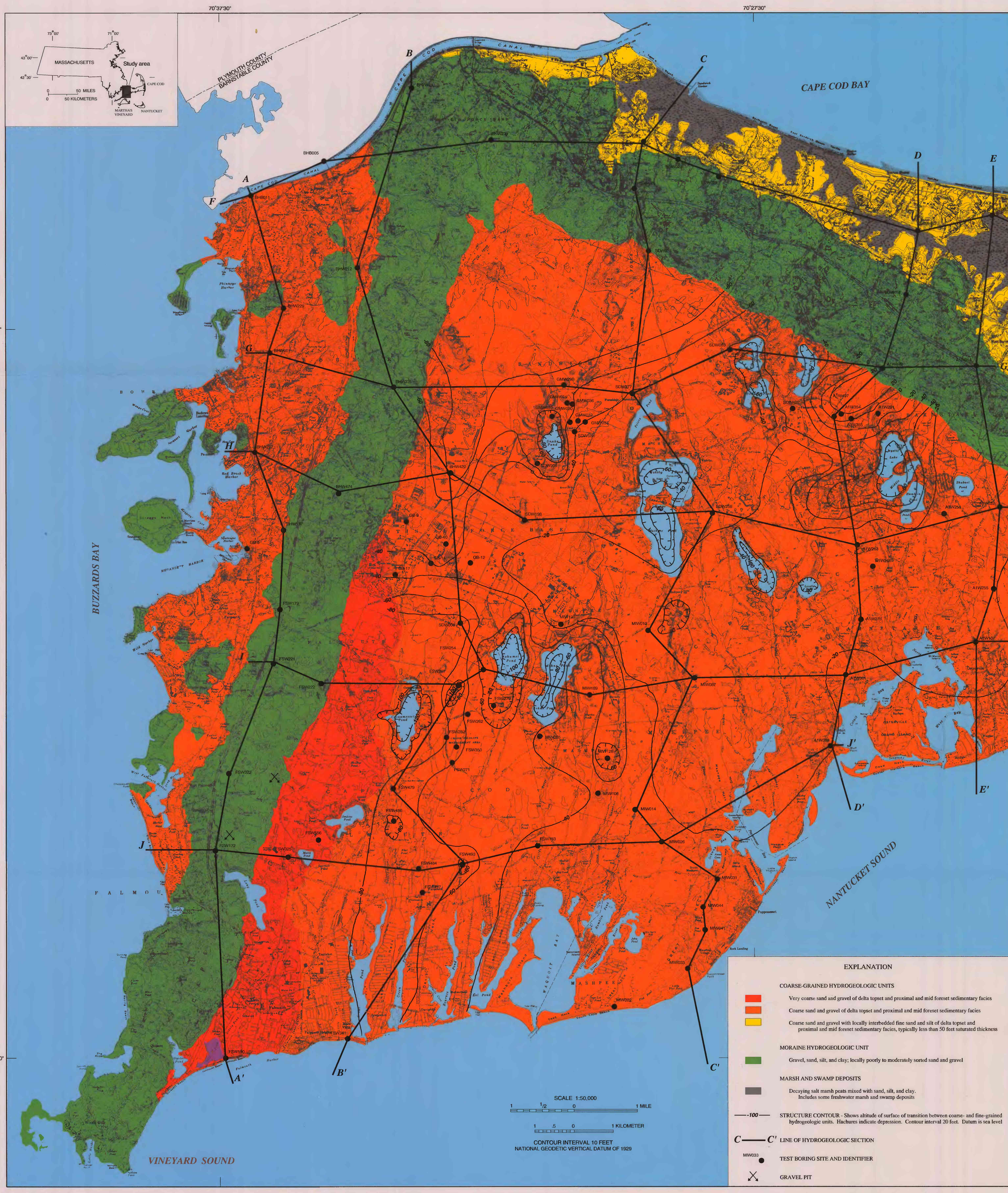

Figure 1.--Hydrogeologic units of Western Cape Cod, Massachusetts.

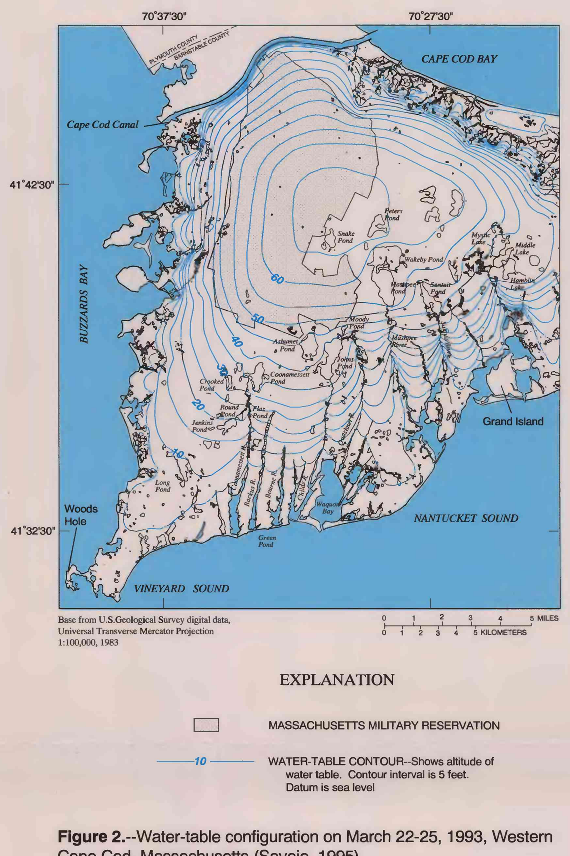

Figure 2.--Water-table configuration on March 22-25, 1993, Western Cape Cod, Massachusetts (Savoie, 1995).

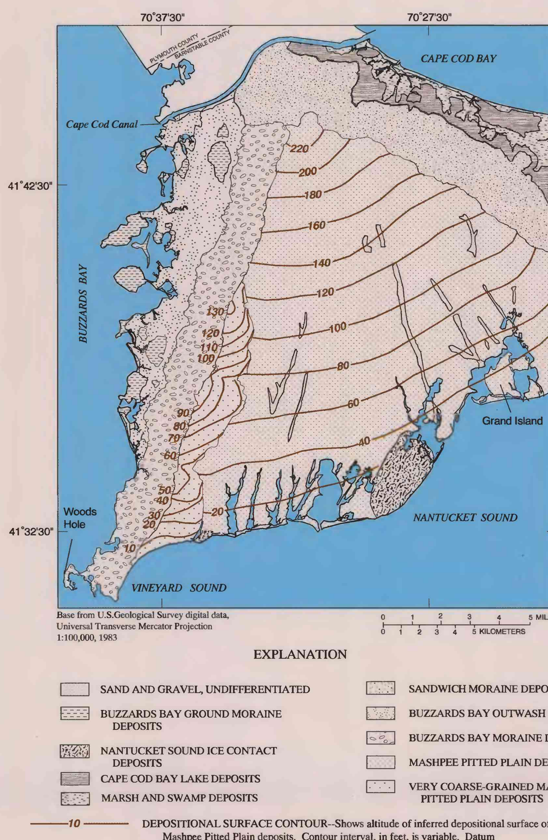

Figure 3.--Surficial geology of Western Cape Cod, Massachusetts (Oldale and Barlow, 1986. Modified by B.D. Stone).

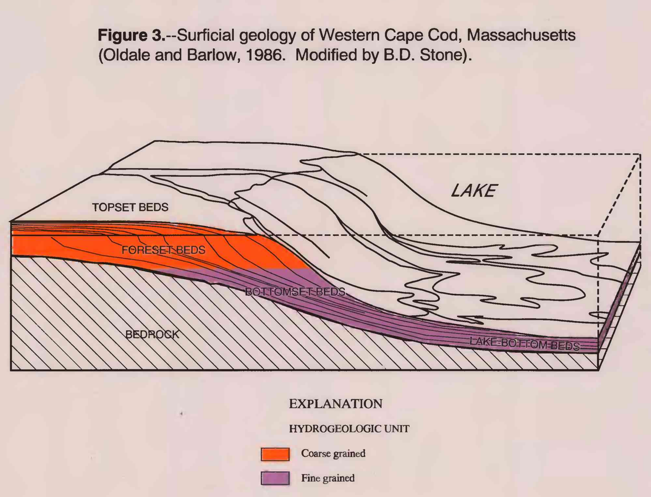

Figure 4.--Generalized progradational deltaic sequence in a pro-glacial lake enviroment showing position of coarse- and fine-grained hydrogeologic units (modified from Smith and Ashley, 1985).

INTRODUCTION

The aquifer of western Cape Cod consists of several hydrogeologic units composed of sand, gravel, silt, and clay (fig. 1) that were deposited during the late Wisconsinan glaciation of New England. The aquifer is a shallow, unconfined hydrologic system in which ground-water flows radially outward from the apex of the ground-water mound near the center of the peninsula toward the coast (fig. 2). The aquifer is the sole source of water supply for the towns of Bourne, Sandwich, Falmouth, and Mashpee, and the Massachusetts Military Reservation (MMR).

Previous geologic studies summarized the characteristics and relative ages of the glacial moraines and meltwater deposits and the relation of these sediments to the extent of the ice-sheet lobes during the last glaciation of southern New England (Oldale and Barlow, 1986; Hartshorn and others, 1991). Hydrogeologic studies in western Cape Cod characterized the shallow regional ground-water-flow system (LeBlanc and others, 1986) and analyzed simulated responses of the aquifer to changes in hydrologic stresses (Guswa and LeBlanc, 1985; Barlow and Hess, 1993; Masterson and Barlow, 1994; and Masterson and others, 1996). Recent concerns about widespread ground-water contamination, especially from sources on the MMR, have resulted in extensive investigations to characterize the local hydrogeology of the aquifer near the MMR (ABB Environmental Services, 1992). Masterson and others (1996) illustrated the strong influence of geology on ground-water flow and the importance of characterizing the hydrogeology to predict the migration of the contaminant plumes beneath the MMR.

This report, a product of a cooperative study between the National Guard Bureau and the U.S. Geological Survey (USGS), characterizes the regional hydrogeology of the western Cape Cod aquifer on the basis of surficial glacial geology previously described by Mather and others (1940) and Oldale and Barlow (1986), and presents a new analysis of the subsurface hydrogeology. The characterization of the regional hydrogeologic framework includes a detailed analysis of the glacial sediments, including deltaic and lacustrine deposits and their sedimentary facies; a structure-contour analysis of the transition between the shallow sand and gravel deposits and the underlying fine sand, silt, and clay deposits; and a summary of the relation between lithologic characteristics (grain size and stratigraphy) and empirically determined hydraulic-conductivity values.

Figure 3 depicts the updated field mapping of the previous studies of Mather and others (1940) and Oldale (1975) that is published in Oldale and Barlow (1986). The structure contours depicting the transition between overlying coarse-grained sediments and underlying fine-grained sediments (fig. 1) and the sedimentary facies shown schematically in figures 4 and 5 represent a new analysis of the subsurface hydrogeology. This analysis was based on (1) grain-size and lithologic data from more than 200 boreholes (Masterson and others, 1996), (2) comparison with generalized depositional models of similar deltaic deposits in northeastern United States (Gustavson and others, 1975; Stone and Force, 1982), (3) field descriptions of shallow gravel-pit exposures in the glaciofluvial deposits (Mather and others, 1942; Thompson, 1993), and (4) shallow ground-penetrating radar profiles (Knoll and others, 1991) and borehole geophysical logs in the Mashpee pitted plain sediments.

HYDROGEOLOGIC FRAMEWORK
Erosional and Depositional History

The geologic history of western Cape Cod consists of periods of glacial erosion and deposition that alternated with long periods of interglacial erosion. The regional distribution of glacial deposits, including submerged deposits on Georges Bank east of Cape Cod, indicate that the present-day Cape Cod area was glaciated at least four times during the Pleistocene Epoch (Stone and Borns, 1986). Each glaciation removed most of the preceding glacial deposits and weathered rock, such that the thick deposits from the last glaciation directly overlie the glacially eroded bedrock surface. The last ice sheet, of late Wisconsinan age, advanced to its terminal position south of Cape Cod about 21,000 years ago (based on radiocarbon age-dating--Oldale and Barlow, 1986). Two lobes of the extensive ice sheet formed in separate lowland areas and coalesced in the area of western Cape Cod (Mather and others, 1940; Oldale and Barlow, 1986). The Buzzards Bay lobe occupied the lowland beneath present-day Vineyard Sound and Buzzards Bay, and the Cape Cod Bay lobe occupied the basin beneath the present-day Nantucket Sound. These lobes of ice-scoured rock materials from underlying Paleozoic and early Mesozoic crystalline and sedimentary bedrock in southern New England and transported them to the southernmost extent of glacial advance, which is delineated by moraines on Martha's Vineyard and Nantucket Island. As the ice-sheet lobes advanced toward the south, they deposited a veneer of compact basal till on the bedrock surface, whose altitude ranges from about 100 ft below sea level near the Cape Cod Canal to 500 ft below sea level near Grand Island in Osterville (sections *D-D'* and *E-E'*, fig. 5).

The glacial sediments that constitute the aquifer of western Cape Cod were deposited from sources near the ice margin during the recession of the ice sheet. During the early stages of the ice recession, the ice lobes in the region dammed a large proglacial lake north of the terminal moraines of Martha's Vineyard and Nantucket Island in the lowland area of the present-day Nantucket Sound. The Buzzards Bay and Cape Cod Bay ice lobes retreated back to the vicinity of the present-day southern shore of western Cape Cod, where the ice recession temporarily halted and meltwater streams deposited the Nantucket Sound ice-contact deposits (fig. 3) into this large lake.

As ice recession continued, the proglacial lake expanded to the north. Large ice blocks became detached from the edge of the ice sheet. Ice blocks that were large enough to extend above the lake level or were partly covered by sediments remained grounded on the lake bottom. Localized ice-marginal deposits consisting of unsorted dense clay and angular sand and gravel were deposited directly on basal till and were subsequently buried by deltaic and lacustrine deposits.

The ice recession continued until it halted at the location of the present-day Buzzards Bay moraine. Streams flowing toward the ice margin deposited sorted, stratified sediments in numerous basins within and on top of the melting, stagnant ice sheet (Mather and others, 1942). The collapse of unstable ice-block slopes resulted in the deposition of unsorted debris-flow sediments into the basins. These sediments form the surficial cap of the present-day Buzzards Bay moraine that can be seen in gravel-pit exposures in the moraine (fig. 1). The deposits that constitute the Buzzards Bay moraine referred to as a kame moraine in Hartshorn and others, 1991 (fig. 3) generally consist of poorly sorted sand and gravel deposits that may be laterally variable and discontinuous. Locally, the ice sheet may have readvanced over part of the moraine sediments in a manner similar to the glaciotectonic process hypothesized by Oldale (1992).

As buried ice blocks within the moraine melted, meltwater streams flowed through the depressions to the eastern front of the moraine (Mather and others, 1942). These meltwater streams deposited very coarse-grained deltaic deposits into the large proglacial lake to the east (fig. 1).

During the prolonged deposition of the Buzzards Bay moraine along the front of the Buzzards Bay ice lobe, the Cape Cod Bay lobe retreated to the present north shore of Cape Cod and began the formation of the Sandwich moraine. Although both ice-lobe margins remained stationary during a contemporaneous standstill, meltwater streams flowed from the interlobate area (herein referred to as the source area) near the present-day location of the Cape Cod Canal and began to build the extensive progradational deltaic deposits of the Mashpee pitted plain (Mather and others, 1940). These deposits constitute the bulk of the aquifer sediments of western Cape Cod (figs. 3 and 4). The deltaic deposits and underlying fine-grained lacustrine deposits accumulated around and on top of the grounded ice blocks in the large proglacial lake to the south. As deposition continued, the ice margin of the Cape Cod Bay lobe remained active, readvancing over and thrusting forward parts of the Mashpee pitted plain deposits to form the upper part of the Sandwich moraine deposits (Oldale, 1975, 1992) (figs. 3 and 5, sections *C-C'*, *D-D'*, *E-E'*).

Renewed ice-margin retreat northwestward from the Buzzards Bay moraine was accompanied by deposition of the Buzzards Bay outwash deposits (figs. 3 and 5, section *H-H'*) in a narrow proglacial lake that formed between the retreating ice margin and the Buzzards Bay moraine. Similarly, as the Cape Cod Bay lobe retreated northward, deltaic and lacustrine deposits accumulated in the initially narrow proglacial lake between the ice margin and the Sandwich moraine (figs. 3 and 5, section *C-C'*).

As the ice recession from the Cape Cod area continued, buried blocks of ice melted within the glacial deposits, creating large depressions, or kettle holes, many of which are occupied by the present-day lakes and ponds of western Cape Cod. The collapse of deposits along the unstable sides of the kettle holes resulted in mixing of overlying coarse-grained sediments with fine-grained sediments in the lower parts of the depressions (for example, Mashpee Pond, fig. 5, section *C-C'*).

The entire ice sheet, which covered most of New England, continued to melt during the late Pleistocene and early Holocene Epochs, resulting in a rise of sea level of more than 300 ft in the Cape Cod region (Oldale, 1992). The marine flooding of the lowland areas beneath the present-day Vineyard Sound, Nantucket Sound, and Cape Cod Bay continued for several thousand years, thus initiating coastal erosion and deposition that continue today.

DELTAIC AND LACUSTRINE DEPOSITS

The deltaic and lacustrine deposits (herein grouped as meltwater deposits), which were sorted and deposited by glacial meltwater, are subdivided into sedimentary facies (table 1 and fig. 5). Sedimentary facies are bodies of sediment with similar lithologic characteristics that were deposited contemporaneously in similar depositional environments. Subdivisions within the sedimentary facies of the deltaic deposits (for example, proximal, mid, and distal delta topset sedimentary facies; table 1) are based on different grain-size and stratification characteristics. These sedimentary facies and their related subdivisions grade laterally into one another. The sediment distributions within the meltwater deposits generally coarsen in the upward direction and become finer from north to south.

The deltaic deposits that constitute the Mashpee pitted plain (fig. 3) contain delta topset, foreset, and bottomset sedimentary facies (fig. 4, table 1) that are similar to other deltaic deposits in the northeastern United States (Stone and Force, 1982; Force and Stone, 1990). The delta topset sedimentary facies consists of horizontally bedded sand and fine to coarse gravel deposits that were deposited in a large glaciofluvial fan by braided streams flowing from the melting ice sheet. The delta foreset sedimentary facies consists of dipping thin beds of medium to fine sand with minor amounts of silt that were deposited subaqueously on the prograding front slope of the delta. The delta bottomset sedimentary facies constitutes glacial lake-bottom sediments consisting of horizontally layered fine sand and silt that were deposited subaqueously in the offshore lake environment at the leading edge of the delta.

The medium to fine sand and silt deposits of the lower deltaic foreset and bottomset sedimentary facies range in thickness from near 0 ft at the contact between moraine and deltaic deposits to nearly 150 ft south of Mashpee Pond (fig. 5, section *C-C'*). The thickest wedge of coarse sand and gravel in the combined delta topset and foreset sedimentary facies occurs at the northernmost extent of the Mashpee pitted plain deposits, at the contact of the Buzzards Bay and Sandwich moraines—the inferred sediment source of the Mashpee pitted plain deposits (fig. 3). These coarse sand and gravel deposits become finer grained and thinner to the south as the distance from the sediment source increases. The maximum saturated thickness of these deposits ranges from about 200 ft at the moraine-outwash contact to about 50 ft at the southern edge of the deposits near the Nantucket Sound ice contact deposits (fig. 5, section *C-C'*).

The surface of the very coarse-grained deposits on the western side of the Mashpee pitted plain (fig. 3) slopes to the east and the surface gravel becomes finer grained to the east, indicating a sediment source from meltwater streams flowing from the Buzzards Bay moraine rather than the Mashpee pitted plain sediment source to the north (Mather and others, 1940). The subsurface sediments in these deposits are inferred to be coarser grained and more permeable than sediments within the Mashpee pitted plain to the east (fig. 5, section *I-I'*), based on the lithologic data and the water-table gradient.

Underlying the Mashpee pitted plain deltaic deposits are the lacustrine lake-bottom deposits, which were deposited in a deep offshore lake floor in the front of the prograding delta. These deposits consist of moderately sorted and horizontally laminated silt and clay, with minor amounts of very fine sand, that grade to moderately sorted and horizontally laminated silt and clay as the distance from the sediment source increases. The lake-bottom deposits range in thickness from 0 ft near the source of the deltaic deposits to more than 200 ft near the Nantucket Sound ice-contact deposits (fig. 5, section *C-C'*). The thickness of the lake-bottom sediments depends on the local altitude of the basal till or bedrock contact at the bottom of the lake basin.

The Nantucket Sound ice-contact deposits (fig. 3) were formed by rapid deltaic sedimentation into deep basins along the retreating edge of the ice sheet. The northerly ice-contact parts of these deposits consist of coarse-grained sand and gravel probably deposited by the collapse of unstable slopes along the ice margin (fig. 5, section *C-C'*). The Nantucket Sound ice-contact deposits are assumed by analogy to the much larger Mashpee pitted plain deposits to contain fine-grained glaciolacustrine deltaic bottomset and lacustrine lake-bottom sediments at depth and to the south away from the ice margin.

Coarse-grained sediments also are present in the upper part of the Buzzards Bay outwash deposits and the Cape Cod Bay lake deposits (fig. 3). The Buzzards Bay outwash deposits are deltaic in origin and consist of fine sand and silt at depth. The Cape Cod Bay lake deposits are deltaic and lacustrine in origin and consist of sand and gravel with locally interbedded fine sand and silt.

Subsurface sediments around and beneath kettle holes in the meltwater deposits are shown schematically in the sections as being coarser grained than adjacent sediments (fig. 5, section *C-C'*). The sides of the kettle holes were formed from the collapsing, faulting, and mixing of sediments in debris flows that occurred during melting of the buried blocks of ice left behind by the retreating ice sheet. These large ice blocks, which rested directly on basal till and bedrock, were subsequently buried by the lacustrine and prograding deltaic sediments. As the buried ice melted, the coarse sand and gravel sediments from the overlying delta foreset and topset deposits slumped into the kettle depressions, resulting in localized collapse structures and the subsequent mixing of coarse- and fine-grained sediments at depth, as shown beneath Mashpee Pond (fig. 5, sections *C-C'* and *H-H'*). The structure caused by collapse of overlying coarse-grained sediments into the kettle-hole depressions has been observed by shallow ground-penetrating radar (Knoll and others, 1991) and in lithologic logs of wells along the northern shore of Ashumet Pond (Walter and others, 1996). The collapse structures near the large kettle ponds are illustrated as closed depressions on the structure contour map (fig. 1).

MORAINE DEPOSITS

The characteristics of sediments within the moraine deposits are inferred from a few large excavations, lithologic data from boreholes, topography characteristic of ice-contact deposits, and generalized depositional models. Excavation of a large gravel pit in an ice-contact ridge in the southern part of the Buzzards Bay moraine (east of well FSW 322, fig. 1) exposed a surface cap of poorly sorted, indistinctly bedded, debris-flow sediments. This surface cap is underlain by more than 40 ft of cross-bedded coarse sand that is deformed by vertical collapse faults. A gravel pit in a large basin in the moraine north of Brick Kiln Road near well FSW 172 (fig. 1) exposed laminated silt and sand with little clay deposited in a pond at the ice margin (Mather and others, 1942, pl. 1, fig. 1).

The stratigraphy exposed at the gravel pits and the absence of a smooth surface-till deposit indicate that the upper part of the Buzzards Bay moraine deposits (below the surface-cap sediments) resulted from meltwater deposition of sorted sediments within the stagnant ice margin, as suggested by its classification as a kame moraine by Hartshorn and others (1991). The moraine deposits may locally overlie the edge of the Mashpee pitted plain deposit (Mather and others, 1942), but generally the deposits are inferred to lie directly on the underlying basal till.

Excavations within the Sandwich moraine deposits, by contrast, indicate a glacial deformation origin for at least the upper part of the moraine (Oldale, 1975). The sandy sediments in boreholes penetrating the lower part of the Sandwich moraine deposits were assumed to include older moraine deposits that were contemporaneously deposited with the basal sediments of the Mashpee pitted plain deposits (Oldale, 1975).

HYDRAULIC CONDUCTIVITY OF GLACIAL SEDIMENTS

Hydraulic conductivity, which largely controls the water-transmitting potential of the aquifer, has been widely investigated in previous studies in western Cape Cod. Much of the work was conducted as part of the USGS Toxic Substances Hydrology Program, by other USGS investigations, and as part of National Guard Bureau Installation Restoration Program on the MMR. Estimates of hydraulic conductivity have been made using several methods, including aquifer tests, slug tests, laboratory permeameter tests, borehole-flowmeter tests, and grain-size analyses. Analyses of these empirical results indicates a strong correlation between lithology and hydraulic conductivity in the noncompacted glacial sediments of the western Cape Cod aquifer (Masterson and others, 1996). Hydraulic conductivity, which generally decreases with decreasing grain size, should decrease with depth at a given location in the meltwater deposits and should decrease with distance from the sediment source. In the Mashpee pitted plain deposits, where the sediment source is near the Cape Cod Canal, grain size and hydraulic conductivity should decrease with depth and in a southerly direction.

Evidence of these spatial trends in hydraulic conductivity have been reported by several investigators. Springer (1991) demonstrated that hydraulic-conductivity values decreased with depth along several sections through the glacial outwash deposits in the town of Falmouth. Thompson (1993) used stochastic modeling to evaluate trends in hydraulic conductivity in the delta topset sedimentary facies of the Mashpee pitted plain deposit. Thompson found that hydraulic-conductivity values decreased in a southerly direction away from the sediment source after reaching a maximum value near the sediment source. Walter and others (1996) found that the average grain size of sediments was larger in deep test holes along the north shore of Ashumet Pond than at the same vertical horizon at locations away from the pond, indicating that the hydraulic conductivity may be higher at depth near the kettle-hole ponds than at the same depth away from the ponds.

Masterson and others (1996) developed a correlation between lithologic characteristics and hydraulic conductivity data for the sedimentary facies of the glacial deposits. The lithologic characteristics and estimated hydraulic conductivity of the sedimentary facies of the glacial deposits in the western Cape Cod aquifer are summarized in table 1.

HYDROGEOLOGIC UNITS OF THE WESTERN CAPE COD AQUIFER

The hydrogeologic map (fig. 1) and sections (fig. 5) depict three principal hydrogeologic units that constitute the western Cape Cod aquifer. These units represent three hydrogeologically contrasting groups of deposits: coarse-grained deltaic deposits, fine-grained deltaic and lacustrine deposits, and moraine deposits. A hydrogeologic unit refers to a body of sediment that generally has consistent hydraulic properties based on lithologic characteristics and is physically contiguous within the aquifer or aquifer system (see also the hydrofacies of Anderson, 1989, and Poeter and Gaylord, 1990). In this investigation, hydrogeologic units are delineated on the basis of the distribution of coarse-grained and fine-grained deposits and may include several sedimentary facies in each unit.

The coarse-grained hydrogeologic units shown in figures 1 and 5 consist of sand and gravel of the delta topset and proximal and mid delta foreset sedimentary facies. The horizontal hydraulic- conductivity values for these units range from 150 to 350 ft/d. Sequences of fine sand and silt may be locally interbedded with coarse sand within these units, especially near Nantucket Sound and north of the Sandwich moraine.

The coarse-grained hydrogeologic units are differentiated by grain size, depositional origin, and vertical thickness. A very coarse-grained unit is east of the Buzzards Bay moraine in the town of Falmouth (fig. 1). This unit may have a different depositional origin than that of the Mashpee pitted plain deposits (Mather and others, 1940). The depositional-surface contours (fig. 3) indicate that the sediment source for these deposits may have been meltwater streams flowing eastward from the Buzzards Bay moraine rather than from the Mashpee pitted plain source to the north. A thinner, coarse-grained unit is north of the Sandwich moraine and consists of the Cape Cod lake deposits (fig. 1). These deposits consist of sand and gravel with sequences of locally interbedded fine sand and silt, and are thin (generally less than 50 ft thick) when compared to the other coarse-grained hydrogeologic units. Another coarse-grained unit occupies most of western Cape Cod and includes the Mashpee pitted plain and Buzzards Bay outwash deposits (fig. 1). This unit generally is thicker than the coarse-grained unit north of the Sandwich moraine and generally is less coarse than the coarse-grained unit east of the Buzzards Bay moraine (fig. 1).

The lower extent of these coarse-grained hydrogeologic units is defined by the uppermost occurrence of laterally continuous or vertically repetitious lenses of silt and very fine sand in the deltaic deposits. The altitude of the transition between the upper coarse sand and gravel and the lower fine sand and silt is shown by the structure contours in figure 1 and by contacts on the hydrogeologic sections (fig. 5). Although depicted as a sharp contact for clarity, the transition is actually gradational. This transition zone separates hydrogeologic units with contrasting horizontal hydraulic conductivity values (150 to 350 ft/d compared to 10 to 70 ft/d) and also contrasting ratios of horizontal to vertical hydraulic conductivity (3:1 to 10:1 compared to 30:1 to 100:1). Results of simulations made using a regional ground-water-flow model developed by Masterson and others (1996) illustrate that this transition from coarse- to fine-grained sediments affects the direction of ground-water flow near the MMR and therefore is an important boundary in terms of water-supply development and contaminant migration in the western Cape Cod aquifer.

The fine-grained and moraine hydrogeologic units shown in figures 1 and 5 generally are assumed to be less suitable than the coarse-grained hydrogeologic units for water supply. The fine-grained hydrogeologic unit consists of the distal delta foreset sedimentary facies, mid and distal bottomset sedimentary facies, and lacustrine lake-bottom sedimentary facies. This hydrogeologic unit is characterized by horizontal hydraulic conductivity values of less than 70 ft/d and ratios of horizontal to vertical hydraulic conductivity equal to or greater than 30:1 (table 1). The unit is assumed to have a low potential well yield based on the calculated transmissivity for the estimated hydraulic conductivity and thickness of sediments of this unit.

The moraine hydrogeologic unit is assumed to be less suitable for water-supply development than the coarse-grained hydrogeologic units because of the wide variation in lithologic characteristics and hydraulic properties over short distances within the Buzzards Bay and Sandwich moraine deposits. Reported subsurface stratigraphy of the moraine deposits includes numerous discontinuous lenses of fine-grained sediments. Surface exposures of moraine deposits reveal extensive deposits of laminated silt and unsorted debris-flow deposits. Ground-water flow and contaminant transport in the moraine hydrogeologic unit are poorly understood because the complex stratigraphy of the moraine deposits (including the possibility that sediments of the Mashpee pitted plain deposit may locally underlie the moraines) is not presently known.

Table 1. Depositional origin, lithology, and hydraulic conductivity of sedimentary facies used in depositional model of western Cape Cod, Massachusetts (Masterson and others, 1996)

[ft/d, foot per day]

Depositional origin	Sedimentary facies	Lithology	Hydraulic conductivity: Horizontal (ft/d)	Hydraulic conductivity: Ratio of horizontal to vertical
Deltaic				
Glaciofluvial	Topset beds			
	Proximal	Sand and coarse gravel	350	3:1
	Mid	Sand and medium gravel	290	3:1
	Distal	Sand and fine gravel	240	3:1
Glaciolacustrine (near shore)	Foreset beds			
	Proximal	Sand, medium to coarse	280	3:1
	Mid	Sand, fine to medium	200	5:1
	Distal	Sand, fine, some silt	150	10:1
Glaciolacustrine (offshore)	Bottomset beds			
	Proximal	Sand, fine	150	10:1
	Mid	Sand, fine; some silt	70	30:1
	Distal	Sand, fine and silt	30	100:1
Lacustrine	Lake-bottom beds	Silt and some clay	10	100:1
Glacial	Moraine	Gravel, sand, silt, and clay, poorly to moderately sorted	10–150	10:1–100:1
	Till	Sand, silt, and clay, unsorted	1	1:1

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CONVERSION FACTORS

Multiply	By	To Obtain
foot (ft)	0.3048	meter
foot per day (ft/d)	0.3048	meter per day
mile (mi)	1.609	kilometer
square mile (mi^2)	2.590	square kilometer

VERTICAL DATUM

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

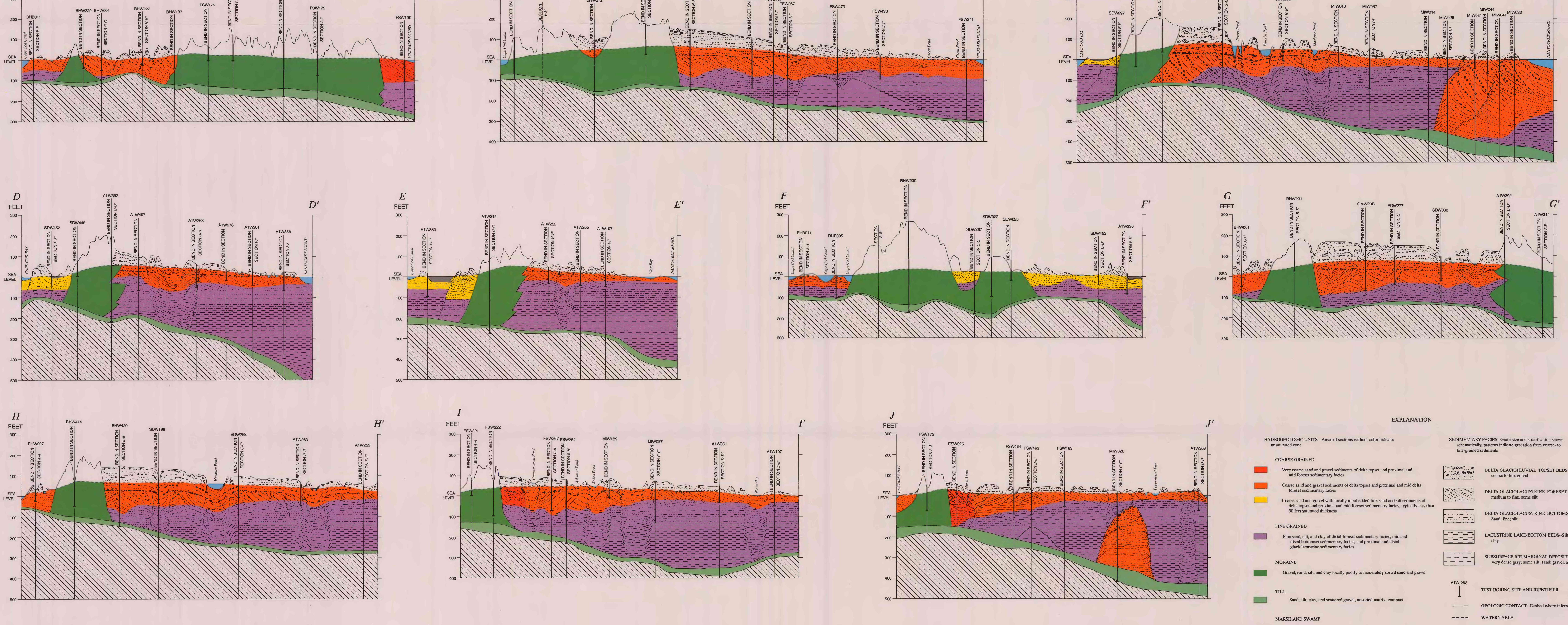

Figure 5.--Hydrogeologic sections showing glacial sediments of western Cape Cod, Massachusetts.

HYDROGEOLOGIC FRAMEWORK OF WESTERN CAPE COD, MASSACHUSETTS

By
John P. Masterson, Byron D. Stone, Donald A. Walter, and Jennifer Savoie
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