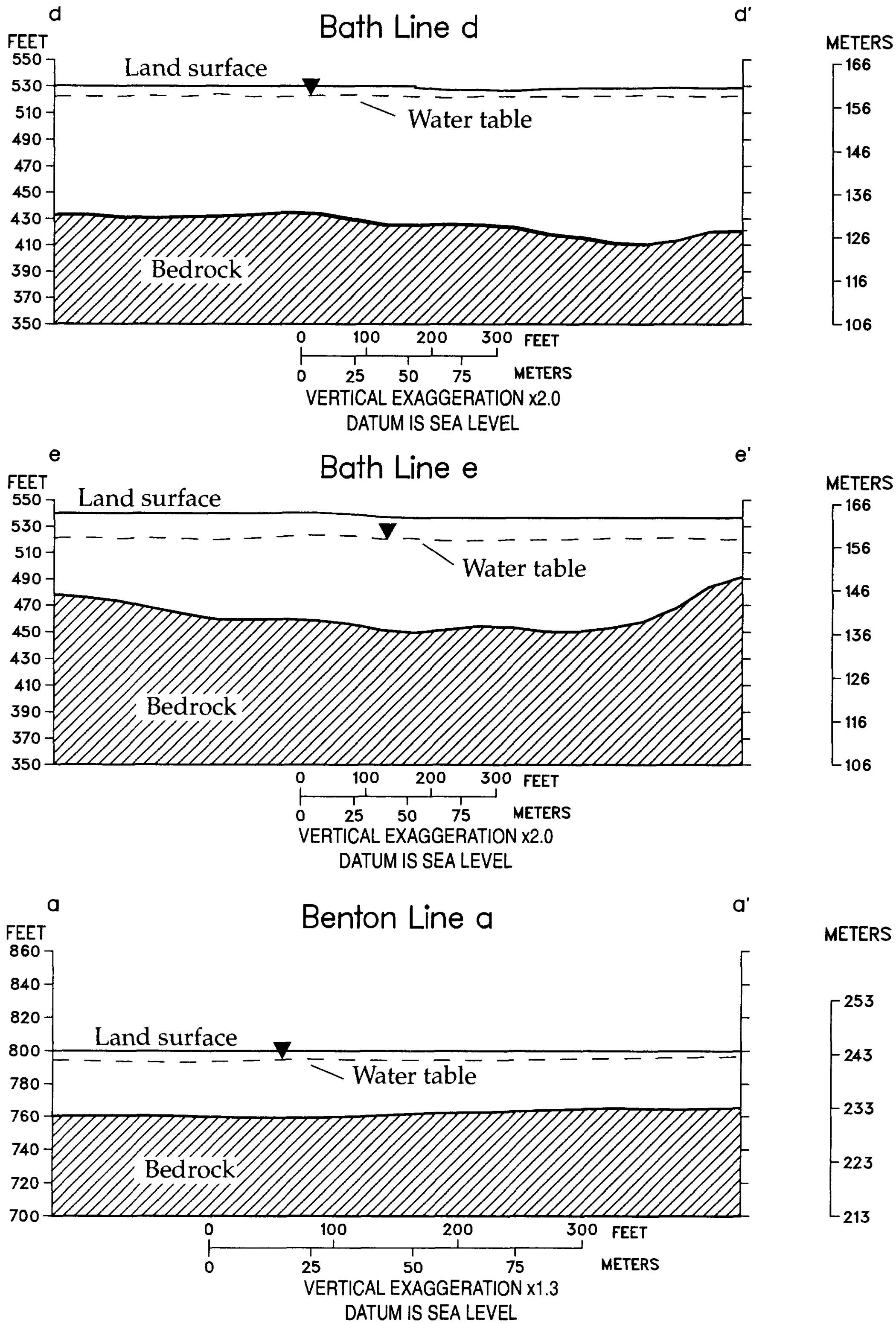


Figure C2. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Bath lines d-e and Benton line a. Lines of section are shown on plates 2 and 3.

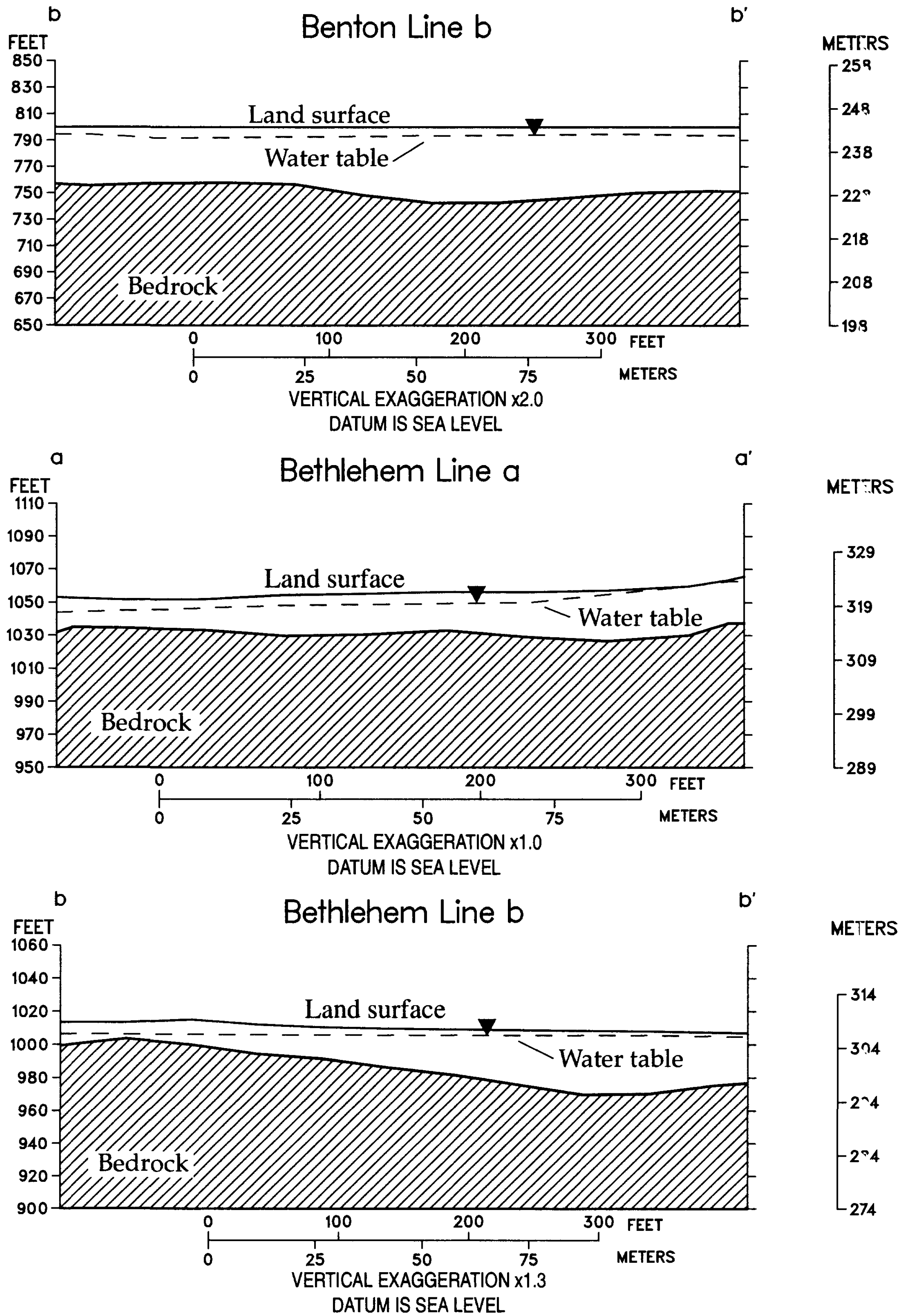


Figure C3. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Benton line b and Bethlehem lines a-b. Lines of section are shown on plates 2 and 4.

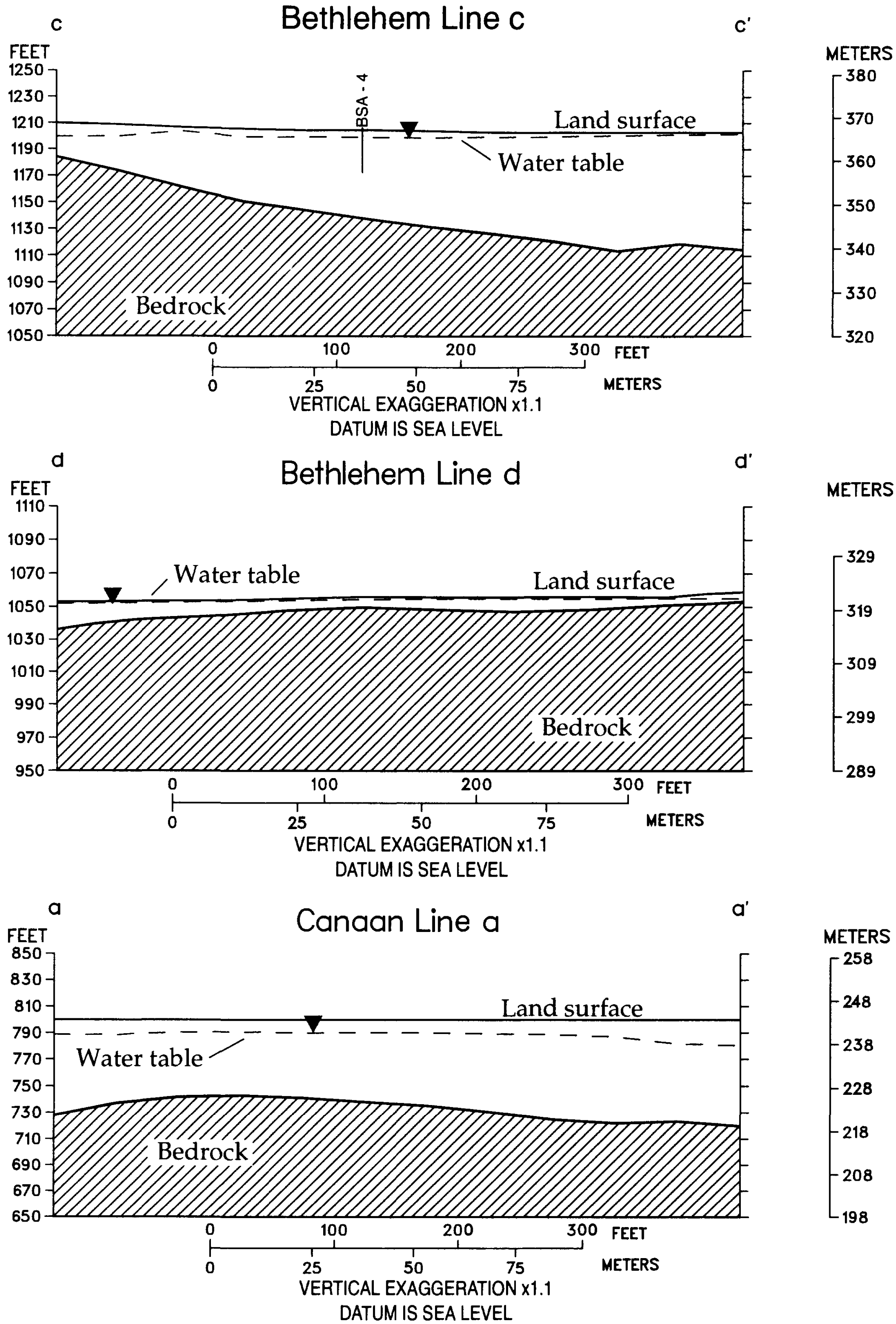


Figure C4. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Bethlehem lines c-d and Canaan line a. Lines of section are shown on plates 1 and 4.

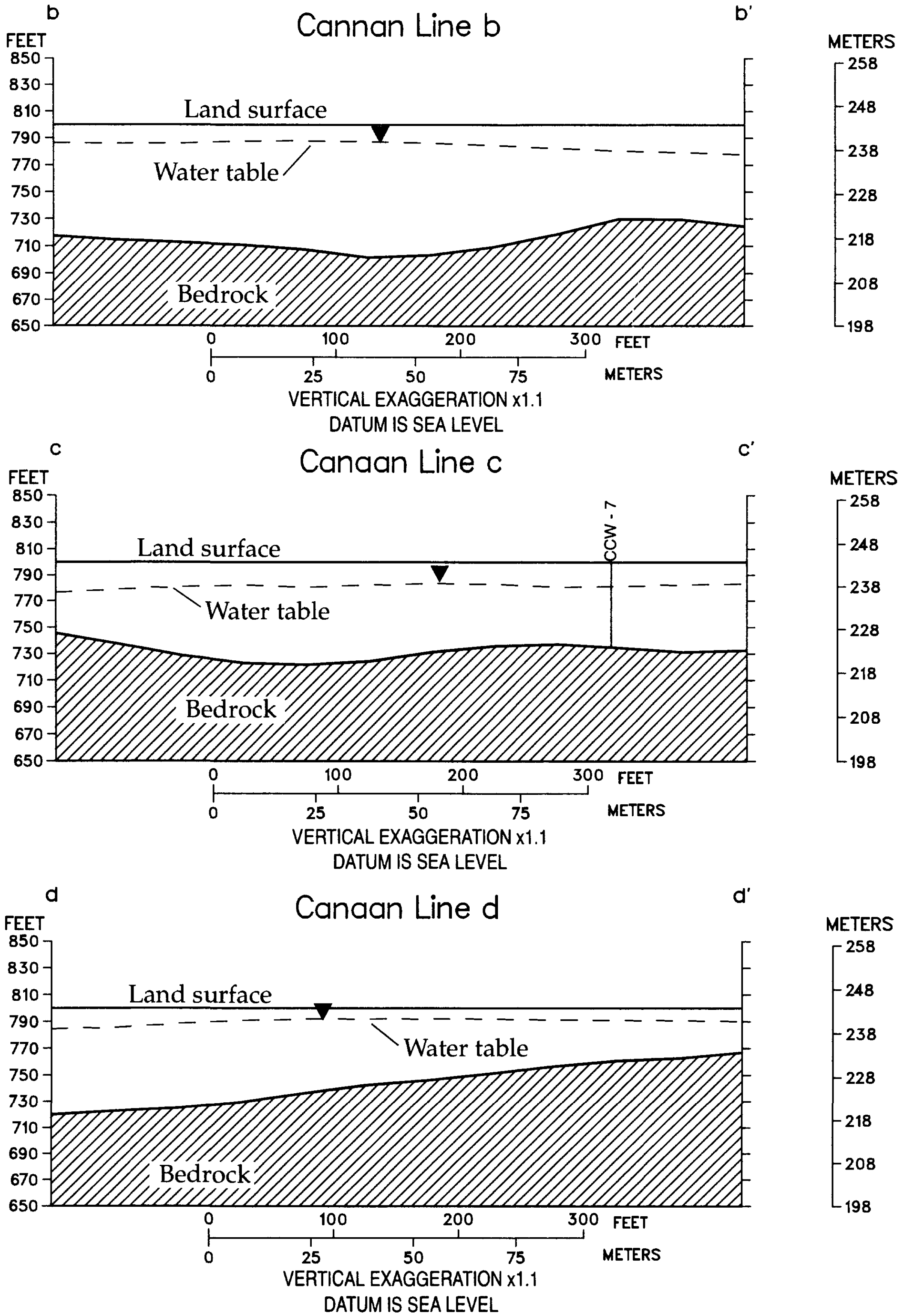


Figure C5. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Canaan lines b-d. Lines of section are shown on plate 1.

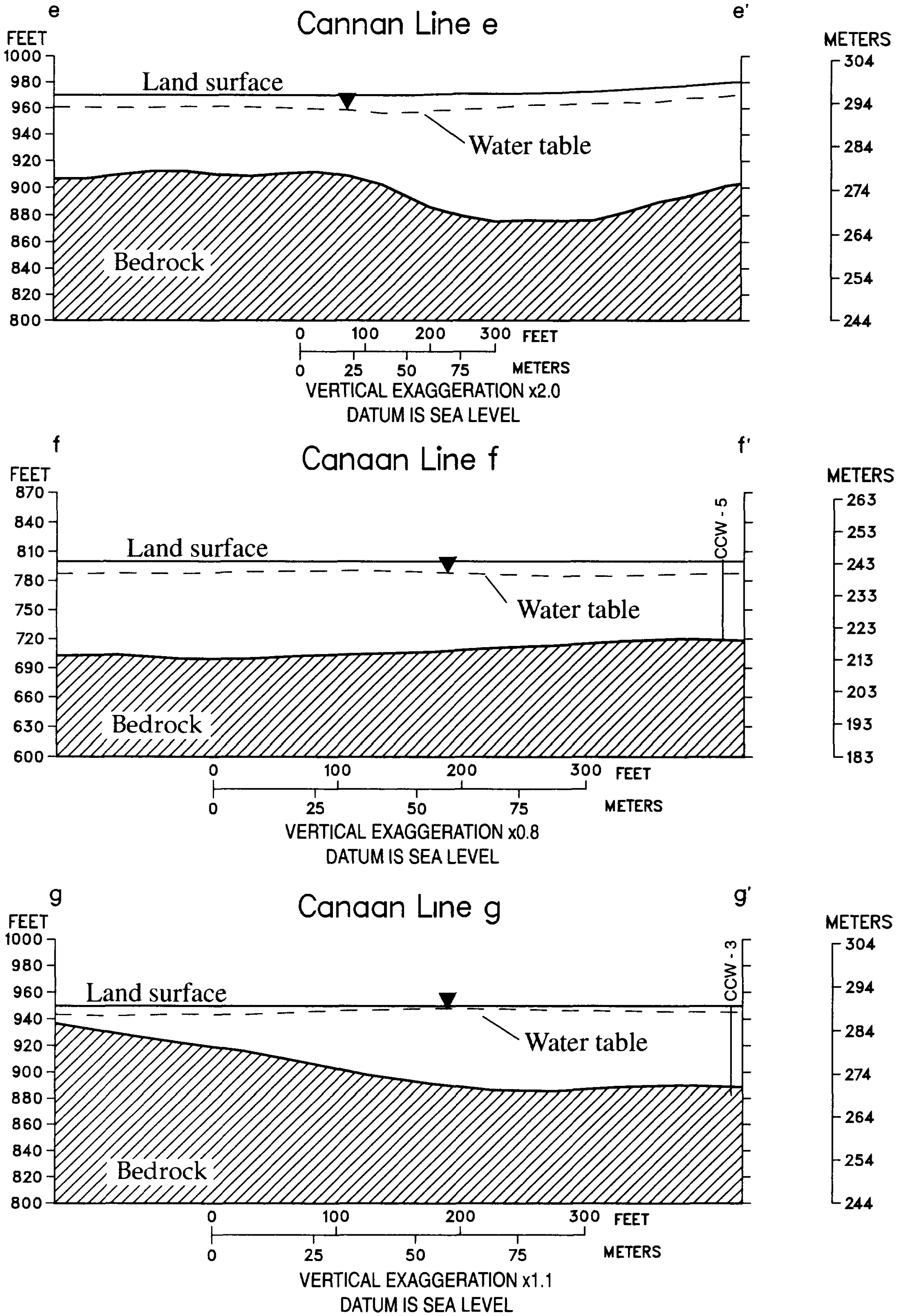


Figure C6. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Canaan lines e-g. Lines of section are shown on plate 1.

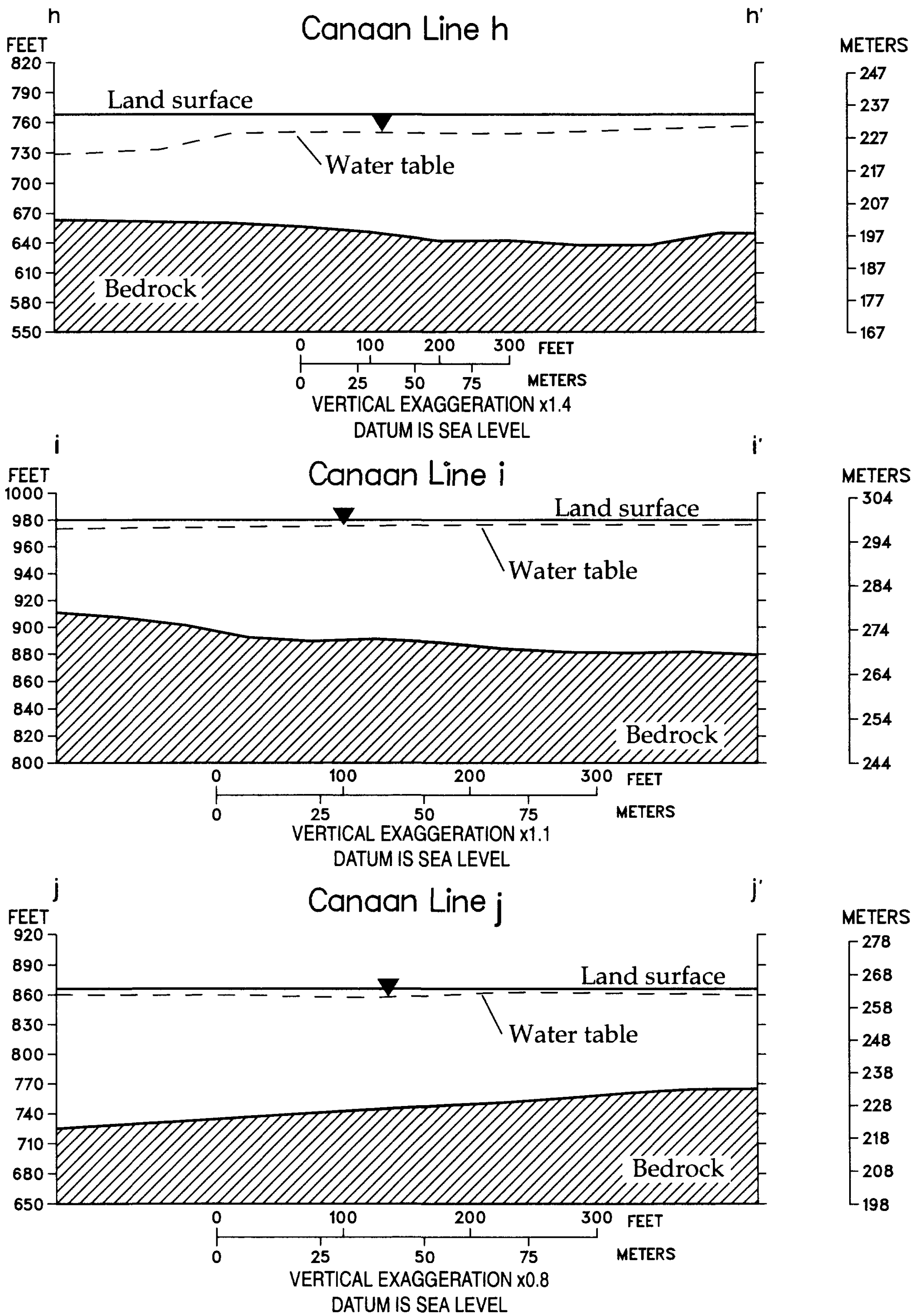


Figure C7. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Canaan lines h-j. Lines of section are shown on plate 1.

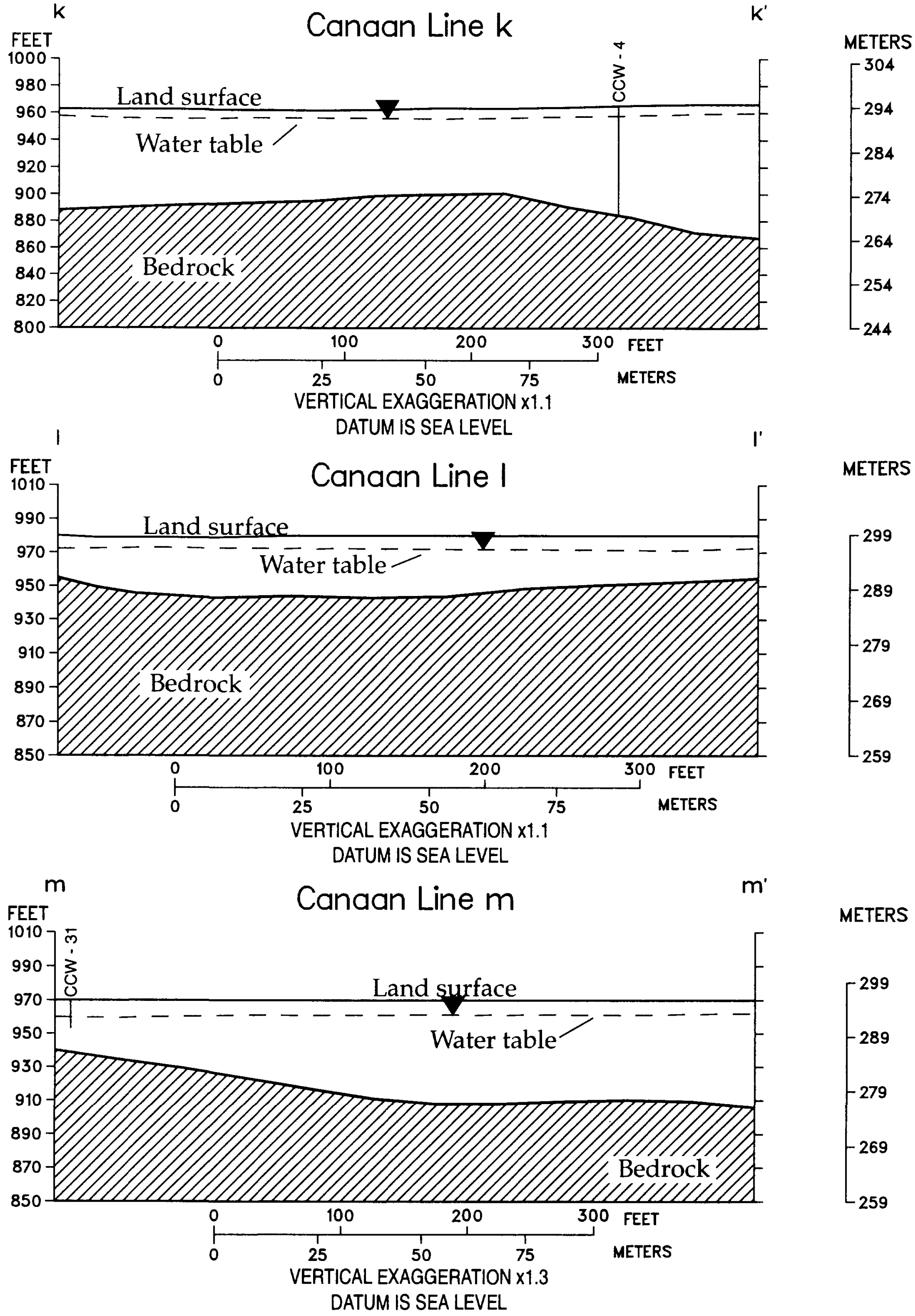


Figure C8. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Canaan lines k-m. Lines of section are shown on plate 1.

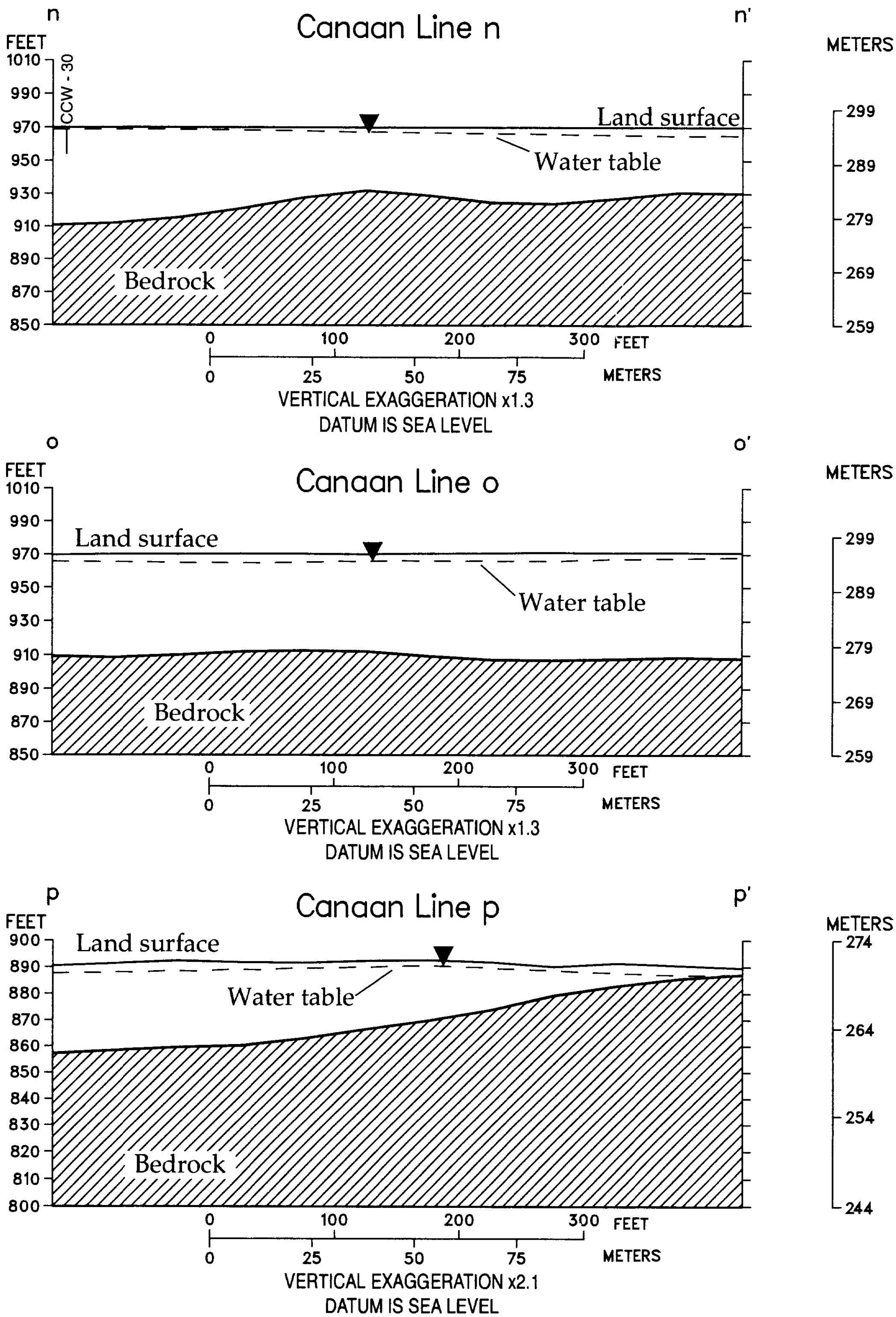


Figure C9. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Canaan lines n-p. Lines of section are shown on plate 1.

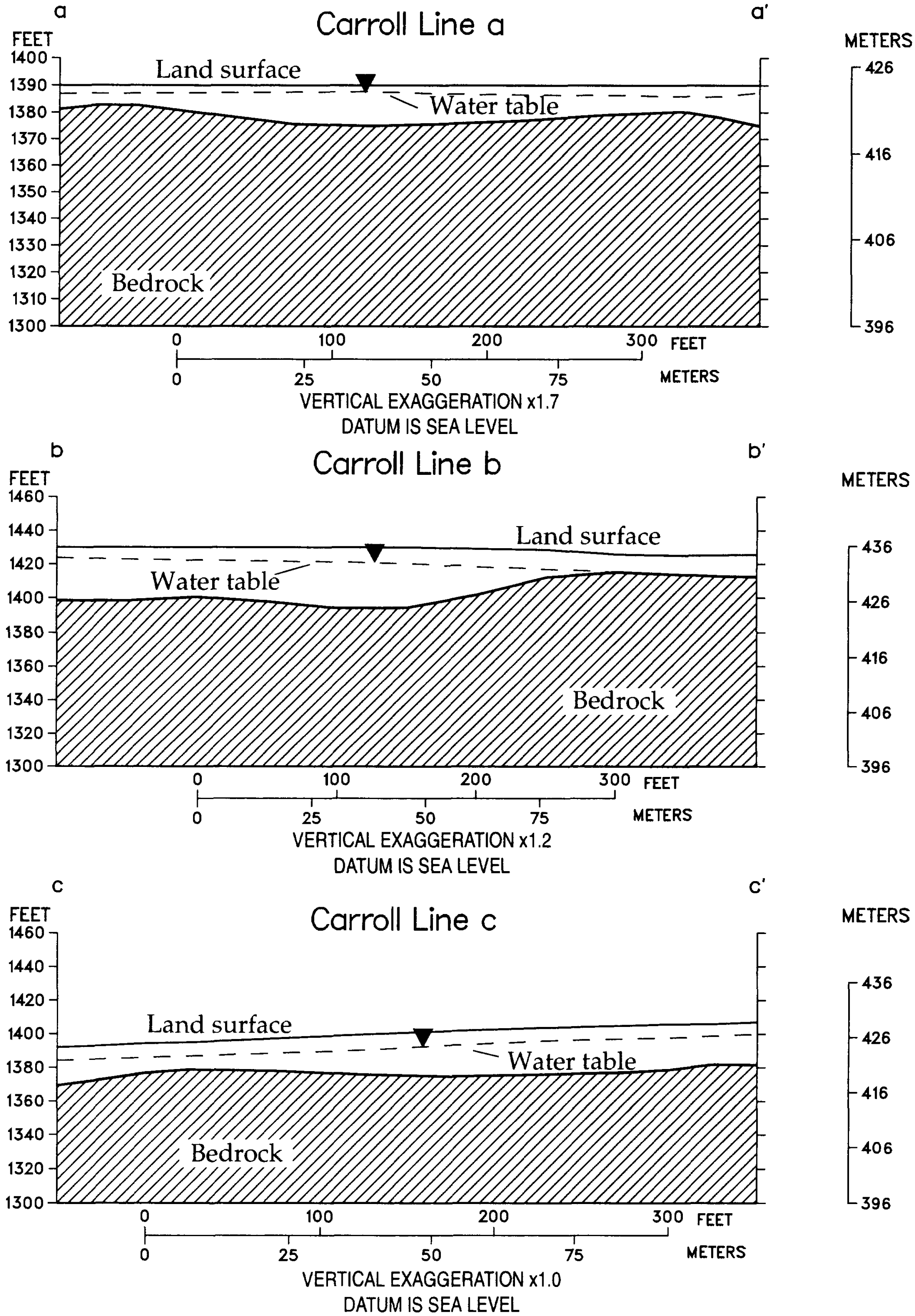


Figure C10. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Carroll lines a-c. Lines of section are shown on plate 4.

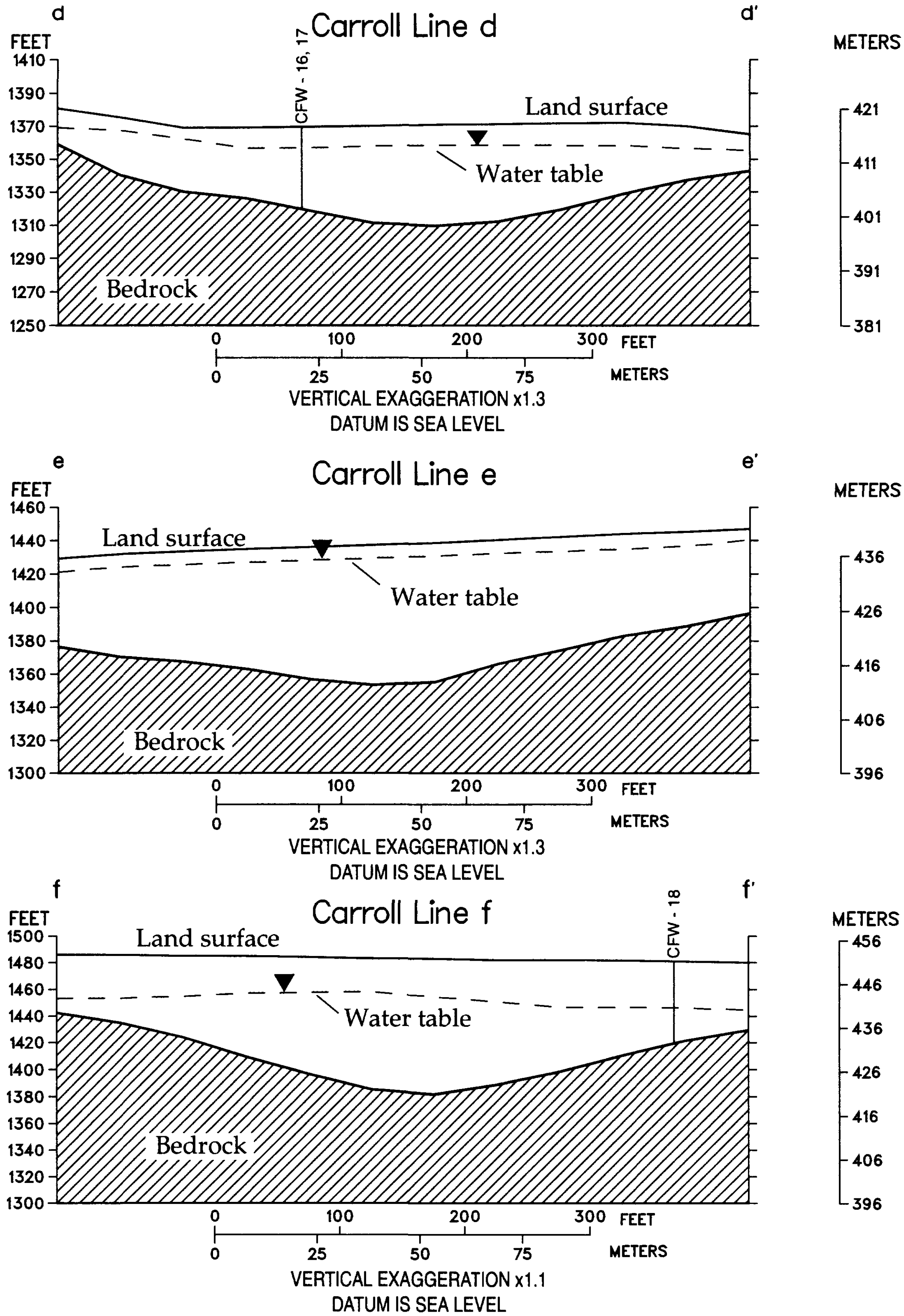


Figure C11. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Carroll lines d-f. Lines of section are shown on plate 4.

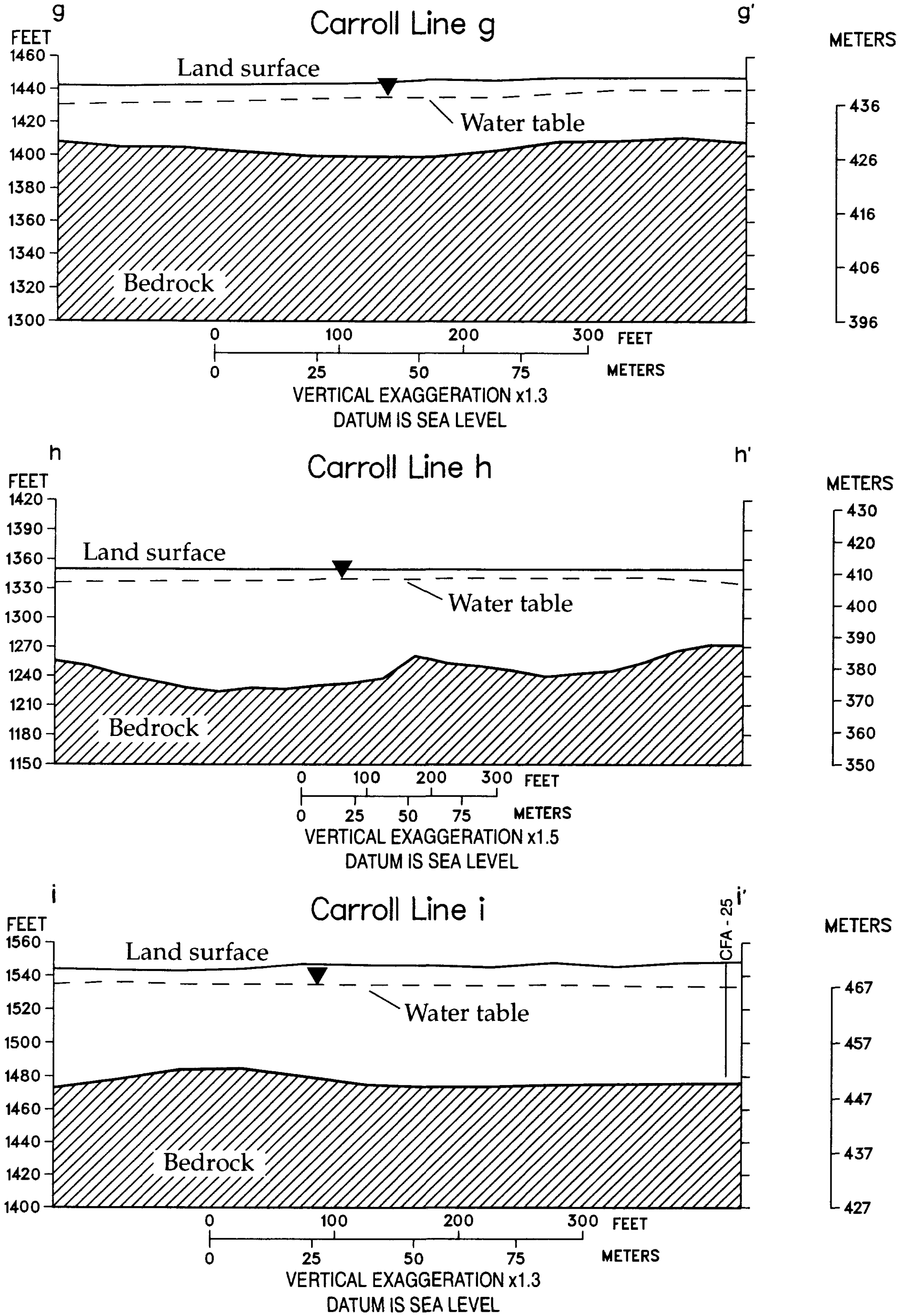


Figure C12. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Carroll lines g-i. Lines of section are shown on plate 4.

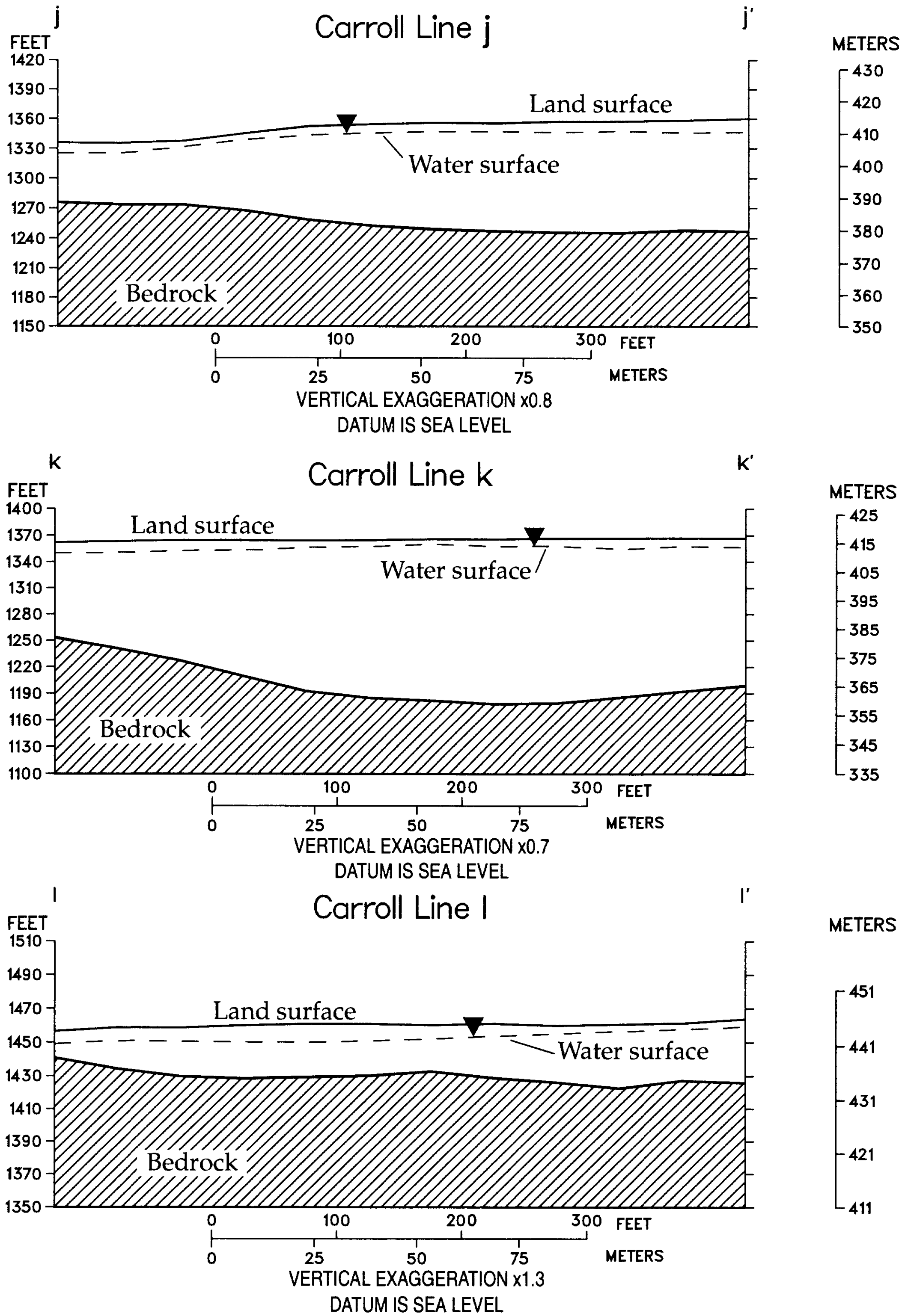


Figure C13. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Carroll lines j-l. Lines of section are shown on plate 4.

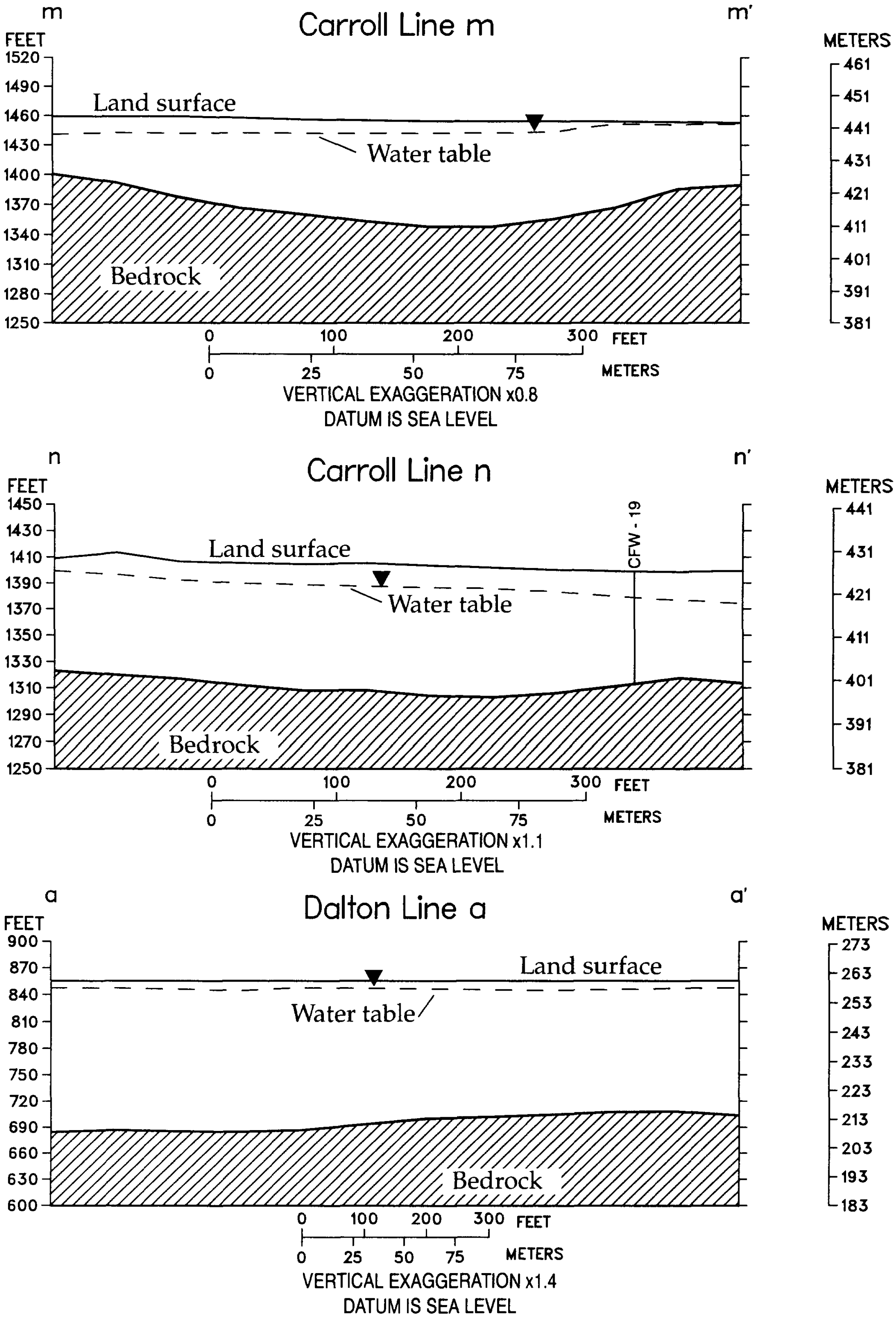


Figure C14. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Carroll lines m-n and Dalton line a. Lines of section are shown on plate 4.

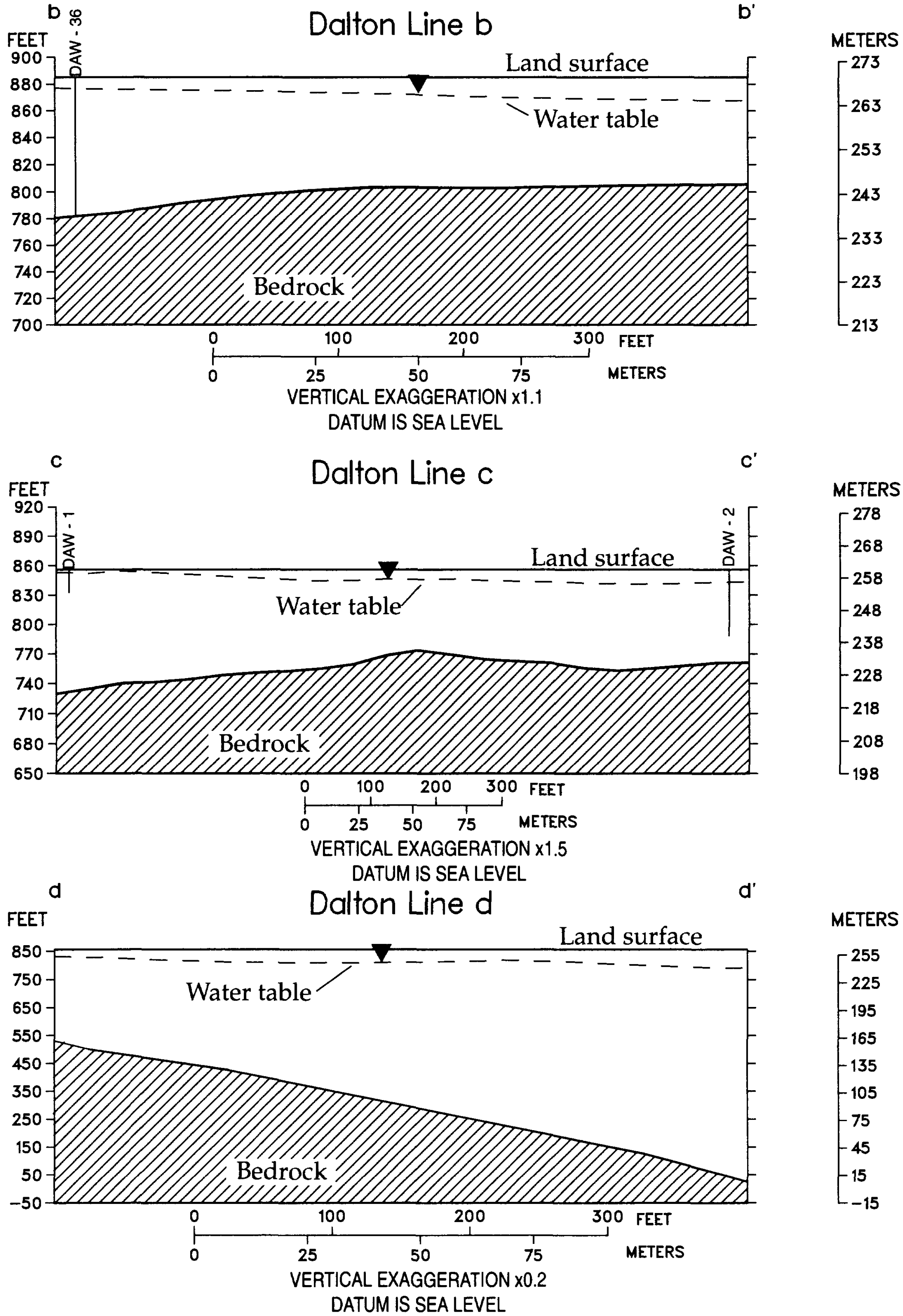


Figure C15. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Dalton lines b-d. Lines of section are shown on plate 4.

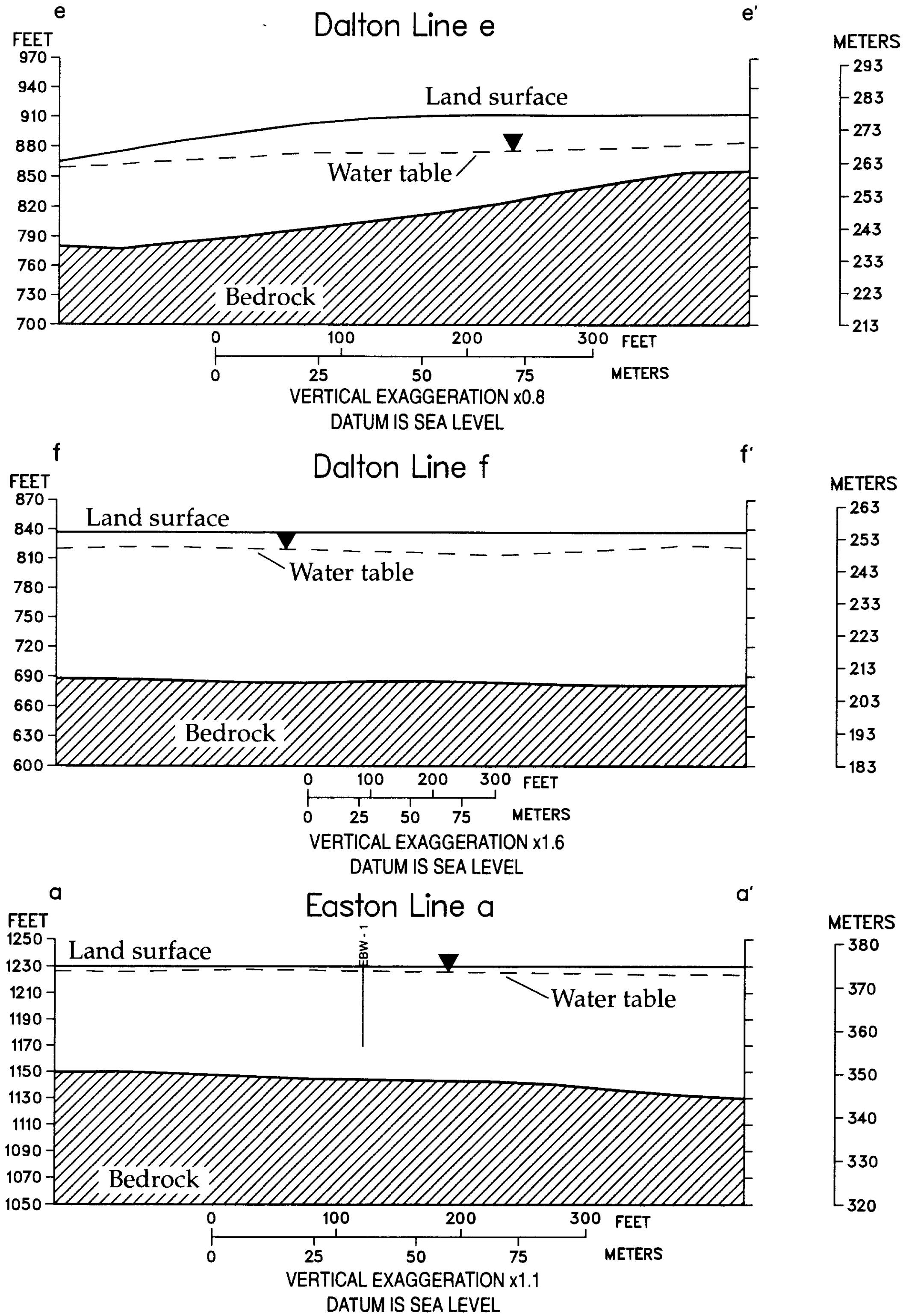


Figure C16. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Dalton lines e-f and Easton line a. Lines of section are shown on plates 3 and 4.

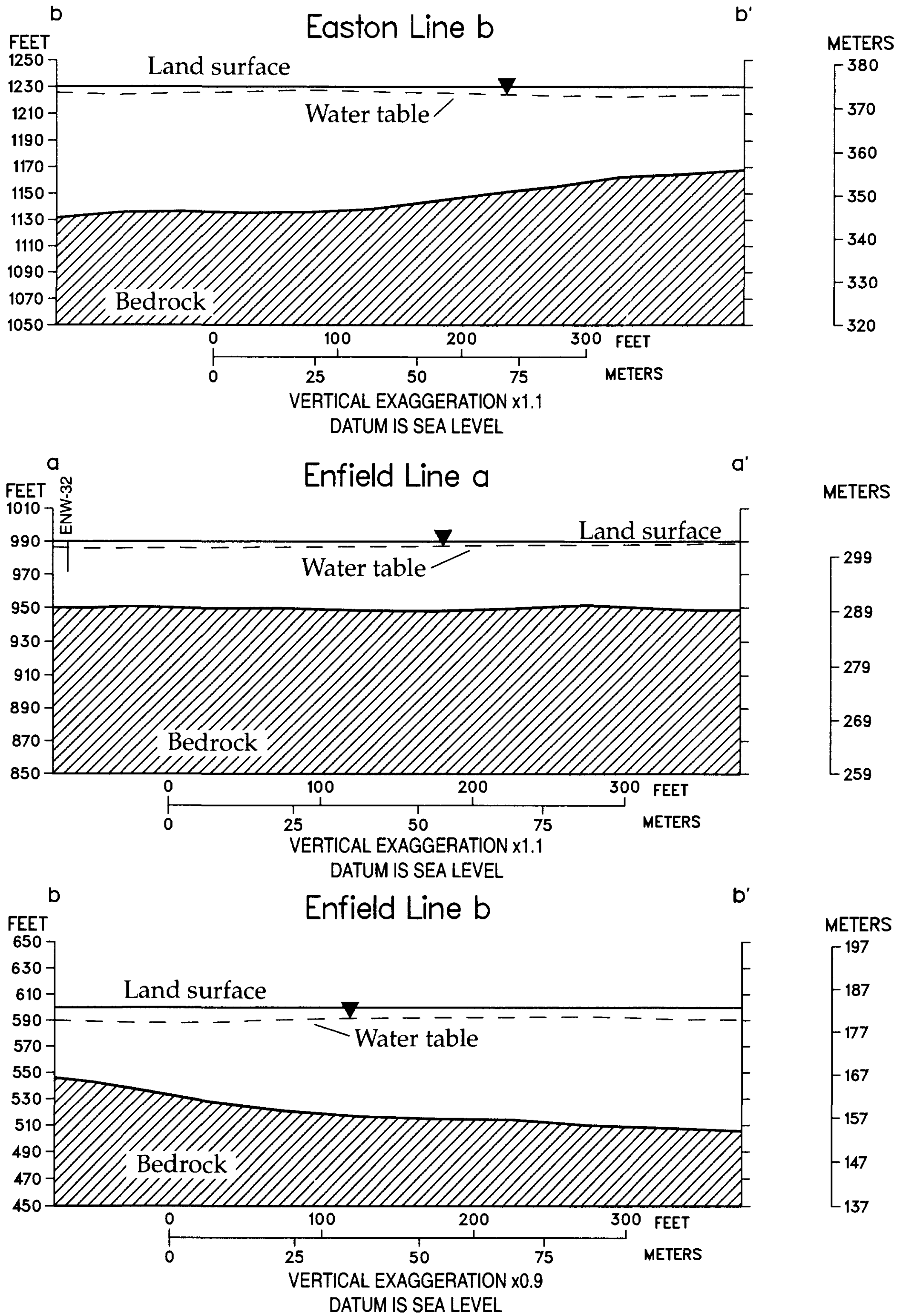


Figure C17. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Easton line b and Enfield lines a-b. Lines of section are shown on plates 1 and 3.

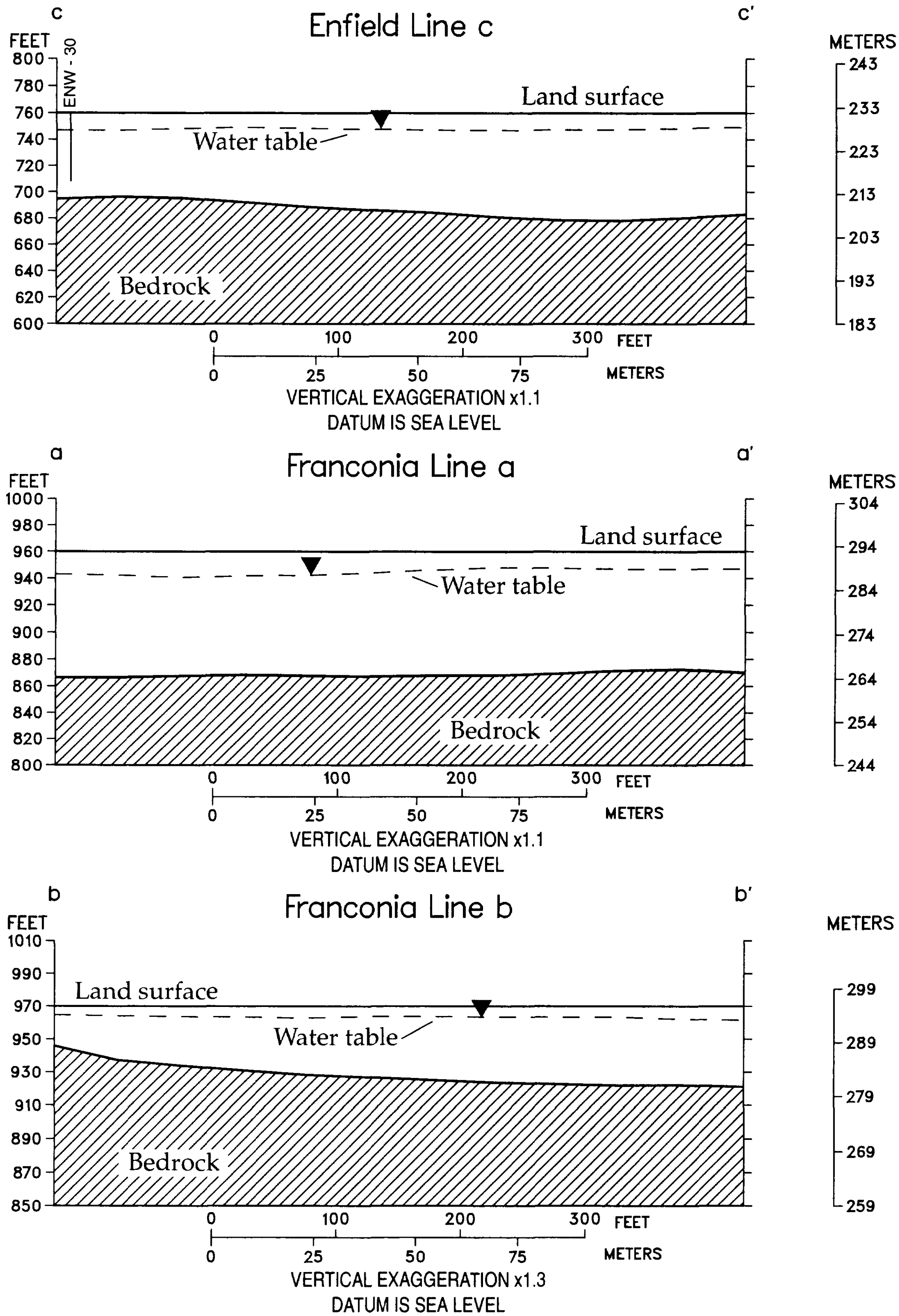


Figure C18. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Franconia lines a-b. Lines of section are shown on plates 1 and 3.

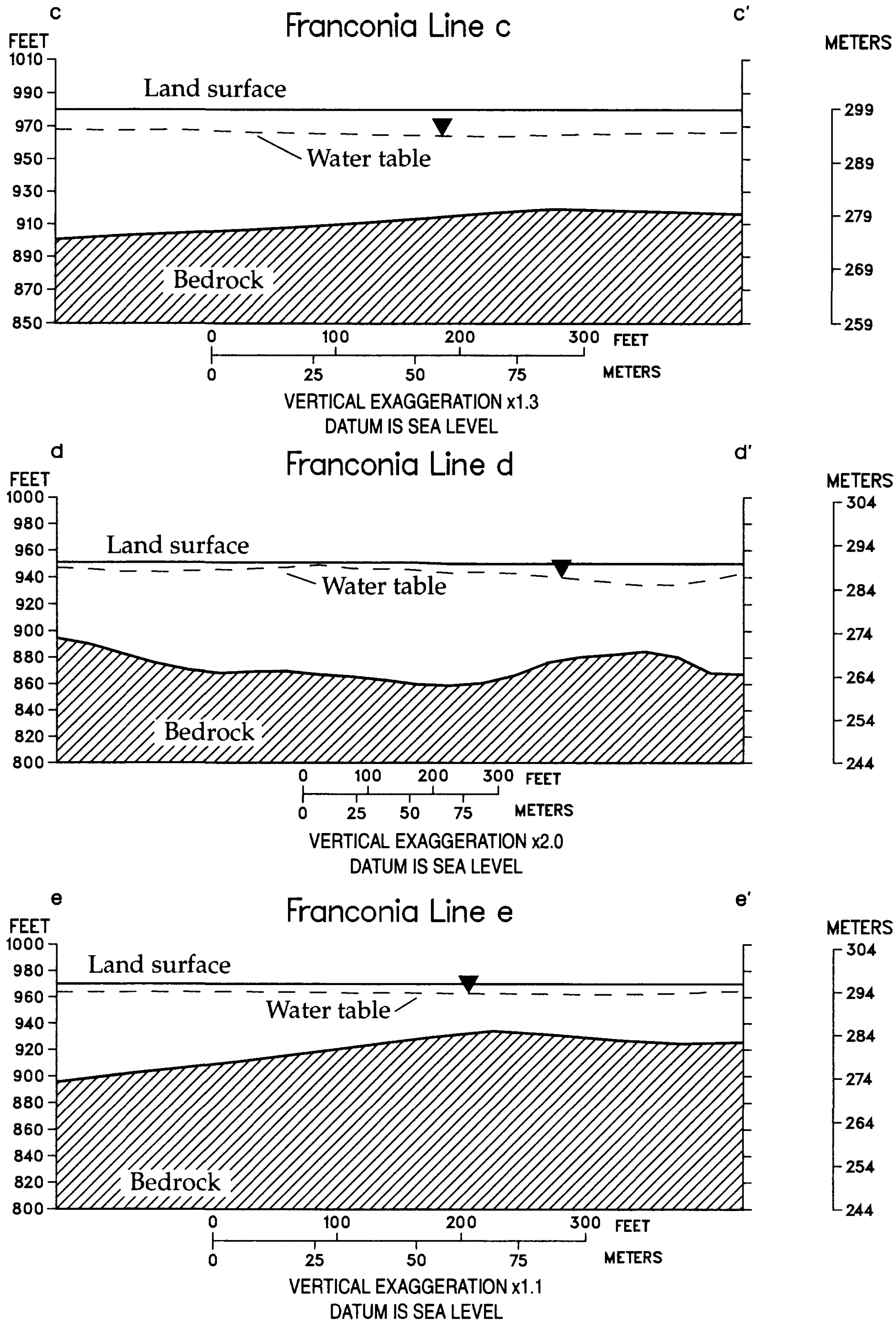


Figure C19. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Franconia lines c-e. Lines of section are shown on plate 3.

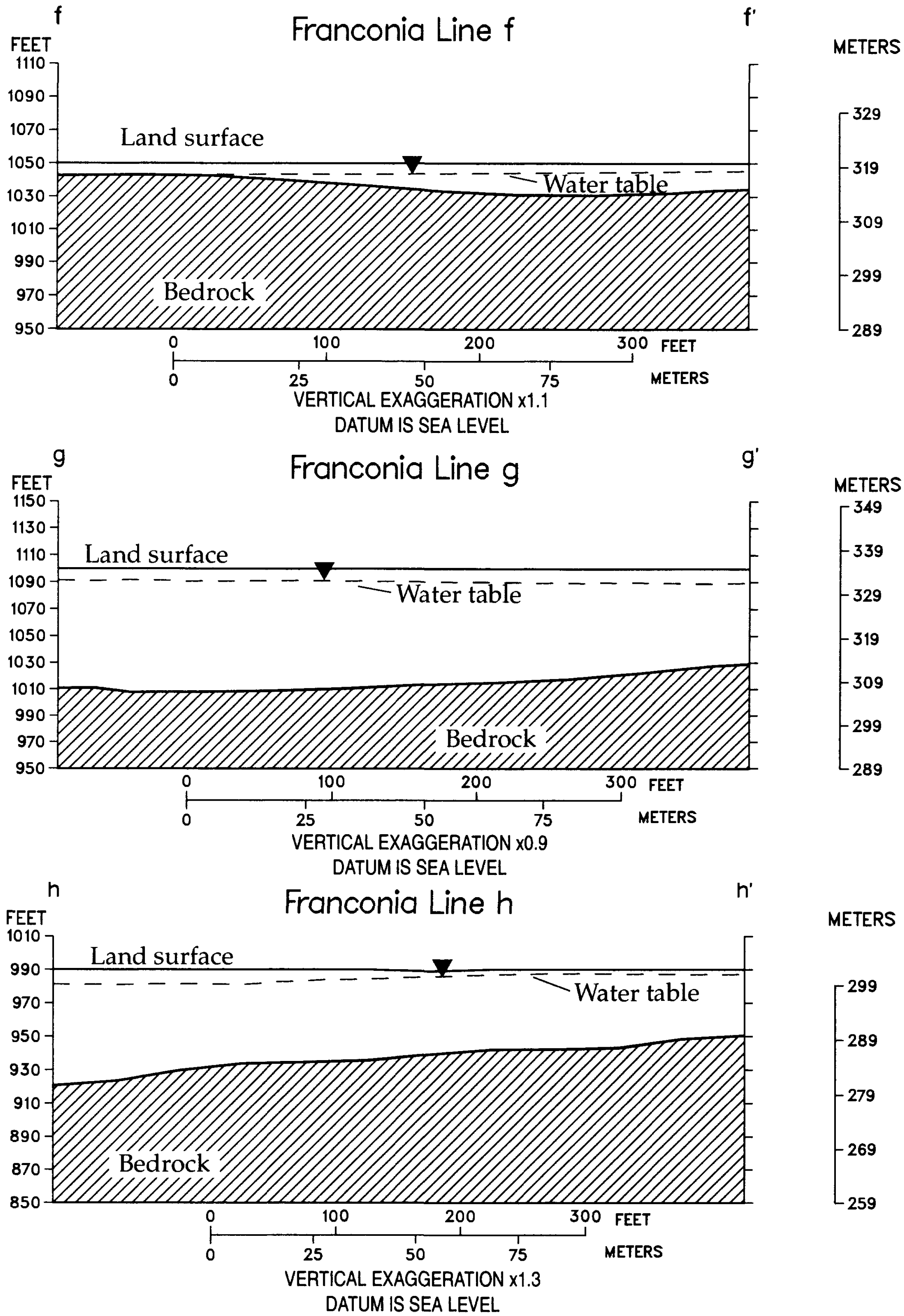


Figure C20. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Franconia lines f-h. Lines of section are shown on plate 3.

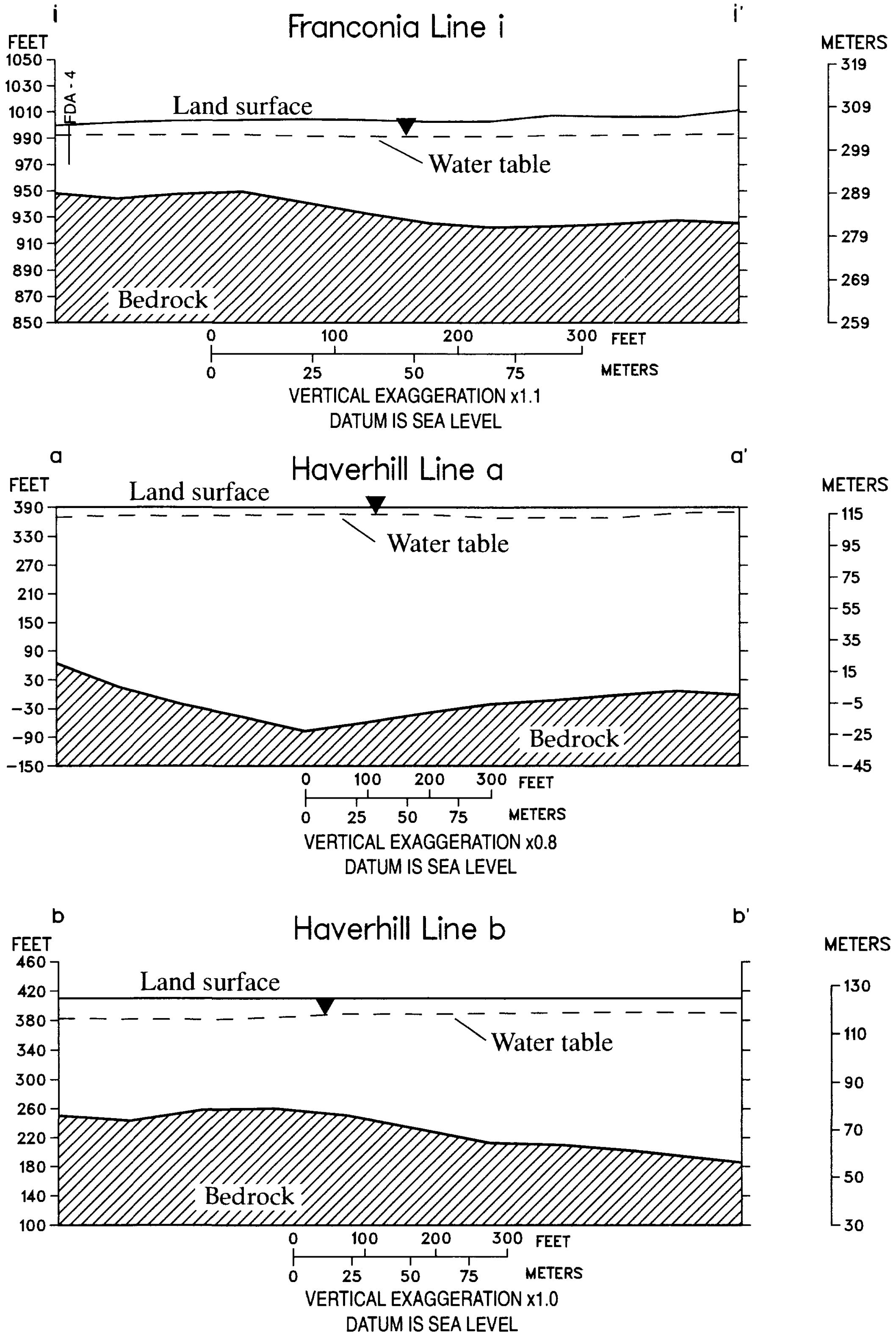


Figure C21. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Franconia line i and Haverhill lines a-b. Lines of section are shown on plates 2 and 3.

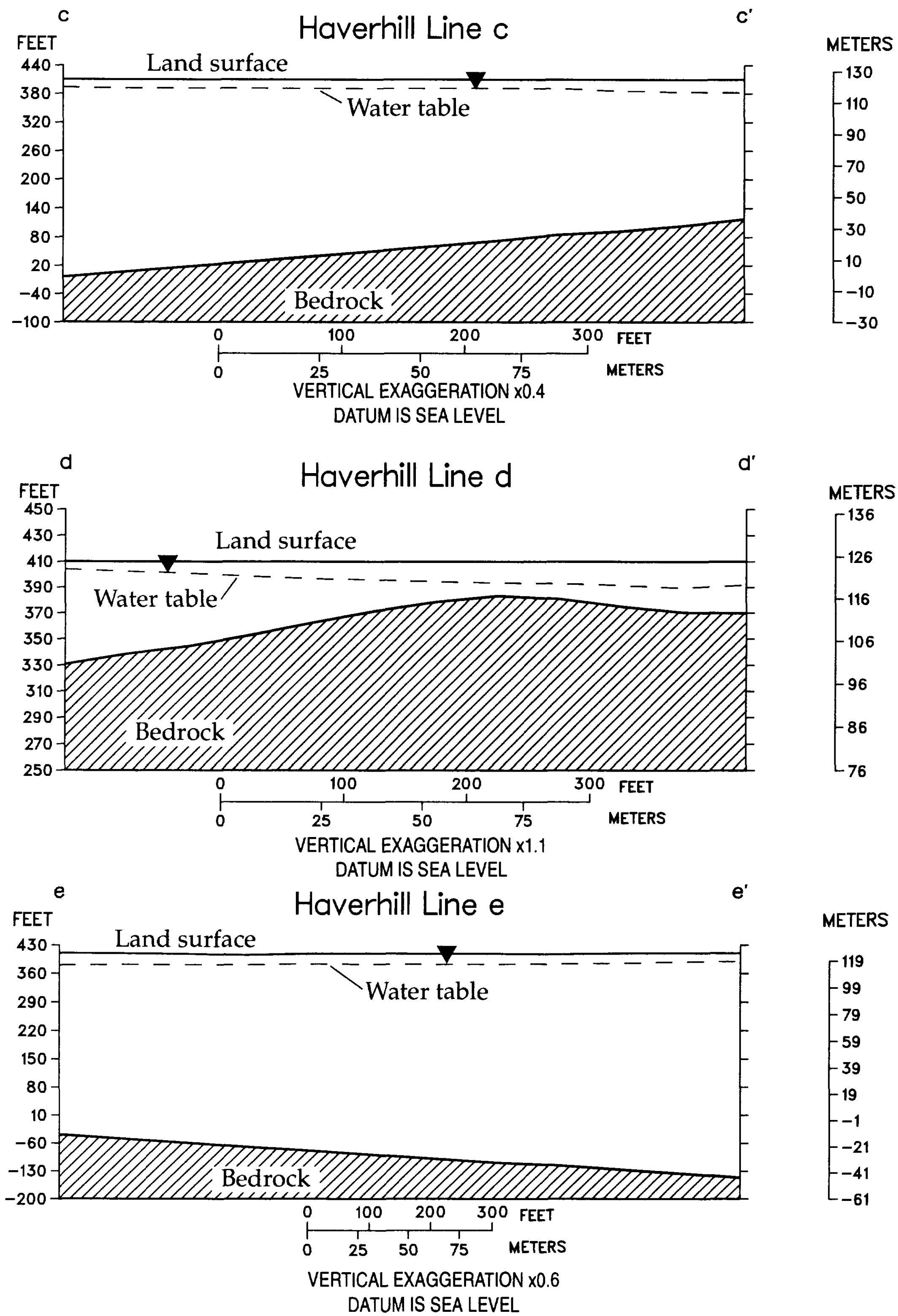


Figure C22. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Haverhill lines c-e. Lines of section are shown on plate 2.

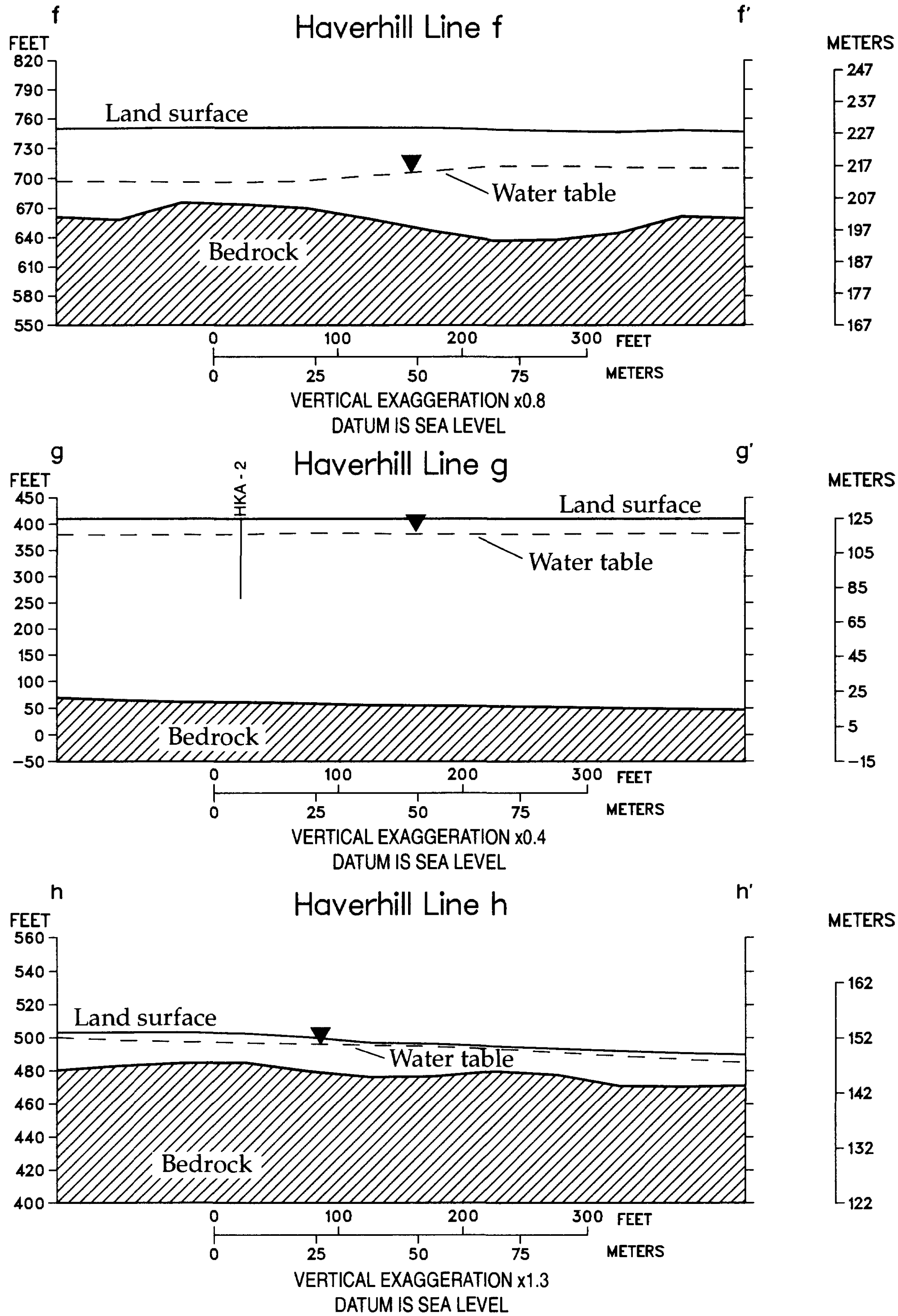


Figure C23. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Haverhill lines f-h. Lines of section are shown on plate 2.

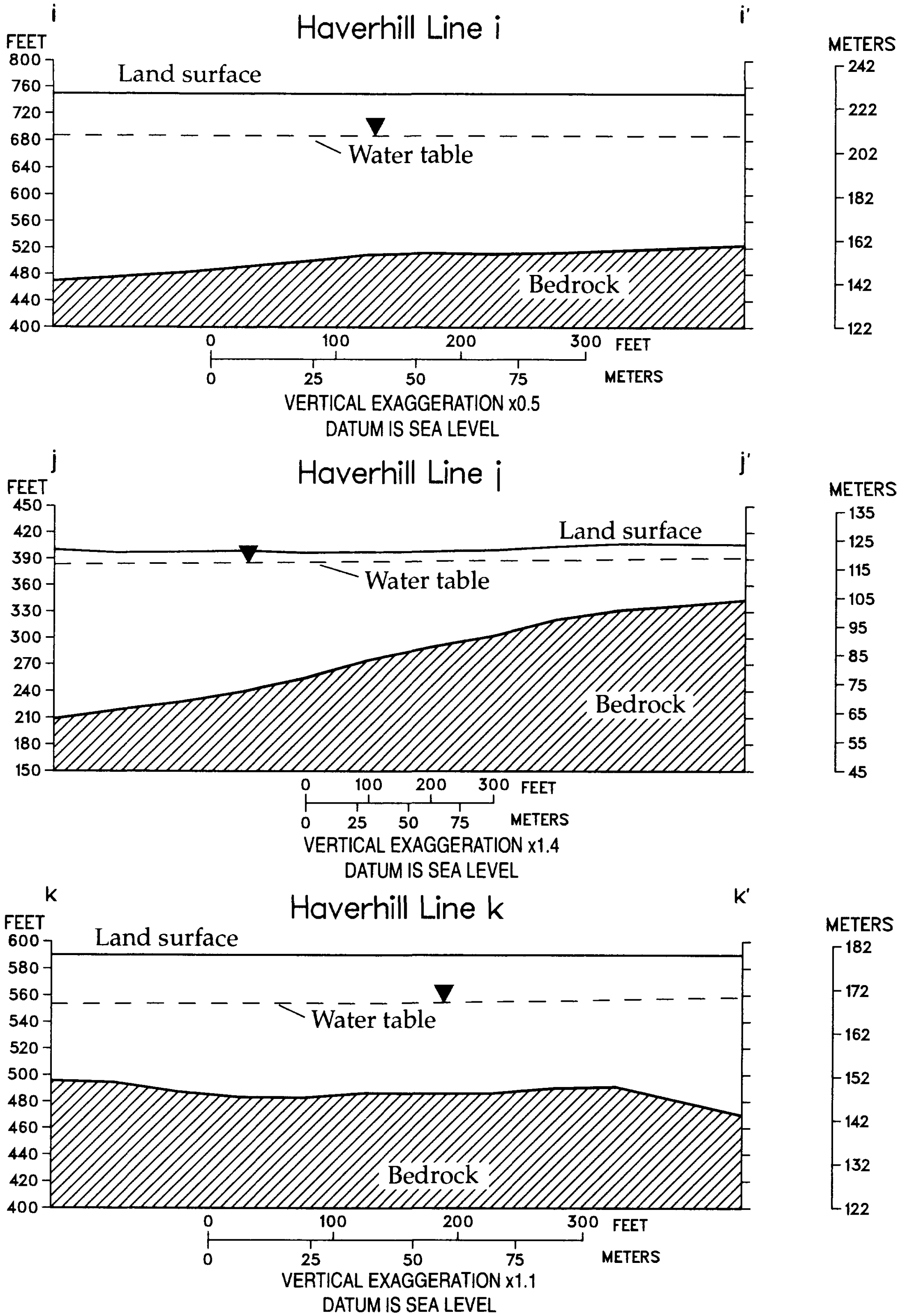


Figure C24. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Haverhill lines i-k. Lines of section are shown on plate 2.

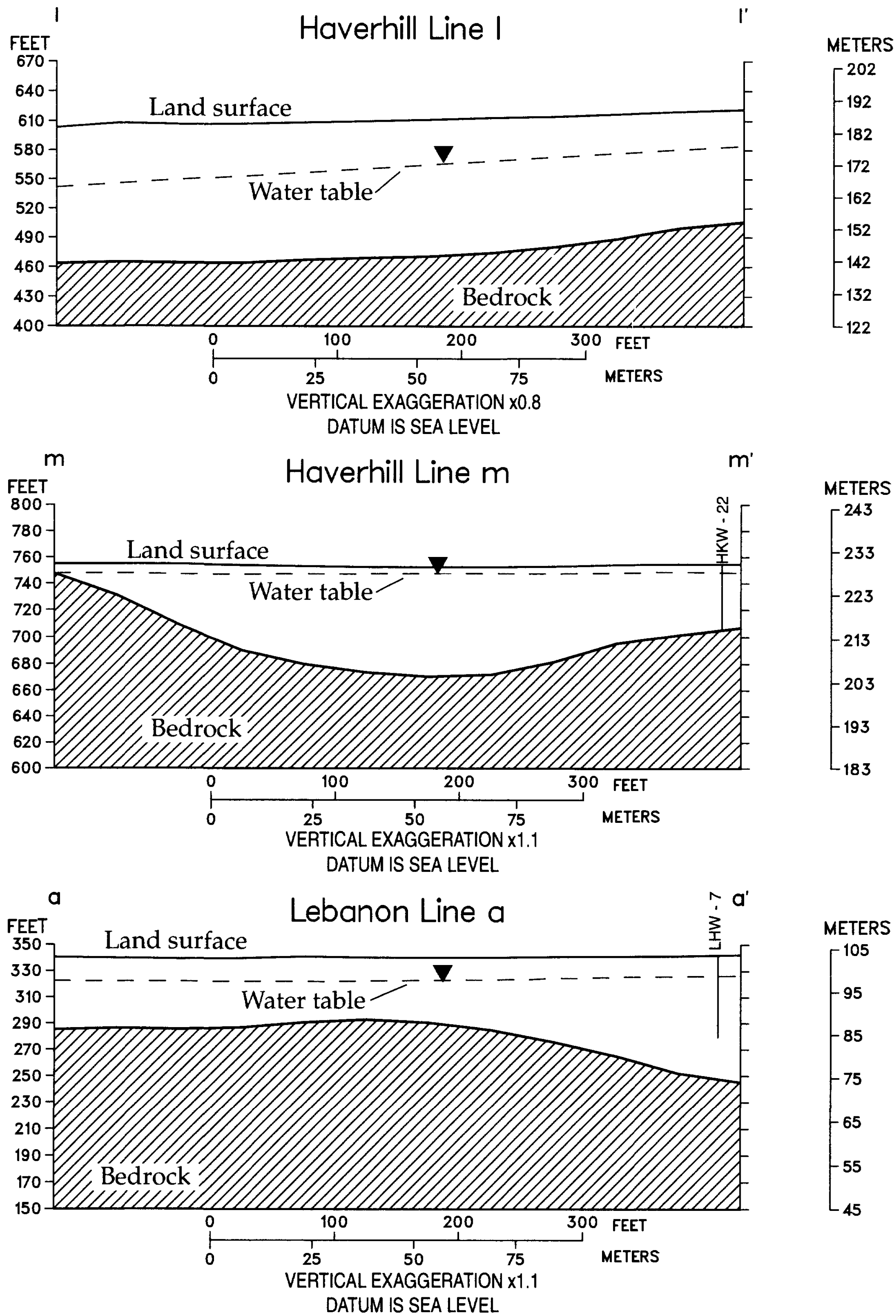


Figure C25. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Haverhill lines l-m and Lebanon line a. Lines of section are shown on plates 1 and 2.

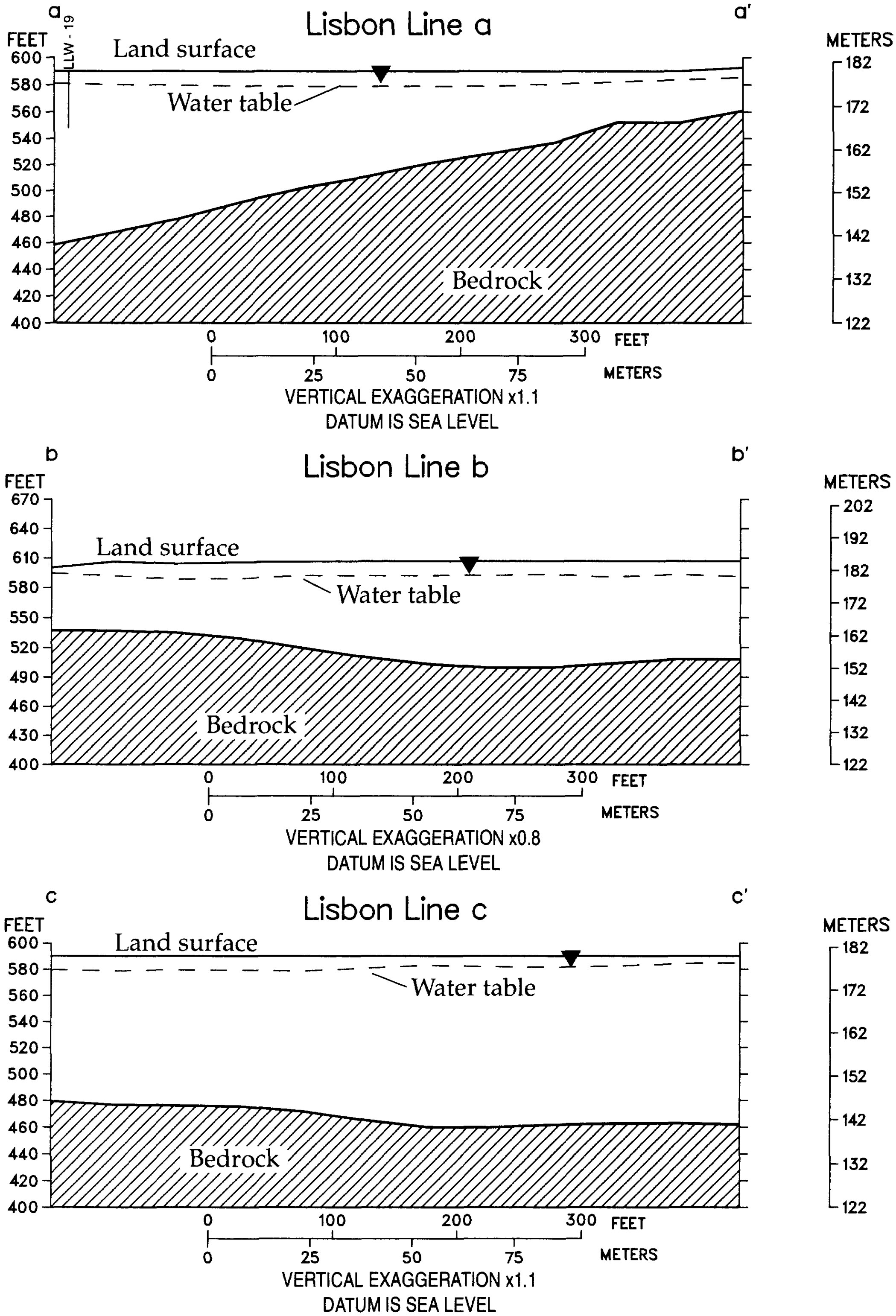


Figure C26. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Lisbon line a-c. Lines of section are shown on plate 3.

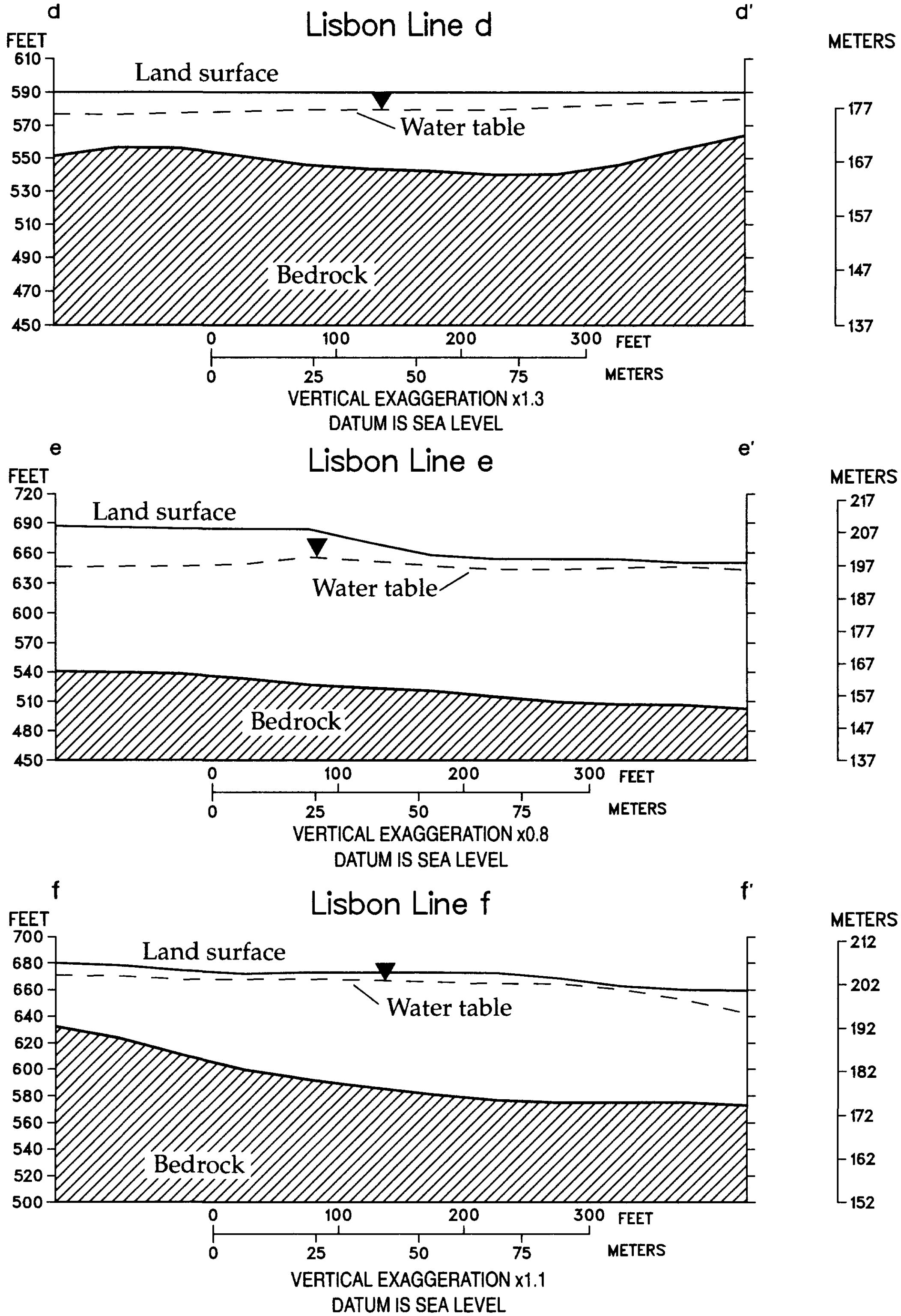


Figure C27. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Lisbon line d-f. Lines of section are shown on plate 3.

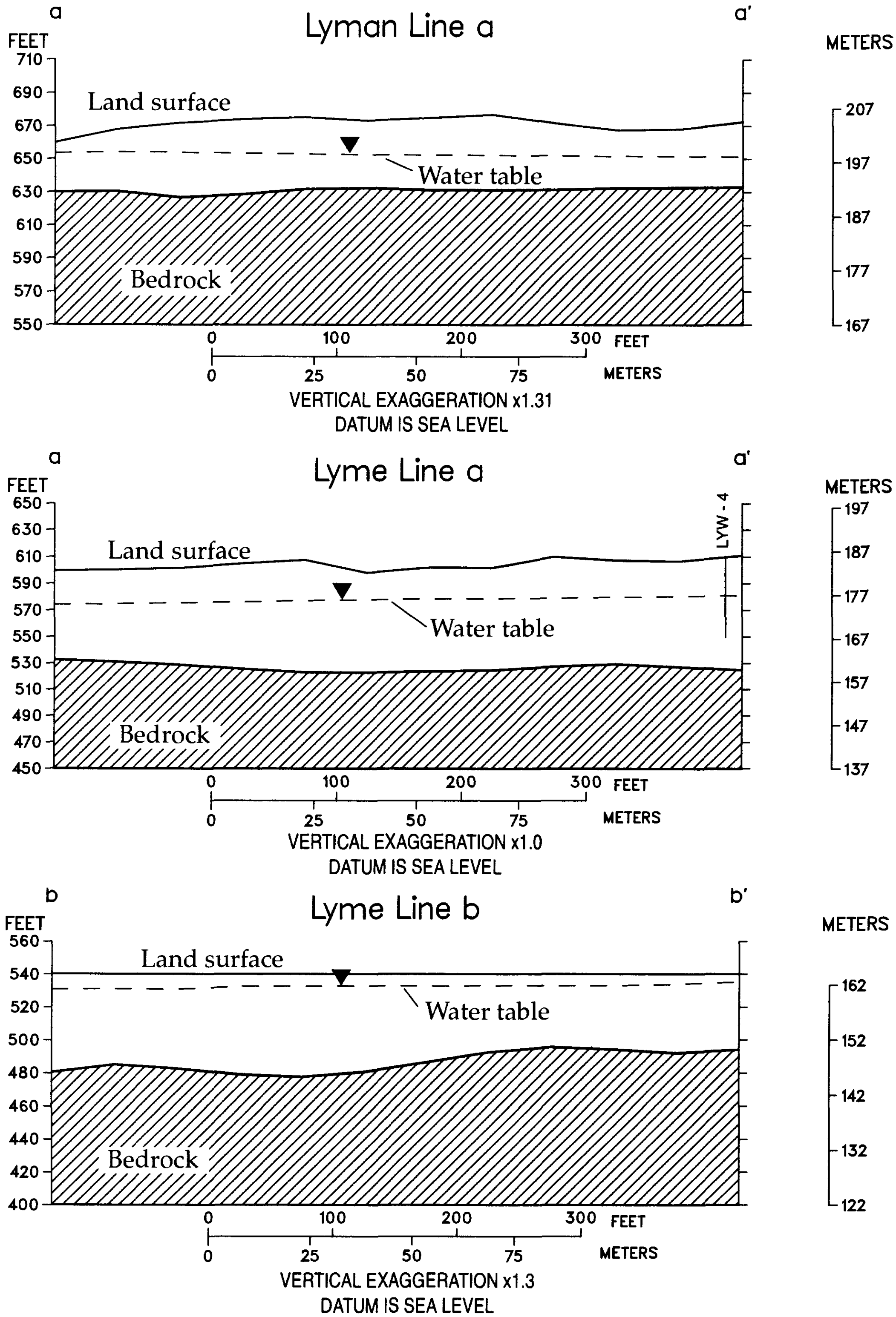


Figure C28. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Lyman line a and Lyme lines a-b. Lines of section are shown on plates 1 and 3.

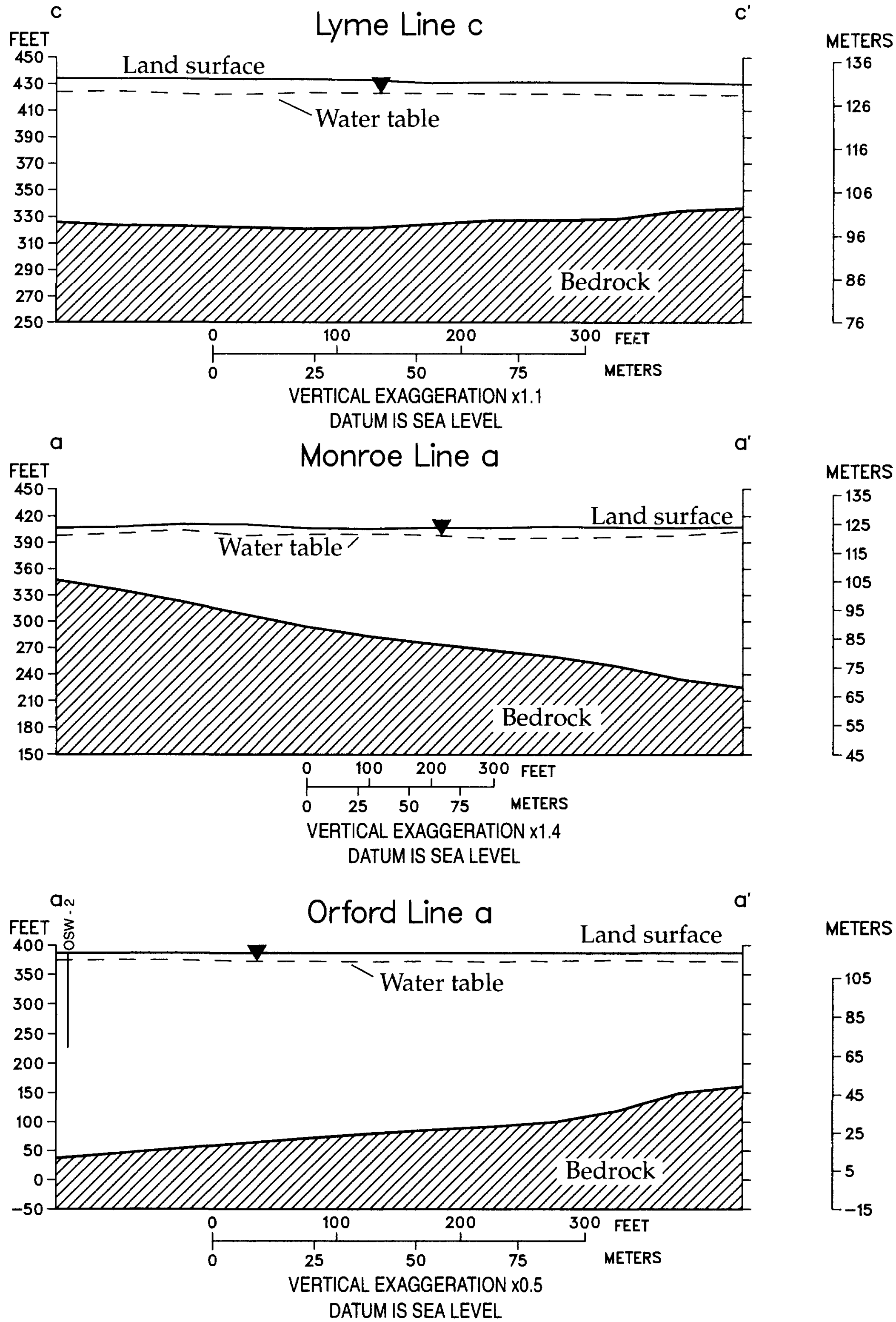


Figure C29. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Lyme line c, Monroe line a, and Orford line a. Lines of section are shown on plates 2 and 3.

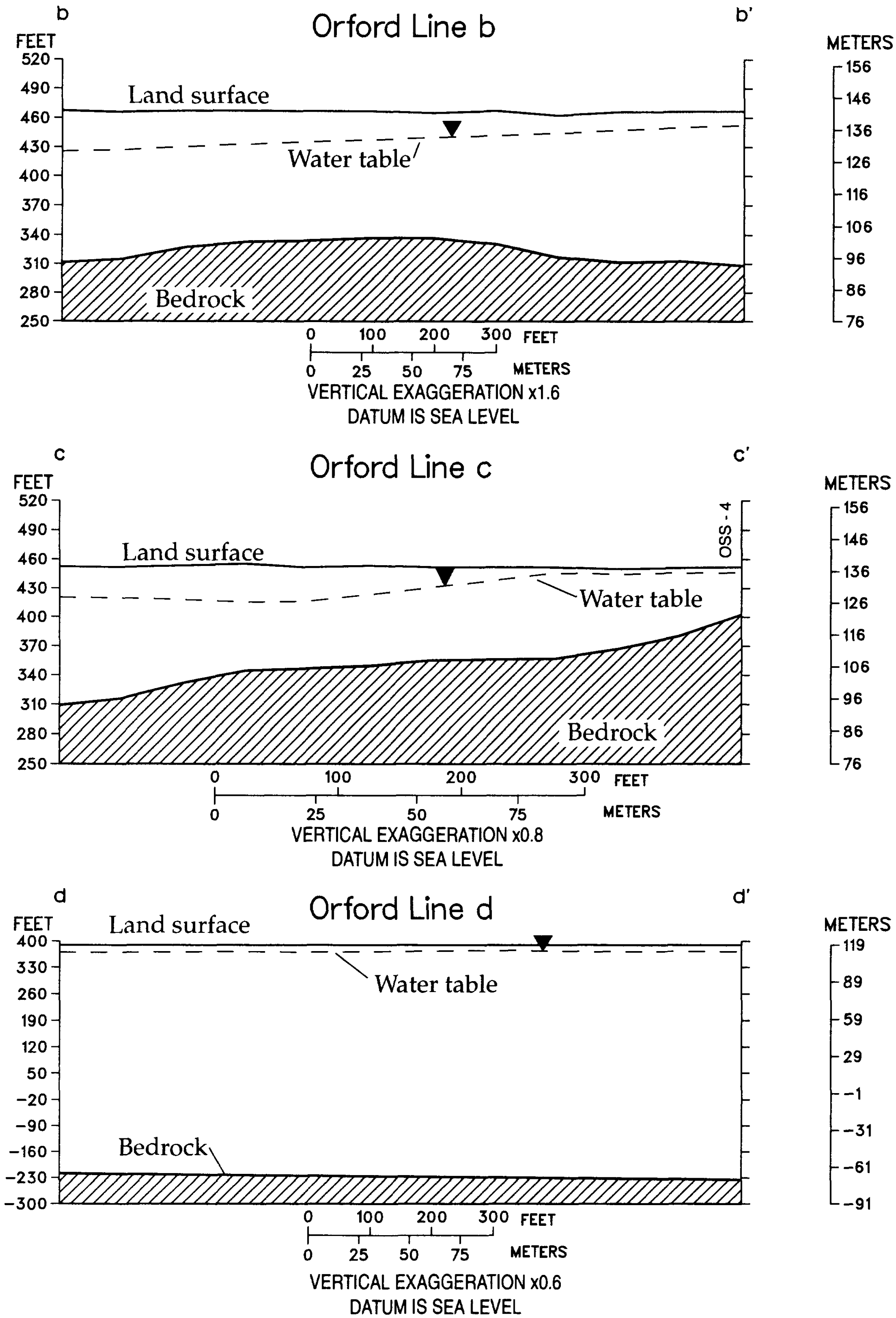


Figure C30. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Orford line b-d. Lines of section are shown on plate 2.

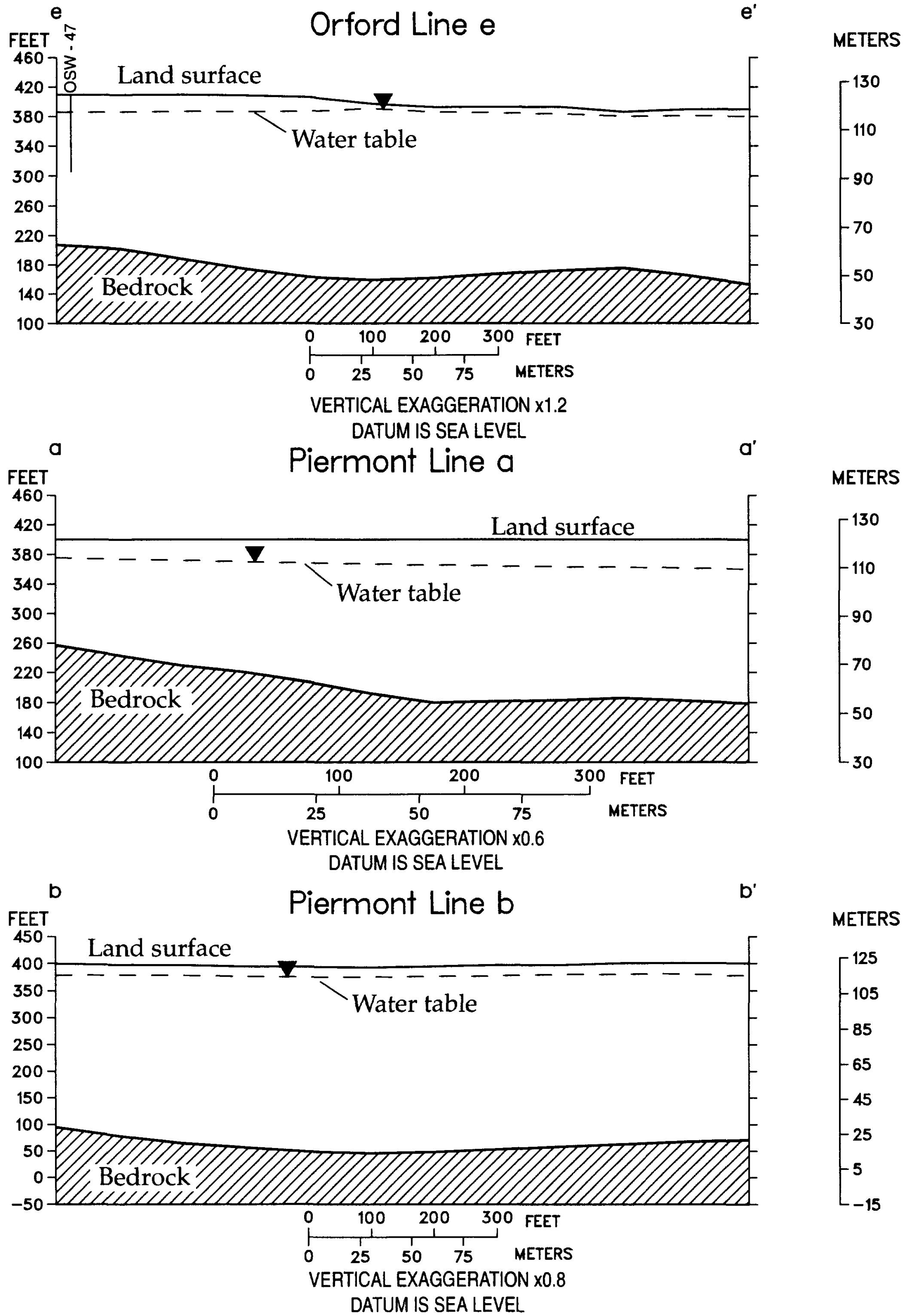


Figure C31. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Orford line e and Piermont lines a-b. Lines of section are shown on plate 2.

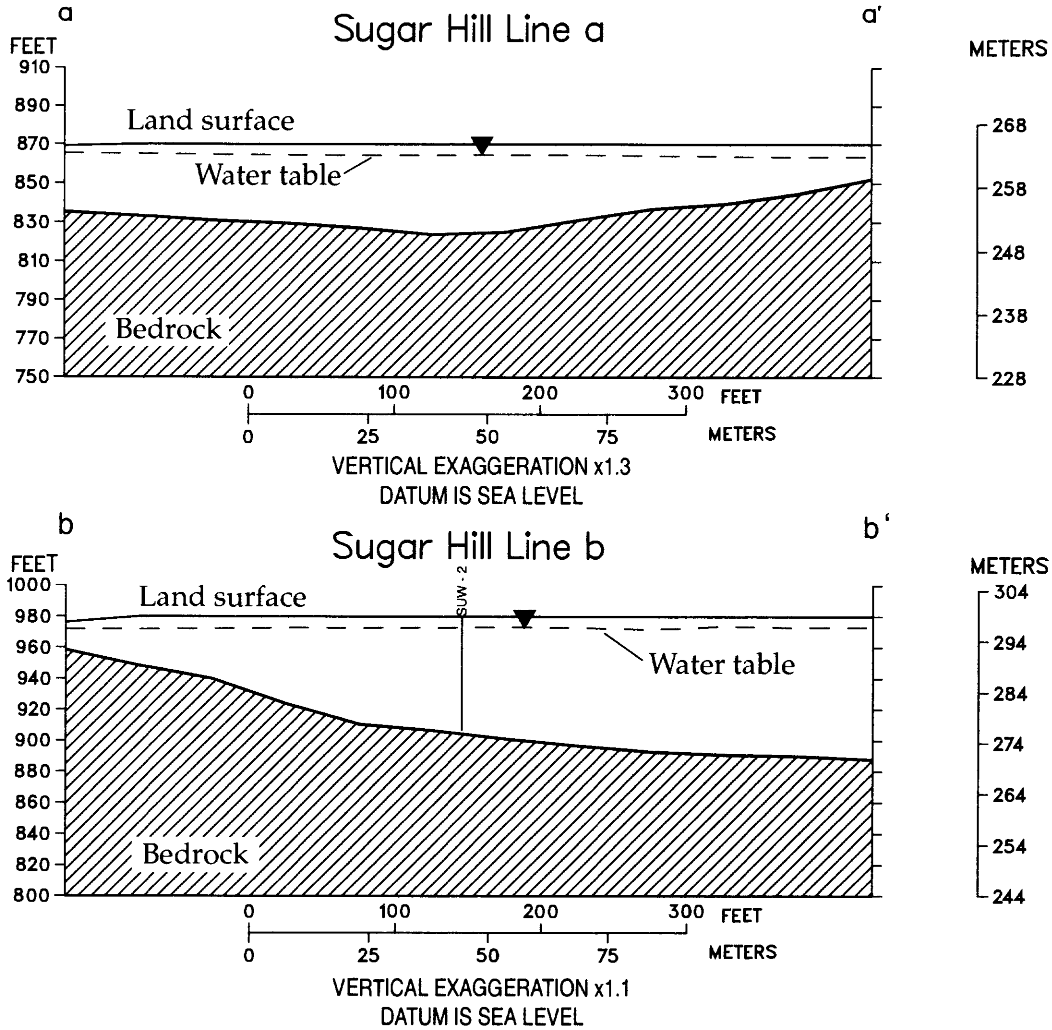


Figure C32. Geohydrologic sections interpreted from seismic-refraction data in west-central New Hampshire for Sugar Hill lines a-b. Lines of section are shown on plate 3.

APPENDIX D

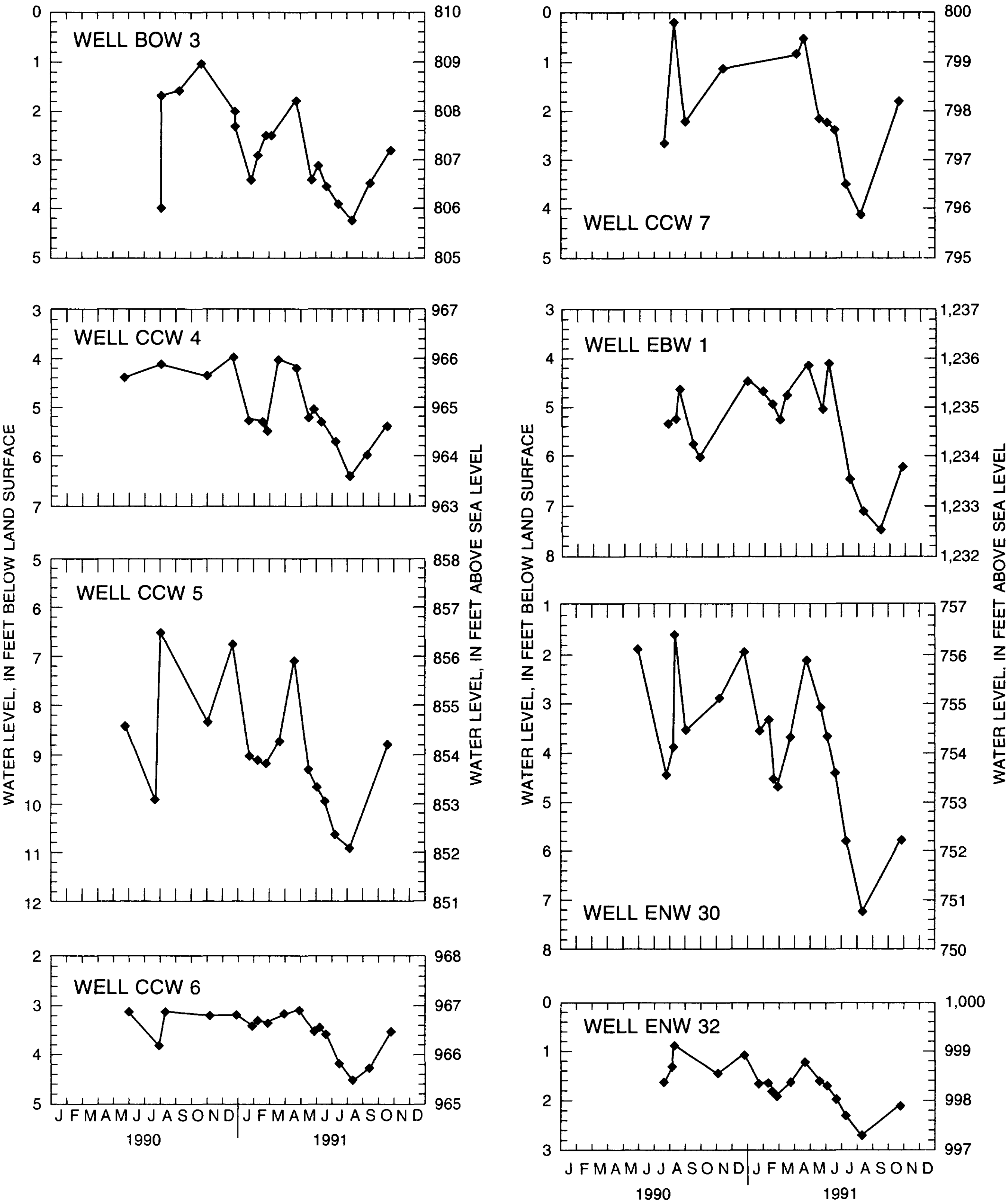


Figure D1. Periodic water-level hydrographs for selected wells.

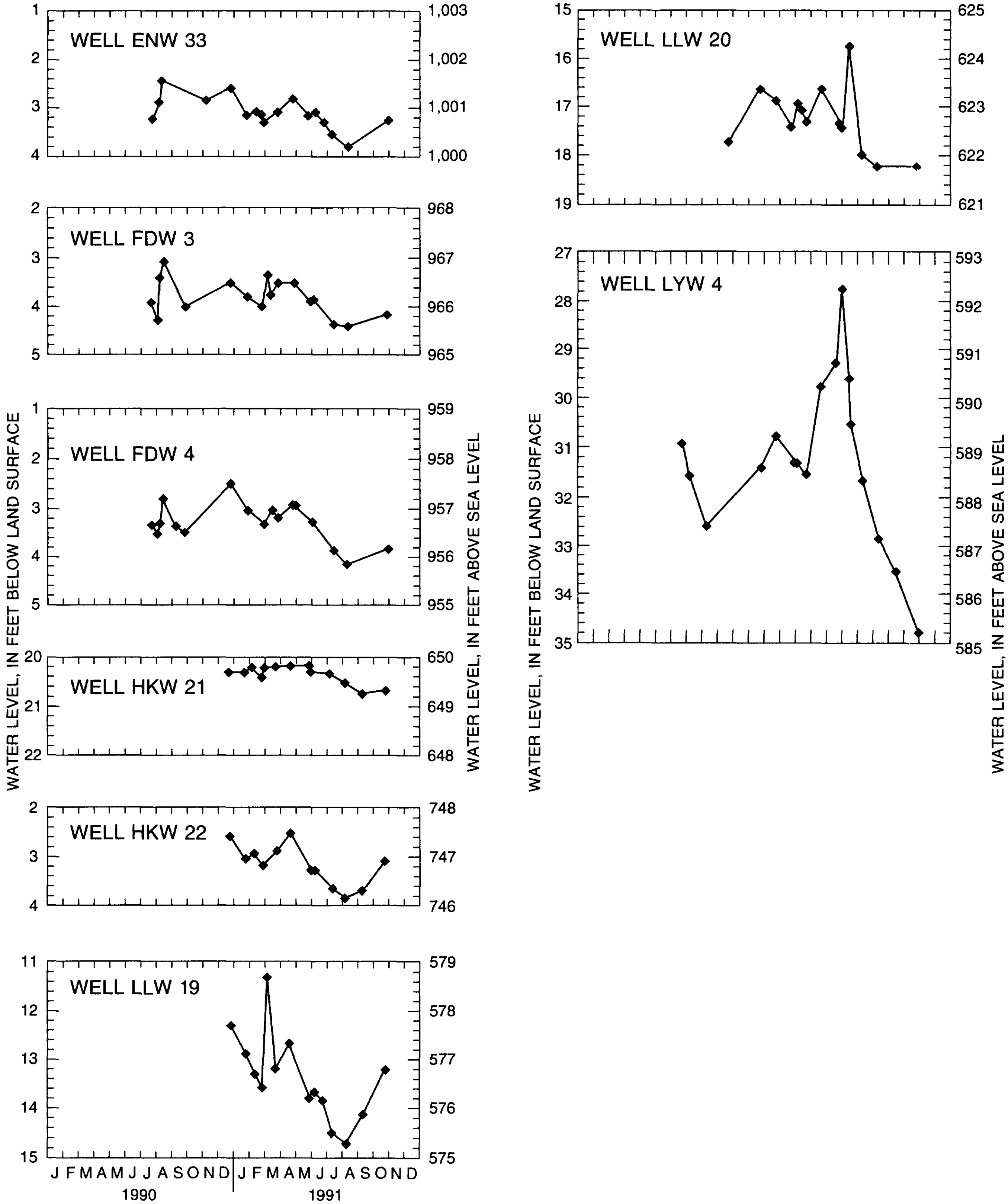


Figure D1.—*Continued.*

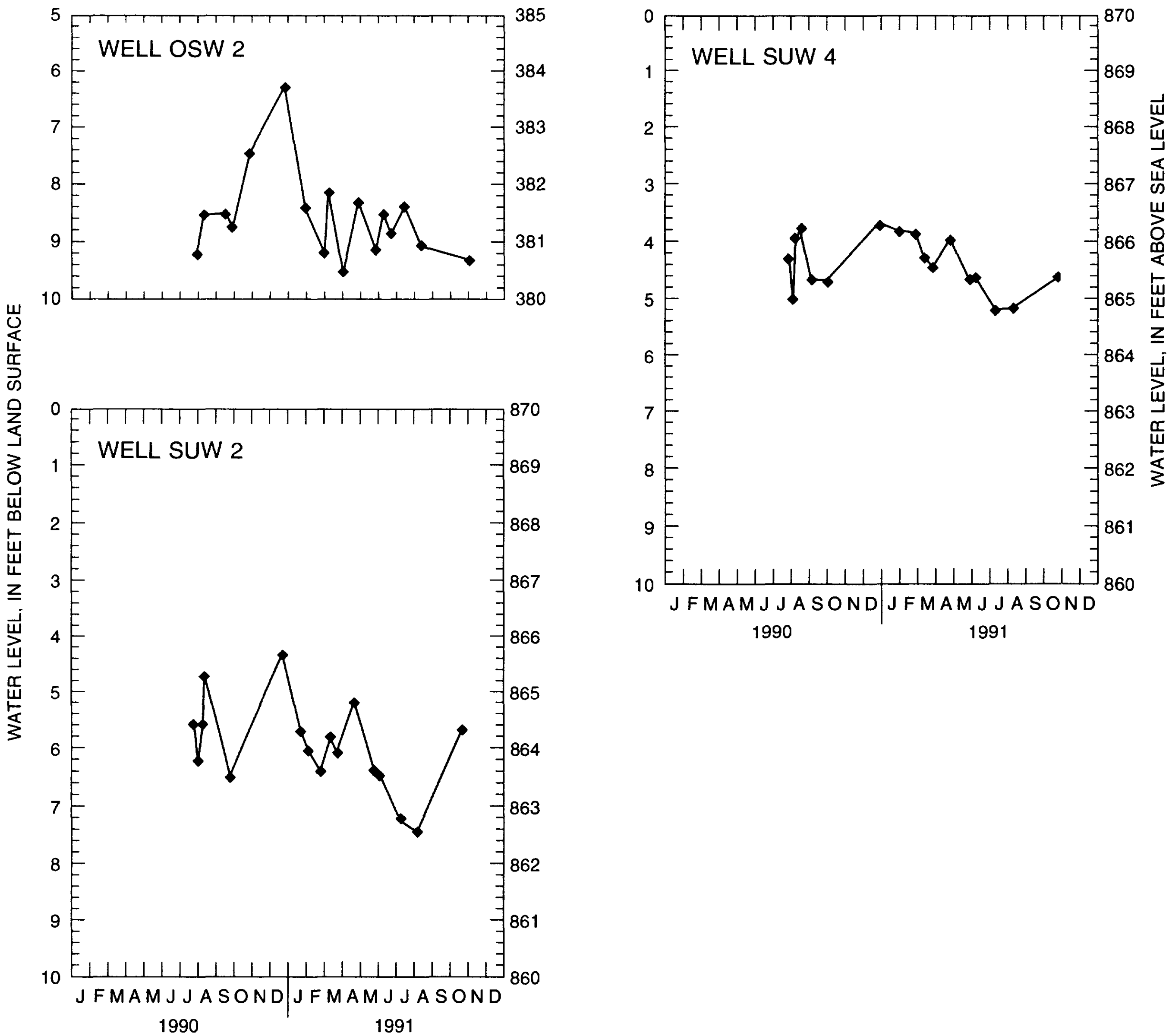


Figure D1.—*Continued.*

APPENDIX E

Table E1. Low-streamflow measurements at miscellaneous sites in the Middle Connecticut River Basin, west-central New Hampshire

[mi^2, square miles; ft^3/s, cubic feet per second; $ft^3/s/mi^2$, cubic feet per second per square mile; m-dd-yy, month-day-year; --, no data]

Name (plate reference No.)	Tributary to	Latitude ° ′ ″	Longitude ° ′ ″	Drainage area, (A) (mi^2)	Date (m-dd-yy)	Discharge (Q) (ft^3/s)	Q/A ($ft^3/s/mi^2$)
John's River Subbasin							
John's River (1)	Connecticut River	442207	713346	25.6	9-14-90	6.0	0.23
					7-10-91	4.7	.18
John's River (2)	.... do................	442426	713755	58.6	9-14-90	18.9	.32
					7-10-91	12.9	.22
Ammonoosuc River Subbasin							
Ammonoosuc River (3)	Connecticut River	441543	712425	14.2	9-14-90	17.0	1.20
					7-10-91	12.2	.86
Ammonoosuc River (4)	.... do................	441515	712659	--	7-10-91	17.8	--
Ammonoosuc River (5)	.... do................	441609	712835	41.7	9-14-90	26.7	.64
					7-10-91	23.4	.56
Zealand River (6)	Ammonoosuc River	441610	713044	--	7-10-91	4.3	--
Tuttle Brook (7)	.... do................	441559	713213	2.1	9-14-90	.5	.24
Ammonoosuc River (8)	Connecticut River	441618	713448	81.2	9-14-90	53.3	.67
					7-10-91	50.6	.62
Gale River (9)	Ammonoosuc River	441438	713820	16.5	9-14-90	10.0	.61
					7-10-91	6.2	.38
Gale River (10)	.... do................	441306	714346	31.2	9-13-90	16.4	.53
					7-10-91	11.4	.37
Lafayette Brook (11)	Meadow Brook	441219	714324	7.2	9-13-90	7.3	1.0
					7- 9-91	3.7	.51
Meadow Brook (12)	Gale River	441257	714406	12.6	9-13-90	8.8	.70
					7- 9-91	6.8	.54
Ham Branch Brook (13)	.... do................	440716	714812	1.2	9-12-90	.5	.42
					7- 9-91	.25	.21
Ham Branch Brook (14)	.... do................	440839	714751	9.3	9-11-90	3.0	.32
					7- 9-91	.41	.04
Ham Branch Brook (15)	.... do................	440933	714633	13.9	9-12-90	4.3	.31
					7-09-91	4.7	.34
Ham Branch Brook (16)	.... do................	441121	714530	24.1	9-13-90	8.4	.35
					7-09-91	8.7	.36
Ham Branch Brook (17)	.... do................	441252	714507	30.7	9-12-90	13.1	.43
					7-09-91	11.6	.38
Gale River (18)	Ammonoosuc River	441455	714707	87.6	9-13-90	48.5	.55
					7-10-91	28.8	.33
Perch Pond Brook (19)	.... do................	441504	715240	.26	9-13-90	.05	.19
Perch Pond Brook (20)	.... do................	441500	715256	.31	9-13-90	no flow	--
Ogontz Brook (21)	.... do................	441804	715410	2.3	7-10-91	.18	.08
Ogontz Brook (22)	.... do................	441638	715526	4.2	7-10-91	.48	.11
Ogontz Brook (23)	.... do................	441522	715338	10.6	7-10-91	3.18	.30
Ogontz Brook (24)	.... do................	441432	715305	19.8	9-12-90	15.2	.77
					7-10-91	4.6	.23
Mill Brook (25)	.... do................	441055	715459	12.0	9-12-90	3.2	.27
Mill Brook (26)	.... do................	441200	715553	13.9	9-12-90	3.6	.26

Table E1. Low-streamflow measurements at miscellaneous sites in the middle Connecticut River Basin, west-central New Hampshire--*Continued*

Name (plate reference No.)	Tributary to	Latitude ° ′ ″	Longitude ° ′ ″	Drainage area, (A) (mi^2)	Date (m-dd-yy)	Discharge (Q) (ft^3/s)	Q/A ($ft^3/s/mi^2$)
			Ammonoosuc River Subbasin—*Continued*				
Ammonoosuc River (27)	Connecticut River	441206	715636	302.4	9-14-90 7-10-91	143 131	0.47 .43
Pettyboro Brook (28)	Ammonoosuc River	441325	715739	11.0	9-13-90	3.9	.35
Pettyboro Brook.(29)	.... do.................	441208	715745	13.4	9-13-90	6.1	.46
Pettyboro Brook.(30)	.... do.................	441138	715727	15.1	9-13-90	6.1	.41
Ammonoosuc River (31)	Connecticut River	441106	715647	319.3	9-14-90	152	.48
Wild Ammonoosuc River (32)	Ammonoosuc River	440552	715055	27.1	9-12-90 7-09-91	10.3 11.4	.38 .42
Wild Ammonoosuc River (33)	.... do.................	440915	715846	59.2	9-12-90 7-10-91	21.8 12.1	.37 .20
Ammonoosuc River (34)	Connecticut River	440913	715918	393.4	9-14-90	169	.43
Unnamed Tributary (35)	Clark Brook	440615	715819	--	7-10-91	no flow	--
Clark Brook (36)	Connecticut River	440556	715811	--	7-10-91	.12	--
Clark Brook (37)	.... do.................	440446	715902	8.2	9-12-90	3.1	.34
Cold Springs Brook Tributary (38)	Cold Springs Brook	440429	715950	--	7-10-91	.63	--
Cold Springs Brook (39)	Clark Brook	440439	720101	--	7-10-91	1.4	--
Clark Brook (40)	Connecticut River	440445	720140	20.0	9-13-90	6.3	.32
Oliverian Brook.(41)	.... do.................	440035	715623	11.4	9-12-90	6.7	.59
Oliverian Brook.(42)	.... do.................	440143	715848	27.9	9-12-90	10.2	.37
Oliverian Brook.(43)	.... do.................	440154	720029	32.3	9-13-90	11.2	.35
Oliverian Brook.(44)	.... do.................	440236	720330	39.1	9-13-90	12.5	.39
Eastman Brook (45)	.... do.................	435955	720046	11.3	9-13-90	.9	.08
Eastman Brook (46)	.... do.................	435810	720448	20.4	9-13-90	2.5	.12
Indian Pond Brook (47)	Connecticut River	435737	720518	10.9	9-13-90	2.0	.18
Jacob's Brook (48)	.... do.................	435250	720605	16.1	9-13-90	4.2	.26
Jacob's Brook (49)	.... do.................	435431	720733	27.1	9-14-90	8.0	.30
Grant Brook (50)	.... do.................	434823	720912	12.7	9-14-90	2.6	.20
Grant Brook (51)	.... do.................	434808	721048	16.1	9-14-90	3.7	.23
Hewes Brook (52)	.... do.................	434550	720828	2.8	9-14-90	2.2	.79
Hewes Brook (53)	.... do.................	434707	721154	11.5	9-14-90	2.2	.19
			Mascoma River Subbasin				
Indian River (54)	Mascoma River	434043	715948	16.0	9-14-90	4.9	.31
Indian River (55)	.... do.................	433908	720014	20.0	9-14-90	7.5	.38
Orange Brook.(56)	Indian River	433906	715813	6.7	9-14-90	2.2	.33
Orange Brook.(57)	.... do.................	433854	715959	8.6	9-14-90	2.9	.34
Indian River (58)	Mascoma River	433842	720033	32.0	9-14-90	11.1	.35
Little Bk.(59)	Knox River	433309	720611	1.9	9-14-90	1.2	.63
Knox River (60)	Mascoma River	433458	720620	5.2	9-14-90	2.6	.50
Knox River (61)	.... do.................	433624	720723	7.7	9-14-90	4.3	.56

APPENDIX F

Table F1. Chemical analyses of ground-water samples in the Middle Connecticut River Basin, west-central New Hampshire

[**Use of site:** OBS, observation well; PS, public supply well. **Water level:** Flow, flowing. No., number; µS/cm; microseimens per centimeter at 25 degrees Celsius; °C, degrees Celsius; mg/L, milligrams per liter; µg/L, micrograms per liter. <, actual value is less than value shown; --, no data]

Local site No.	Date	Time	Latitude ° ′ ″	Longitude ° ′ ″	Use of site	Water level, in feet below land surface [1](72019)	Screen interval, in feet below land surface	Altitude of land-surface, in feet above sea level [1](72000)	Specific conductance (µS/cm) [1](00095)
BOW 3	03-06-91	1400	440055	0715652	OBS	2.47	29.5 - 31	810	250
CCW 3	04-11-91	1230	433943	0715957	OBS	Flow	51 - 53.5	950	127
CCW 4	02-22-91	1300	434038	0715943	OBS	5.34	20.5 - 23	975	72
CCW 4	09-10-91	1430	434038	0715943	--	6.00	--	--	48
CCW 5	02-05-91	1400	433856	0720330	OBS	9.15	26.5 - 29	863	185
CCW 6	02-05-91	1000	434021	0715953	OBS	3.34	17.5 - 20	970	77
CCW 6	09-10-91	1540	434021	0715953	--	4.26	--	--	90
CCW 7	04-11-91	1030	433935	0720610	OBS	.82	50 - 52.5	797	342
CFW 15	09-04-91	1500	441731	0713248	OBS	44.49	78.3 - 81.3	1,455	199
CFW 16	09-04-91	1330	441615	0713244	OBS	4.39	37.5 - 40	1,348	225
CFW 17	09-04-91	1400	441615	0713244	OBS	4.20	13 - 15.5	1,348	117
CFW 18	09-04-91	1100	441558	0713014	OBS	23.78	42 - 45	1,475	45
DAW 1	09-05-91	1215	442403	0713747	OBS	4.64	26.5 - 29.5	856	115
DAW 2	09-05-91	1400	442351	0713743	OBS	3.85	27 - 30	856	189
EBW 1	02-13-91	1400	440745	0714759	OBS	4.99	24.5 - 27	1,240	186
EBW 1	09-11-91	1430	440745	0714759	--	7.49	--	--	159
ENW 30	02-20-91	1400	433616	0720740	OBS	4.43	35 - 37.5	758	124
ENW 32	02-22-91	1000	433304	0720607	OBS	1.79	15.5 - 18	1,000	44
ENW 32	09-10-91	1215	433304	0720607	--	2.58	--	--	59
ENW 33	02-21-91	1200	433312	0720607	OBS	3.18	34.5 - 37	1,004	46
FDW 3	03-08-91	1400	441051	0714538	OBS	3.38	57.5 - 60	970	88
FDW 4	02-04-91	1500	441121	0714512	OBS	6.12	57.5 - 60	960	172
HKS 1	09-03-91	1200	440428	0715955	PS	Flow	--	550	151
HKW 21	03-06-91	1130	440441	0715949	OBS	20.23	40 - 42.5	670	185
HKW 21	09-12-91	1200	440441	0715949	--	20.76	--	--	215
HKW 22	02-08-91	1200	440509	0715835	OBS	2.96	24.5 - 27	750	400
HKW 22	09-12-91	1000	440509	0715835	--	3.70	--	--	328
LLW 2	09-11-91	1730	441313	0715409	PS	--	39 - 44	570	98
LLW 19	02-13-91	1200	441401	0715315	OBS	13.32	39.5 - 42	590	98
LLW 20	03-08-91	1200	441439	0715257	OBS	16.96	116 - 119	640	68
LYW 4	03-06-91	1500	434835	0720905	OBS	31.18	48.5 - 51	620	226
LYW 4	09-03-91	1415	434835	0720905	--	33.53	--	--	189
MUW 1	09-06-91	1547	441531	0720304	PS	--	46 - 51	551	316
MUW 2	09-06-91	1530	441530	0720305	PS	--	40 - 45	541	326
OSW 2	03-05-91	1230	435409	0720849	OBS	8.13	30 - 32.5	390	361
SUW 2	02-04-91	1100	441451	0714615	OBS	6.06	48 - 50.5	870	158
SUW 4	03-13-91	--	441502	0714652	OBS	4.28	20.5 - 23	870	156

Table F1. Chemical analyses of ground-water samples in the Middle Connecticut River Basin, west-central New Hampshire—*Continued*

Local site No.	Date	pH, field (standard units) [1](00400)	Temperature, water (°C) [1](00010)	Oxygen, dissolved (mg/L) [1](00300)	Hardness, total (mg/L as $CaCO_3$) [1](00900)	Acidity (mg/L as H) [1](71825)	Calcium, dissolved (mg/L) [1](00915)	Magnesium, dissolved (mg/L) [1](00925)	Sodium, dissolved (mg/L) [1](00930)
BOW 3	03-06-91	7.9	8.5	0	100	--	35	3.6	7.7
CCW 3	04-11-91	8.1	7.5	3.1	54	<0.1	18	2.2	3.9
CCW 4	02-22-91	5.9	8.5	3.3	--	--	--	--	--
CCW 4	09-10-91	5.9	12.0	--	13	.3	4.1	.57	1.6
CCW 5	02-05-91	6.1	9.5	3.0	54	--	18	2.2	8.7
CCW 6	02-05-91	6.2	10.0	.6	--	--	--	--	--
CCW 6	09-10-91	6.4	11.5	--	26	<.1	8.1	1.5	3.3
CCW 7	04-11-91	7.4	7.5	.7	130	<.1	44	4.4	9.2
CFW 15	09-04-91	6.3	10.0	--	34	.2	9.7	2.4	23
CFW 16	09-04-91	6.4	9.0	--	80	<.1	20	7.3	10
CFW 17	09-04-91	5.9	9.5	--	33	--	9.1	2.4	7.5
CFW 18	09-04-91	6.0	9.5	--	14	.2	4.2	.88	2.4
DAW 1	09-05-91	6.9	10.5	--	36	.2	10	2.6	4.5
DAW 2	09-05-91	7.5	13.0	--	65	--	18	4.8	6.6
EBW 1	02-13-91	5.7	6.5	--	--	--	--	--	--
EBW 1	09-11-91	5.8	9.0	--	33	.2	10	1.9	20
ENW 30	02-20-91	6.7	9.0	5.0	57	--	19	2.2	3.1
ENW 32	02-22-91	6.4	8.0	9.2	--	--	--	--	--
ENW 32	09-10-91	6.4	14.0	--	21	<.1	6.5	1.1	2.1
ENW 33	02-21-91	6.1	8.0	8.4	15	<.1	4.8	.77	1.8
FDW 3	03-08-91	6.1	7.0	8.7	27	--	8.0	1.8	4.4
FDW 4	02-04-91	6.2	7.5	6.0	33	<10	10	1.9	24
HKS 1	09-03-91	6.5	8.0	--	40	.2	13	1.9	21
HKW 21	03-06-91	7.5	9.0	--	--	--	--	--	--
HKW 21	09-12-91	7.8	10.5	--	--	--	--	--	--
HKW 22	02-08-91	6.3	8.0	0	54	.1	17	2.7	54
HKW 22	09-12-91	6.3	8.0	--	--	--	--	--	--
LLW 2	09-11-91	6.5	14.0	--	29	<.1	9.6	1.3	7.2
LLW 19	02-13-91	6.2	8.0	.7	39	.1	12	2.1	3.1
LLW 20	03-08-91	6.8	7.0	10.3	23	--	6.6	1.5	2.8
LYW 4	03-06-91	6.6	7.5	11.2	--	--	--	--	--
LYW 4	09-03-91	6.6	10.5	--	50	.1	16	2.3	12
MUW 1	09-06-91	7.1	10.5	--	--	--	--	--	--
MUW 2	09-06-91	6.8	10.5	--	120	.2	42	3.3	11
OSW 2	03-05-91	7.4	9.5	2.2	170	--	58	5.7	9.6
SUW 2	02-04-91	6.5	8.0	3.7	65	<.1	22	2.5	3.9
SUW 4	03-13-91	6.4	7.5	1.6	64	--	20	3.3	3.9

Table F1. Chemical analyses of ground-water samples in the middle Connecticut River Basin, west-central New Hampshire—*Continued*

Local site No.	Date	Sodium, percent [1](00932)	Potassium, dissolved (mg/L) [1](00935)	Alkalinity, field (mg/L as $CaCO_3$) [1](00410)	Sulfate, dissolved (mg/L) [1](00945)	Chloride, dissolved (mg/L) [1](00940)	Fluoride, dissolved (mg/L) [1](00950)	Silica, dissolved (mg/L) [1](00955)	Solids, residue at 180°C, dissolved (mg/L) [1](70300)
BOW 3	03-06-91	14	2.5	72	24	18	0.10	14	--
CCW 3	04-11-91	13	1.1	48	13	1.7	.30	11	95
CCW 4	02-22-91	--	--	17	--	--	--	--	--
CCW 4	09-10-91	20	1.0	8	6.7	1.1	<.10	8.8	34
CCW 5	02-05-91	25	2.3	32	11	28	<.10	9.6	--
CCW 6	02-05-91	--	--	29	--	--	--	--	--
CCW 6	09-10-91	21	.80	28	9.8	3.0	<.10	20	69
CCW 7	04-11-91	12	17	150	22	8.7	<.10	18	243
CFW 15	09-04-91	56	3.6	19	7.6	39	<.10	19	124
CFW 16	09-04-91	21	2.8	31	9.5	45	.10	19	146
CFW 17	09-04-91	32	1.3	11	5.5	21	<.10	12	--
CFW 18	09-04-91	25	1.3	10	5.0	1.5	<.10	11	32
DAW 1	09-05-91	20	2.7	37	9.9	4.8	.10	23	83
DAW 2	09-05-91	17	4.8	59	13	11	.20	20	--
EBW 1	02-13-91	--	--	6	--	--	--	--	--
EBW 1	09-11-91	55	1.8	--	5.9	53	<.10	9.7	111
ENW 30	02-20-91	10	1.7	52	7.8	2.1	<.10	14	--
ENW 32	02-22-91	--	--	15	--	--	--	--	--
ENW 32	09-10-91	17	.80	17	6.2	1.0	<.10	11	42
ENW 33	02-21-91	19	.80	13	7.2	.60	<.10	10	29
FDW 3	03-08-91	25	1.2	18	3.8	13	<.10	16	--
FDW 4	02-04-91	60	1.5	18	7.3	41	.10	12	108
HKS 1	09-03-91	52	1.7	27	23	34	<.10	13	108
HKW 21	03-06-91	--	--	98	--	--	--	--	--
HKW 21	09-12-91	--	--	64	--	--	--	--	--
HKW 22	02-08-91	68	2.2	27	12	100	<.10	15	219
HKW 22	09-12-91	--	--	32	--	--	--	--	--
LLW 2	09-11-91	34	1.3	25	5.3	11	.20	9.5	62
LLW 19	02-13-91	14	2.3	28	16	2.2	<.10	14	64
LLW 20	03-08-91	20	1.6	24	7.0	.40	<.10	16	--
LYW 4	03-06-91	--	--	25	--	--	--	--	--
LYW 4	09-03-91	34	1.3	22	12	21	<.10	13	107
MUW 1	09-06-91	--	--	79	--	--	--	--	--
MUW 2	09-06-91	16	4.2	78	19	16	<.10	13	188
OSW 2	03-05-91	11	1.8	124	18	39	<.10	13	--
SUW 2	02-04-91	11	3.0	71	13	8.6	<.10	18	111
SUW 4	03-13-91	11	4.3	42	15	3.5	<.10	11	--

Table F1. Chemical analyses of ground-water samples in the middle Connecticut River Basin, west-central New Hampshire—*Continued*

Local site No.	Date	Solids, sum of constituents, dissolved (mg/L) [1](70301)	Nitrogen, nitrite, dissolved (mg/L as N) [1](00613)	Nitrogen, NO_2+NO_3, dissolved (mg/L as N) [1](006310	Nitrogen, ammonia, dissolved (mg/L as N) [1](00608)	Nitrogen, ammonia + organic, dissolved (mg/L as N) [1](00623)	Phosphorus, dissolved (mg/L as P) [1](00666)	Phosphorus, orthophos-phate, dissolved (mg/L as P) [1](00671)	Aluminum, dissolved (μg/L) [1](01106)
BOW 3	03-06-91	151	--	--	--	--	--	--	<10
CCW 3	04-11-91	80	<0.010	0.058	0.030	<0.20	0.060	0.060	--
CCW 4	02-22-91	--	--	--	--	--	--	--	--
CCW 4	09-10-91	31	<.010	.560	<.010	<.20	<.010	<.010	--
CCW 5	02-05-91	100	--	--	--	--	--	--	<10
CCW 6	02-05-91	--	--	--	--	--	--	--	--
CCW 6	09-10-91	69	<.010	.220	.050	.20	<.010	<.010	--
CCW 7	04-11-91	220	<.010	<.050	.370	.50	.010	<.010	--
CFW 15	09-04-91	118	<.010	.540	<.010	<.20	<.010	<.010	--
CFW 16	09-04-91	138	<.010	1.20	<.010	<.20	.010	<.010	--
CFW 17	09-04-91	65	--	--	--	--	--	--	--
CFW 18	09-04-91	36	<.010	.750	<.010	<.20	<.010	<.010	--
DAW 1	09-05-91	82	<.010	<.050	.030	<.20	.010	<.010	--
DAW 2	09-05-91	114	--	--	--	--	--	--	--
EBW 1	02-13-91	--	--	--	--	--	--	--	--
EBW 1	09-11-91	108	<.010	.430	<.010	<.20	.010	<.010	--
ENW 30	02-20-91	80	--	--	--	--	--	--	10
ENW 32	02-22-91	--	--	--	--	--	--	--	--
ENW 32	09-10-91	41	<.010	.560	<.010	<.20	.010	<.010	--
ENW 33	02-21-91	35	<.010	.500	<.010	<.20	<.010	<.010	--
FDW 3	03-08-91	59	--	--	--	--	--	--	--
FDW 4	02-04-91	110	<.010	.400	<.010	<.20	<.010	<.010	--
HKS 1	09-03-91	125	<.010	.240	<.010	<.20	<.010	<.010	--
HKW 21	03-06-91	--	--	--	--	--	--	--	--
HKW 21	09-12-91	--	--	--	--	--	--	--	--
HKW 22	02-08-91	221	--	--	--	--	--	--	--
HKW 22	09-12-91	--	<.010	.061	<.010	<.20	<.010	<.010	--
LLW 2	09-11-91	61	<.010	.160	.020	<.20	<.010	<.010	--
LLW 19	02-13-91	72	<.010	.800	<.010	<.20	<.010	<.010	--
LLW 20	03-08-91	50	--	--	--	--	--	--	--
LYW 4	03-06-91	--	--	--	--	--	--	--	--
LYW 4	09-03-91	99	<.010	1.80	<.010	<.20	<.010	<.010	--
MUW 1	09-06-91	--	--	--	--	--	--	--	--
MUW 2	09-06-91	187	<.010	7.20	<.010	.60	.020	<.010	--
OSW 2	03-05-91	222	<.010	.160	.420	.60	<.010	<.010	10
SUW 2	02-04-91	125	<.010	2.40	<.010	<.20	<.010	<.010	--
SUW 4	03-13-91	86	--	--	--	--	--	--	--

Table F1. Chemical analyses of ground-water samples in the Middle Connecticut River Basin, west-central New Hampshire—*Continued*

Local site No.	Date	Barium, dissolved (μg/L) [1](01005)	Beryllium, dissolved (μg/L) [1](01010)	Boron, dissolved (μg/L) [1](01020)	Cadmium, dissolved (μg/L) [1](01025)	Cobalt, dissolved (μg/L) [1](01035)	Copper, dissolved (μg/L) [1](01040)	Iron, dissolved (μg/L) [1](01046)
BOW 3	03-06-91	--	--	20	--	--	--	1,600
CCW 3	04-11-91	<2	<0.5	--	<1.0	<3	<10	8
CCW 4	02-22-91	--	--	--	--	--	--	--
CCW 4	09-10-91	<2	<.5	--	<1.0	<3	<10	6
CCW 5	02-05-91	--	--	<10	--	--	--	1,400
CCW 6	02-05-91	--	--	--	--	--	--	--
CCW 6	09-10-91	8	<.5	--	<1.0	5	<10	4,500
CCW 7	04-11-91	62	<.5	--	<1.0	<3	<10	5,600
CFW 15	09-04-91	40	<.5	--	<1.0	<3	<10	7
CFW 16	09-04-91	32	<.5	--	<1.0	<3	<10	20
CFW 17	09-04-91	--	--	--	--	--	--	<3
CFW 18	09-04-91	19	.7	--	<1.0	<3	<10	5
DAW 1	09-05-91	31	<.5	--	<1.0	<3	<10	2,600
DAW 2	09-05-91	--	--	--	--	--	--	98
EBW 1	02-13-91	--	--	--	--	--	--	--
EBW 1	09-11-91	45	<.5	--	<1.0	<3	<10	6
ENW 30	02-20-91	--	--	<10	--	--	--	7
ENW 32	02-22-91	--	--	--	--	--	--	--
ENW 32	09-10-91	17	<.5	--	<1.0	<3	<10	5
ENW 33	02-21-91	18	.5	--	<1.0	<3	<10	3
FDW 3	03-08-91	--	--	--	--	--	--	<3
FDW 4	02-04-91	8	.5	--	<1.0	<3	<10	5
HKS 1	09-03-91	19	<.5	--	1.0	<3	<10	4
HKW 21	03-06-91	--	--	--	--	--	--	--
HKW 21	09-12-91	--	--	--	--	--	--	--
HKW 22	02-08-91	38	<.5	--	1.0	<3	<10	1,400
HKW 22	09-12-91	--	--	--	--	--	--	--
LLW 2	09-11-91	13	<.5	--	<1.0	<3	<10	<3
LLW 19	02-13-91	11	<.5	--	<1.0	<3	<10	12
LLW 20	03-08-91	--	--	--	--	--	--	3
LYW 4	03-06-91	--	--	--	--	--	--	--
LYW 4	09-03-91	20	<.5	--	<1.0	<3	<10	5
MUW 1	09-06-91	--	--	--	--	--	--	--
MUW 2	09-06-91	25	<.5	--	1.0	3	<10	17
OSW 2	03-05-91	--	--	<10	--	--	--	13
SUW 2	02-04-91	8	<.5	--	<1.0	<3	<10	8
SUW 4	03-13-91	--	--	--	--	--	--	130

Table F1. Chemical analyses of ground-water samples in the Middle Connecticut River Basin, west-central New Hampshire—*Continued*

Local site No.	Date	Lead, dissolved (µg/L) [1](01049)	Lithium, dissolved (µg/L) [1](01130)	Manganese, dissolved (µg/L) [1](01056)	Molybdenum, dissolved (µg/L) [1](01060)	Strontium, dissolved (µg/L) [1](01085)	Vanadium, dissolved (µg/L) [1](01085)	Zinc, dissolved (µg/L) [1](01090)
BOW 3	03-06-91	--	--	550	--	180	--	--
CCW 3	04-11-91	<10	<4	2	<10	44	<6	<3
CCW 4	02-22-91	--	--	--	--	--	--	--
CCW 4	09-10-91	<10	<4	180	<10	27	<6	<3
CCW 5	02-05-91	--	--	480	--	87	--	--
CCW 6	02-05-91	--	--	--	--	--	--	--
CCW 6	09-10-91	<10	<4	420	<10	48	<6	5
CCW 7	04-11-91	<10	6	420	<10	260	<6	<3
CFW 15	09-04-91	<10	<4	71	<10	92	<6	15
CFW 16	09-04-91	<10	<4	140	<10	150	<6	10
CFW 17	09-04-91	--	--	<1	--	--	--	--
CFW 18	09-04-91	<10	<4	38	<10	54	<6	3
DAW 1	09-05-91	<10	<4	84	<10	61	<6	4
DAW 2	09-05-91	--	--	390	--	--	--	--
EBW 1	02-13-91	--	--	--	--	--	--	--
EBW 1	09-11-91	<10	<4	22	<10	150	<6	6
ENW 30	02-20-91	--	--	40	--	80	--	--
ENW 32	02-22-91	--	--	--	--	--	--	--
ENW 32	09-10-91	<10	<4	<1	<10	45	<6	5
ENW 33	02-21-91	<10	<4	19	<10	37	<6	<3
FDW 3	03-08-91	--	--	7	--	--	--	--
FDW 4	02-04-91	<10	<4	2	<10	69	<6	<3
HKS 1	09-03-91	<10	<4	21	<10	66	<6	8
HKW 21	03-06-91	--	--	--	--	--	--	--
HKW 21	09-12-91	--	--	--	--	--	--	--
HKW 22	02-08-91	<10	<4	270	<10	83	<6	<3
HKW 22	09-12-91	--	--	--	--	--	--	--
LLW 2	09-11-91	<10	<4	68	<10	46	<6	5
LLW 19	02-13-91	<10	<4	7	<10	59	<6	<3
LLW 20	03-08-91	--	--	8	--	--	--	--
LYW 4	03-06-91	--	--	--	--	--	--	--
LYW 4	09-03-91	<10	<4	<1	<10	150	<6	<3
MUW 1	09-06-91	--	--	--	--	--	--	--
MUW 2	09-06-91	10	5	1	<10	180	<6	13
OSW 2	03-05-91	--	--	690	--	280	--	--
SUW 2	02-04-91	<10	<4	3	<10	90	<6	4
SUW 4	03-13-91	--	--	100	--	--	--	--

[1]A five-digit parameter code used in the U.S. Environmental Protection Agency's computerized data system, Storage and Retrieval System (STORET), to uniquely identify a specific constituent. The codes used in STORET are the same as those used in the U.S. Geological Survey's data system, National Water Information System (NWIS). The U.S. Environmental Protection Agency assigns and approves all requests for new codes.

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EXPLANATION

STRATIFIED-DRIFT AQUIFER--Materials typically are thinly saturated coarse-grained stratified drift overlying fine-grained lake-bottom deposits in the main valley of the Connecticut River; thicker deposits of saturated coarse-grained aquifer material can be found in the upland valley areas

TILL-COVERED BEDROCK

AQUIFER BOUNDARY--Approximately located; dashed where inferred; dotted where concealed

DRAINAGE-BASIN DIVIDE

GROUND-WATER DIVIDE

420 WATER-TABLE CONTOUR--Approximately located; contours are in feet above sea level; contour interval varies. Arrow indicates general direction of ground-water flow. (Local anomalies in flow that result from ground-water withdrawals are not shown)

a a' SEISMIC-REFRACTION LINE--Sequence letters given for each town

A A' SEISMIC-REFLECTION LINE--Found in Mascoma Lake in Enfield and Lebanon

R BEDROCK OUTCROP--Within or adjacent to stratified-drift aquifer

S1 SPRING

53 LOW-STREAMFLOW-MEASUREMENT SITE AND NUMBER--Data reported in Appendix E

	WELL OR BORING	PUBLIC-SUPPLY WELL	USGS OBSERVATION WELL OR BORING
PENETRATED ONLY UNCONSOLIDATED DEPOSITS	W9	W1	W5
REACHED REFUSAL OR BEDROCK	W7		A2
PENETRATED BEDROCK	W22	W9	
CHEMICAL ANALYSIS OF WATER			W7

NUMBER IS LOCAL SITE IDENTIFICATION NUMBER. THE FOLLOWING PREFIXES ARE USED WITH WELL, AUGER, AND BRIDGE BORING SITE IDENTIFICATION: (A) AUGER BORINGS, (B) BRIDGE BORINGS, (W) CASED WELLS

Letter and number, identifying the site, are shown without a preceding two-letter town code to conserve space. (See section in text on numbering system for wells, borings, and springs)

CCW 7 WELL IDENTIFIER

$Na^{+}+K^{+}$ — $Cl^{-}+F^{-}$

Mg^{+2} — SO_4^{-2}

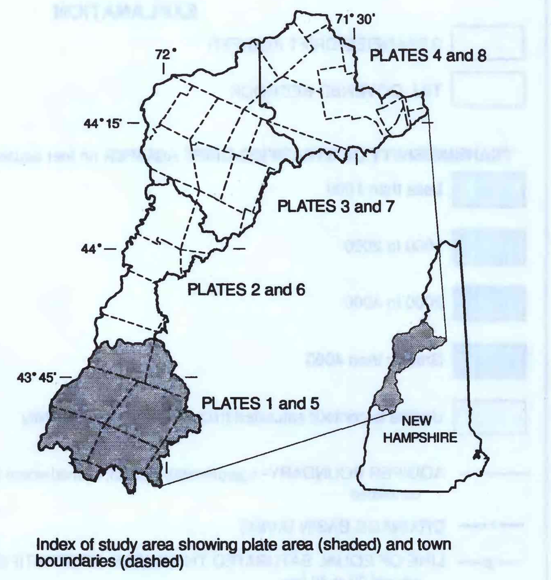
Ca^{+2} — $HCO_3^{-}+CO_3^{-2}$

Cations — Anions

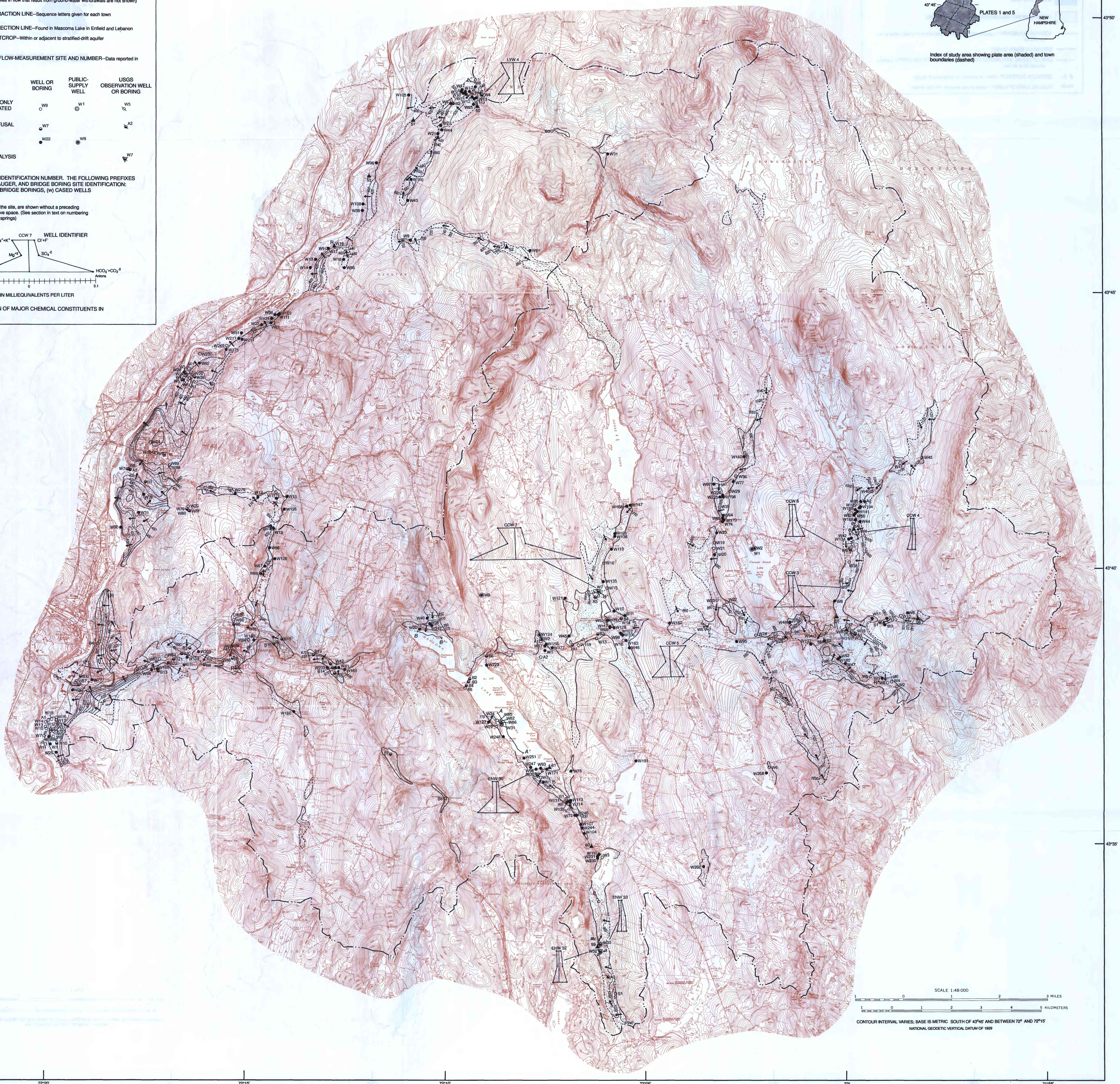
3.1 — 0 — 3.1

IONS, IN MILLIEQUIVALENTS PER LITER

CONCENTRATION OF MAJOR CHEMICAL CONSTITUENTS IN GROUND WATER



Index of study area showing plate area (shaded) and town boundaries (dashed)



SCALE 1:48 000

1 0 1 2 3 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL VARIES; BASE IS METRIC SOUTH OF 43°45' AND BETWEEN 72° AND 72°15'

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Base from U.S. Geological Survey
Canaan, N.H.-Vt., 1984; Enfield Center, N.H., 1984; 1:25,000 scale
Grafton, N.H., provisional, 1987;
Hanover, N.H.-Vt., photorevised, 1980; Lyme, N.H.-Vt., 1981;
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AQUIFER BOUNDARIES, DATA-COLLECTION LOCATIONS, ALTITUDE OF WATER TABLE, AND CONCENTRATION OF MAJOR CHEMICAL CONSTITUENTS FOR STRATIFIED-DRIFT AQUIFERS IN THE MIDDLE CONNECTICUT RIVER BASIN, WEST-CENTRAL NEW HAMPSHIRE, SOUTHERN QUADRANT

By
S.M. Flanagan
1995

Geohydrology by S.M. Flanagan and S.F. Clark, 1989-91

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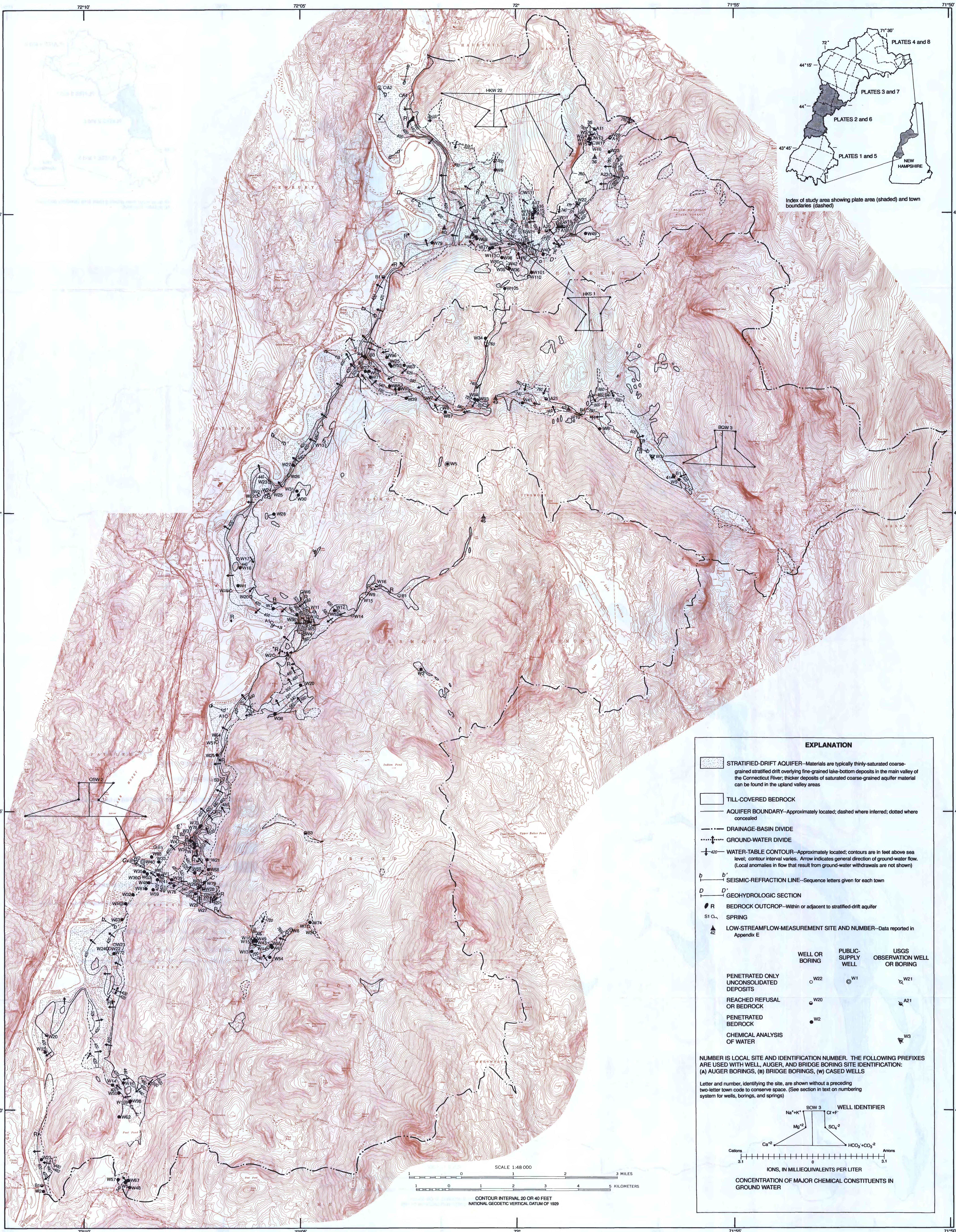
WATER-RESOURCES INVESTIGATIONS REPORT 94-4181
Aquifer boundaries, data-collection locations, water table, and chemical constituents, central quadrant-PLATE 2
Flanagan, S.M., 1995, Geohydrology and water quality of stratified-drift aquifers in the middle Connecticut River Basin, west-central New Hampshire



Base from U.S. Geological Survey
East Haverhill, N.H., 1967; Fairlee, Vt.-N.H., 1981;
Lisbon, N.H., 1967; Lyme, N.H.-Vt.., 1981;
Mount Moosilauke, N.H., 1967; Newbury, Vt.-N.H., 1973;
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Aquifer boundaries, data-collection locations, water table, and chemical constituents, northwestern quadrant-PLATE 3
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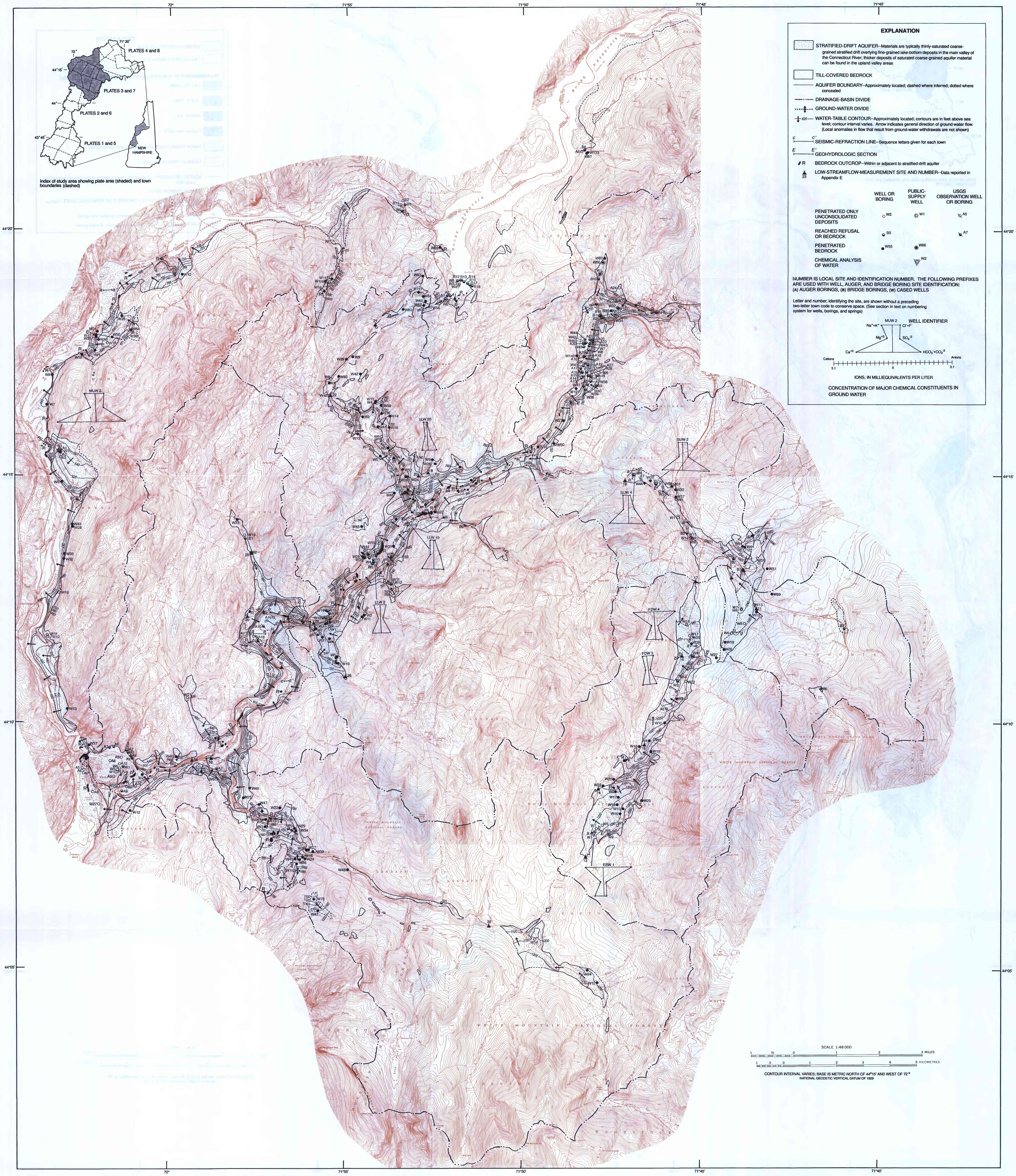

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Sugar Hill, N.H., 1973; Woodsville, N.H.-Vt., 1973; 1:24,000 scale

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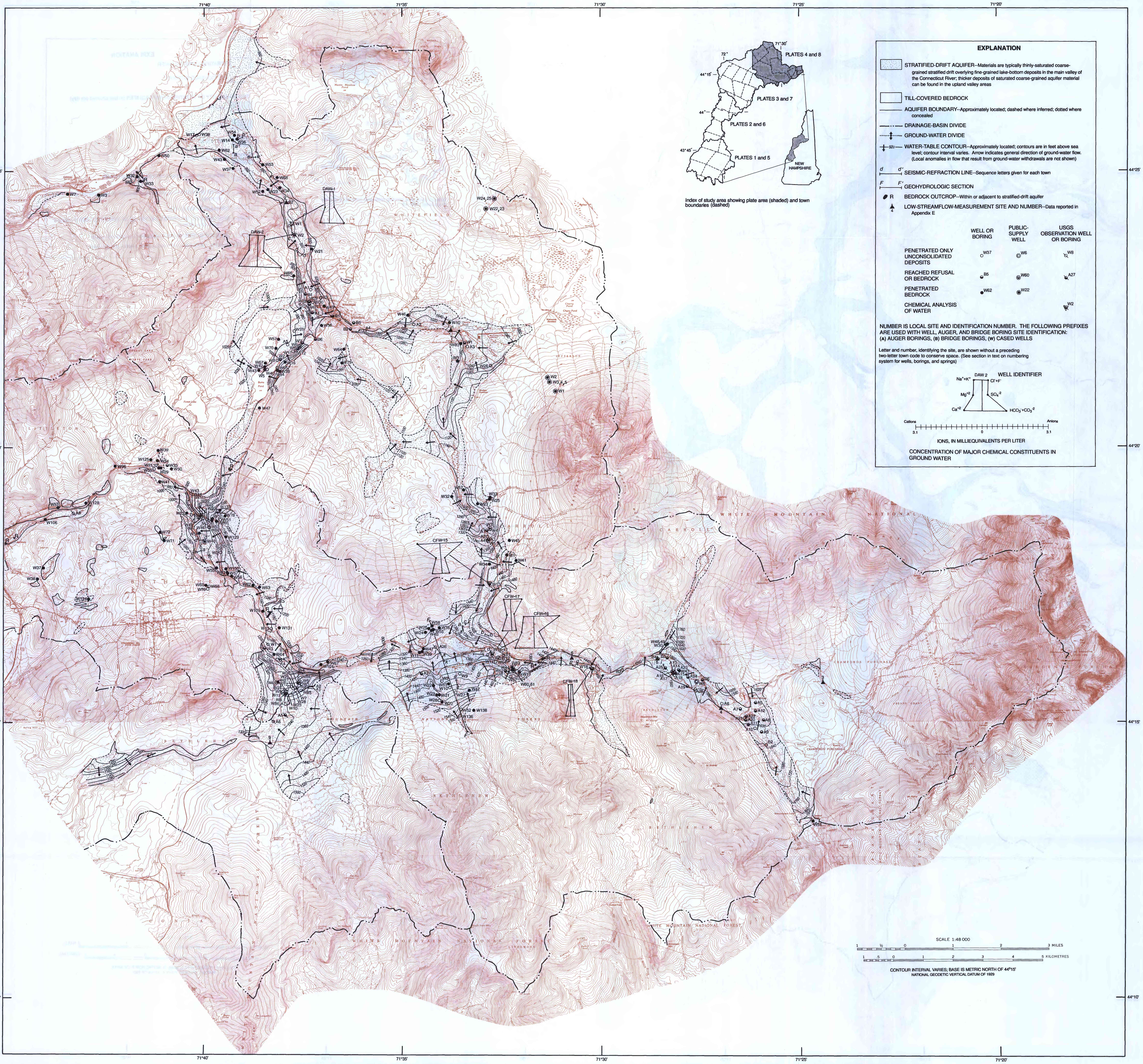

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WATER-RESOURCES INVESTIGATIONS REPORT 94-4181
Saturated thickness and transmissivity, southern quadrant-PLATE 5
Flanagan, S.M., 1995, Geohydrology and water quality of
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EXPLANATION

STRATIFIED-DRIFT AQUIFER

TILL-COVERED BEDROCK

TRANSMISSIVITY OF STRATIFIED-DRIFT AQUIFER (in feet squared per day)

Less than 1000

1000 to 2000

2000 to 4000

Greater than 4000

Unable to contour saturated thickness and transmissivity

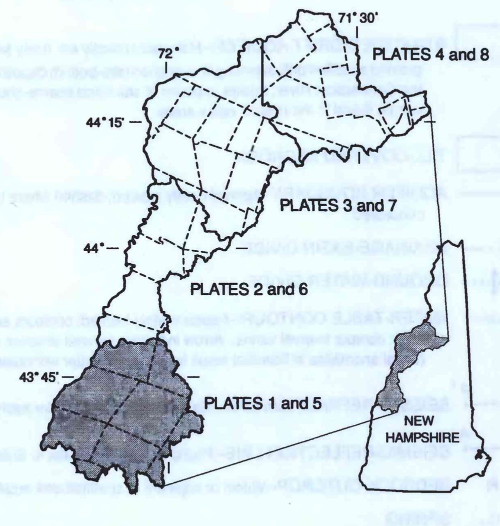
AQUIFER BOUNDARY--Approximately located; dashed where inferred; dotted where concealed

DRAINAGE-BASIN DIVIDE

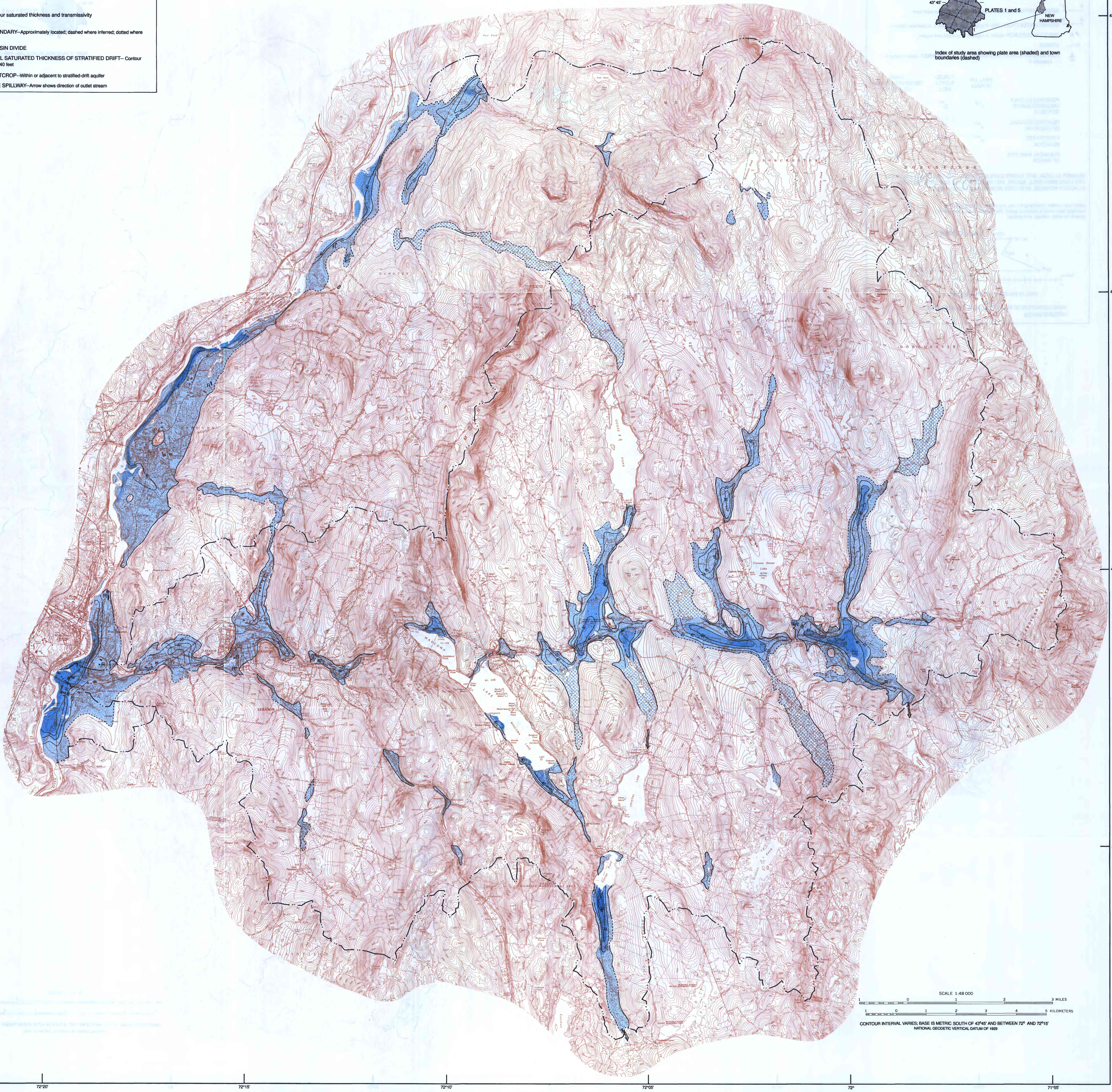
—20— LINE OF EQUAL SATURATED THICKNESS OF STRATIFIED DRIFT-- Contour interval 20 or 40 feet

R BEDROCK OUTCROP--Within or adjacent to stratified-drift aquifer

GLACIAL-LAKE SPILLWAY--Arrow shows direction of outlet stream



Index of study area showing plate area (shaded) and town boundaries (dashed)



SCALE 1:48 000

1 0 1 2 3 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL VARIES; BASE IS METRIC SOUTH OF 43°45' AND BETWEEN 72° AND 72°15'
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SATURATED THICKNESS AND TRANSMISSIVITY OF STRATIFIED-DRIFT AQUIFERS IN THE MIDDLE CONNECTICUT RIVER BASIN, WEST-CENTRAL NEW HAMPSHIRE, SOUTHERN QUADRANT

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WATER-RESOURCES INVESTIGATIONS REPORT 94-4181
Saturated thickness and transmissivity, central quadrant-PLATE 6
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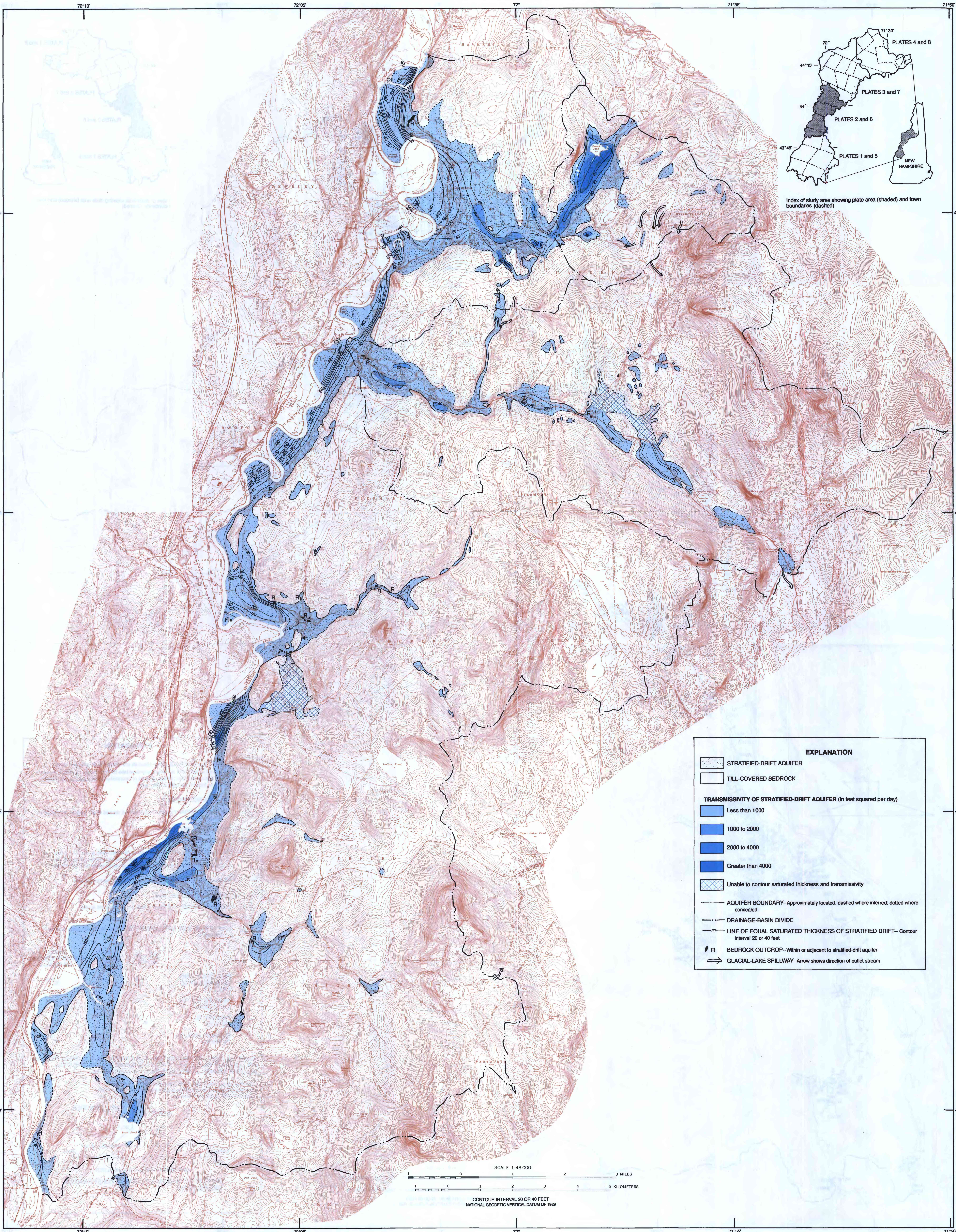

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Piermont, N.H.-Vt., 1979; Smarts Mountain, N.H., 1979;
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WATER-RESOURCES INVESTIGATIONS REPORT 94-4181
Saturated thickness and transmissivity, northwestern quadrant-PLATE 7
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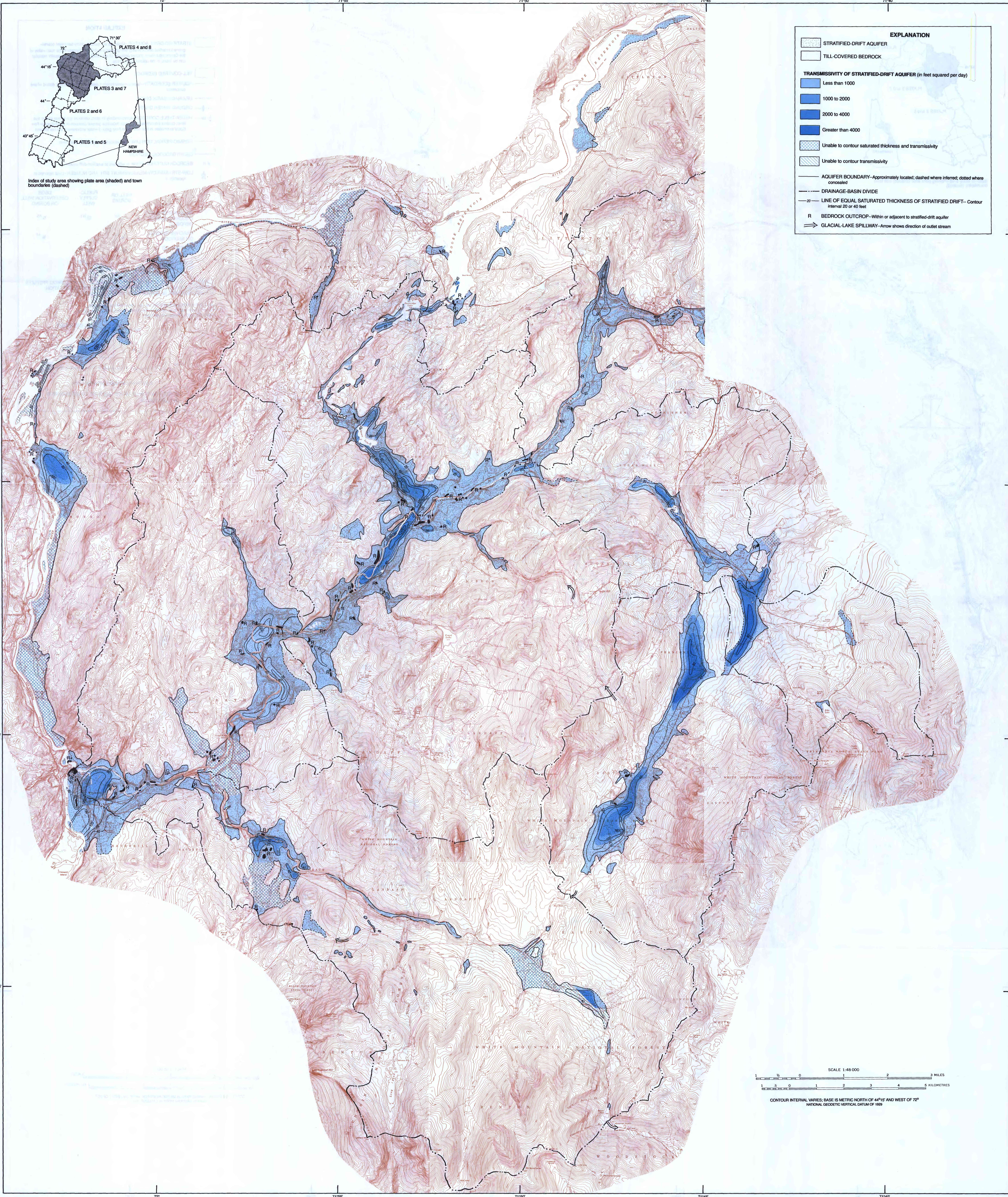
stratified-drift aquifers in the middle Connecticut River Basin, west-central New Hampshire



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SATURATED THICKNESS AND TRANSMISSIVITY OF STRATIFIED-DRIFT AQUIFERS IN THE MIDDLE CONNECTICUT RIVER BASIN, WEST-CENTRAL NEW HAMPSHIRE, NORTHWESTERN QUADRANT

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WATER-RESOURCES INVESTIGATIONS REPORT 94-4181
Saturated thickness and transmissivity, northeastern quadrant-PLATE 8
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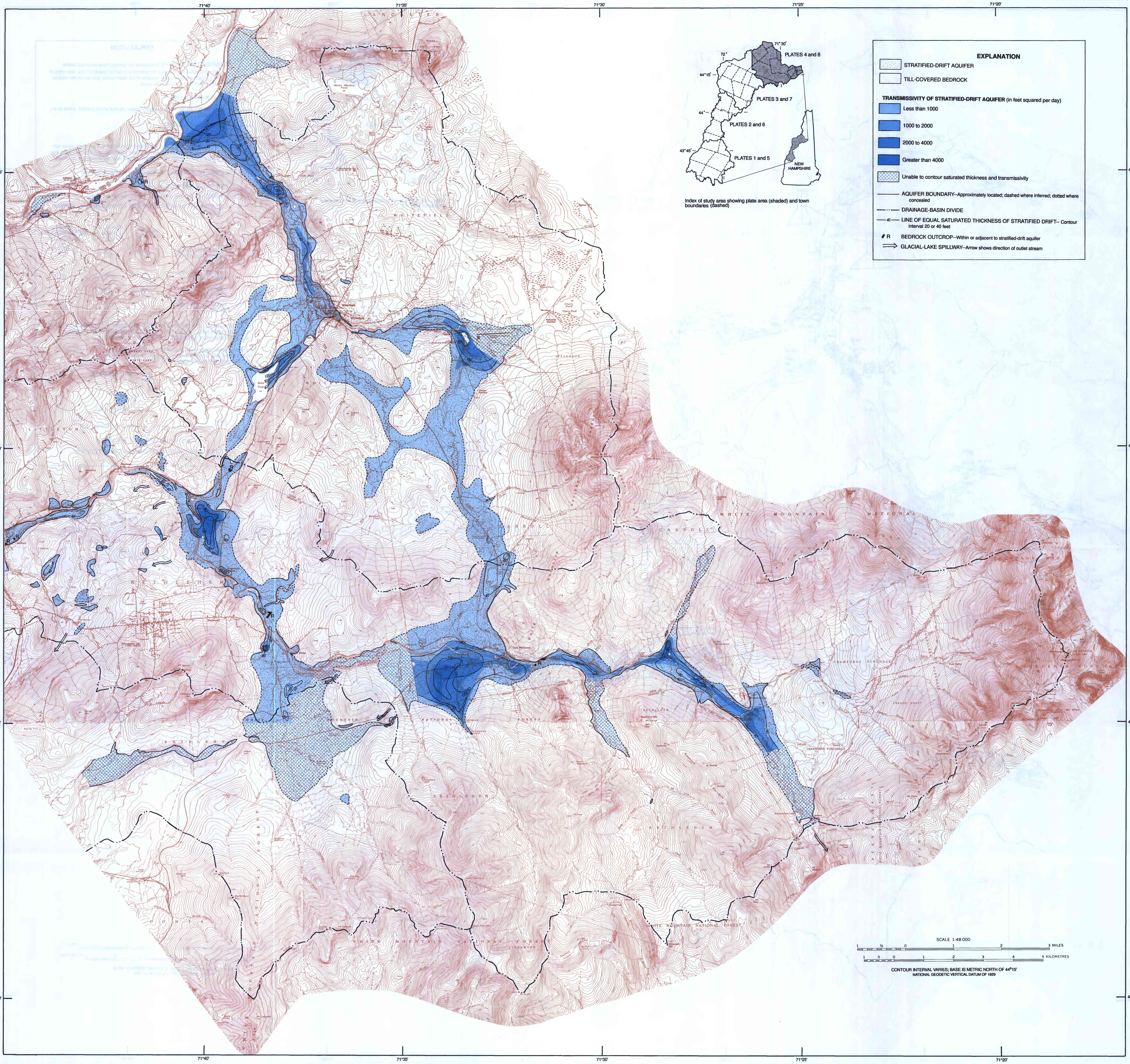

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