SURFICIAL GEOLOGY OF THE MILTON QUADRANGLE

Brief Geologic Description

The existing surficial geology of the Milton, New Hampshire, quadrangle is primarily the result of glacial and post-glacial activities in the area. When the continental glacier advanced over the area, it mobilized and re-deposited a great quantity of unconsolidated material. Those materials, known as surficial deposits, can be classified into two major categories based on whether the deposits were transported in or deposited by moving water.

Those deposits deposited directly beneath the ice mass or dropped out of suspension into disorganized piles of debris are referred to as glacial till. Till is a poorly-sorted mix of many different grain sizes within a relatively fine matrix (Figure 1). Those deposits transported by or deposited in water are referred to as stratified drift.

The movement of continental glaciers across the landscape also shaped the morphology of the area. Streamlined hills, with long axes extending towards the southeast, reflect the shaping of the landscape by the moving ice mass. Some exposures of bedrock also retain striations that formed as the ice and entrained materials scraped across the surface. Several such striations are recorded on the map and record ice movement in a direction of 143 degrees east of true north.

Stratified drift deposits form the major sand and gravel deposits within the quadrangle. These deposits were carried away from the receding glacier by meltwater and deposited in marine (ocean), fluvial (rivers), or lacustrine (lake) environments (Figure 2). All stratified drift deposits having undergone some degree of sorting and have become well-rounded by the action of moving water.

Coarser materials are generally found near the ice margin (proximal environment) where meltwater energy is the greatest. The further from the ice margin one proceeds, the finer the material that can be carried, so deposits become finer away from the ice margin (distal environment).

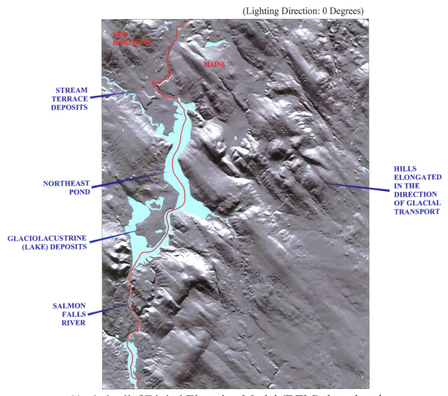
In the southern end of the Milton Quadrangle, the stratified deposits were laid down in a marine setting. As the ice receded from the area, the ocean maintained contact with the ice until a point about one mile south of Milton. The marine limit presently lies at an elevation of approximately 300 to 320 feet (91 to 98 meters) above sea level.

As the ice retreated from the area, a blockage within the present Salmon Falls River valley created Glacial Lake Milton. The waters of this lake backed up to Milton Mills and up the Branch River Valley. Meltwater from the glacier carried massive amounts of material into the lake creating large deltas and lake bottom deposits. Large stagnant blocks of ice remained in some areas and prevented the huge volumes of material from filling all the existing lakes in the area.

Within and west of the Town House section of Milton, glaciofluvial ice contact deposits are found (Figure 3). These deposits were laid down in close proximity to the retreating ice above the level of Glacial Lake Milton. Eskers / Ice Channel Fill deposits were formed within tunnels in the melting ice mass and remain as steep-sided, narrow piles of coarse-grained debris. The islands in Milton Pond are composed of ice contact material and line up with similar features mapped by Meglioli (1999) in Lebanon, Maine.

A small deposit on the western edge of the quadrangle, Qgb1, was formed when meltwater leaving the glacier filled a small lake. The glacier was blocking a north-flowing drainage to the Branch River, creating a dam for the lake. Water from the melting ice could only exit the lake by flowing over a bedrock spillway to the south. The elevation of the spillway controlled the maximum elevation of the lake bottom (lacustrine) deposits. Once the ice retreated from the tributary to Branch River, these deposits were left stranded.

Eventually, the continental glaciers receded from the area of Milton leaving post-glacial processes to modify the landscape. Glacial Lake Milton eventually drained as the Salmon Falls River eroded the channel to its present elevation. Extensive re-working of the glacial deposits by post-glacial streams and rivers cut stream terraces in many locations, which now lie stranded above the level of the existing rivers and streams. Alluvial deposits are still being created by the on-going work of present-day streams as they continually erode and deposit unconsolidated material within the quadrangle. Many of the wetlands that exist today formed in areas that were previously stream channels or locations where stagnant ice blocks melted away leaving lakes and ponds that continue to be filled in to this day (Figure 4).



Shaded relief Digital Elevation Model (DEM) data showing southeast trending glacial topographic fabric and selected surficial geologic features within the Milton Quadrangle.

Reference Cited

Koteff, Carl, 1991, Surficial Geologic Map of Parts of the Rochester and Somersworth Quadrangles, Strafford County, New Hampshire: U.S. Geological Survey Miscellaneous Investigations Series, Map I-2265, scale 1:24,000.

Koteff, Carl, Robinson, Gilpin R., Goldsmith, Richard, and Thompson, Woodrow B., 1993, Delayed Postglacial Uplift and Synglacial Sea Levels in Coastal Central New England, Quaternary Research, Volume 40, pages 46-54.

Goldsmith, Richard, 1993, Surficial Geologic Map of the Farmington Quadrangle, Strafford County, New Hampshire: N.H. Department of Environmental Services, Open File Map, OFR-94, scale 1:24,000.

Meglioli, Andres, 1999, Surficial Geology, Milton Quadrangle, Maine: Maine Geological Survey, Open-File No. 99-91, scale 1:24,000.

Other Sources of Information

Swamp deposits and boundaries of surface water bodies were modified from New Hampshire GRANIT GIS database layers for the National Wetland Inventory (NWI) and Surface Water. Well information obtained from the New Hampshire Geological Survey Water Well Inventory.

Representative Photographs from the Map Area

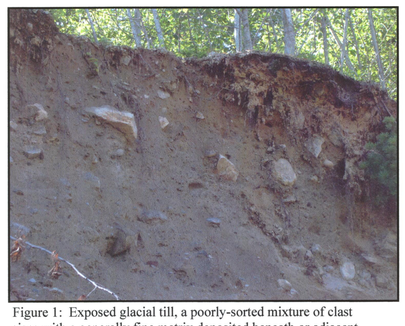


Figure 1: Exposed glacial till, a poorly-sorted mixture of clast sizes with a generally fine matrix deposited beneath or adjacent to glacial ice.

Figure 2: Stratified sands deposited in Glacial Lake Milton, composed of well-sorted sands with some pebble beds.

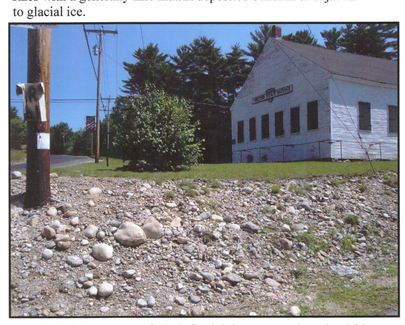
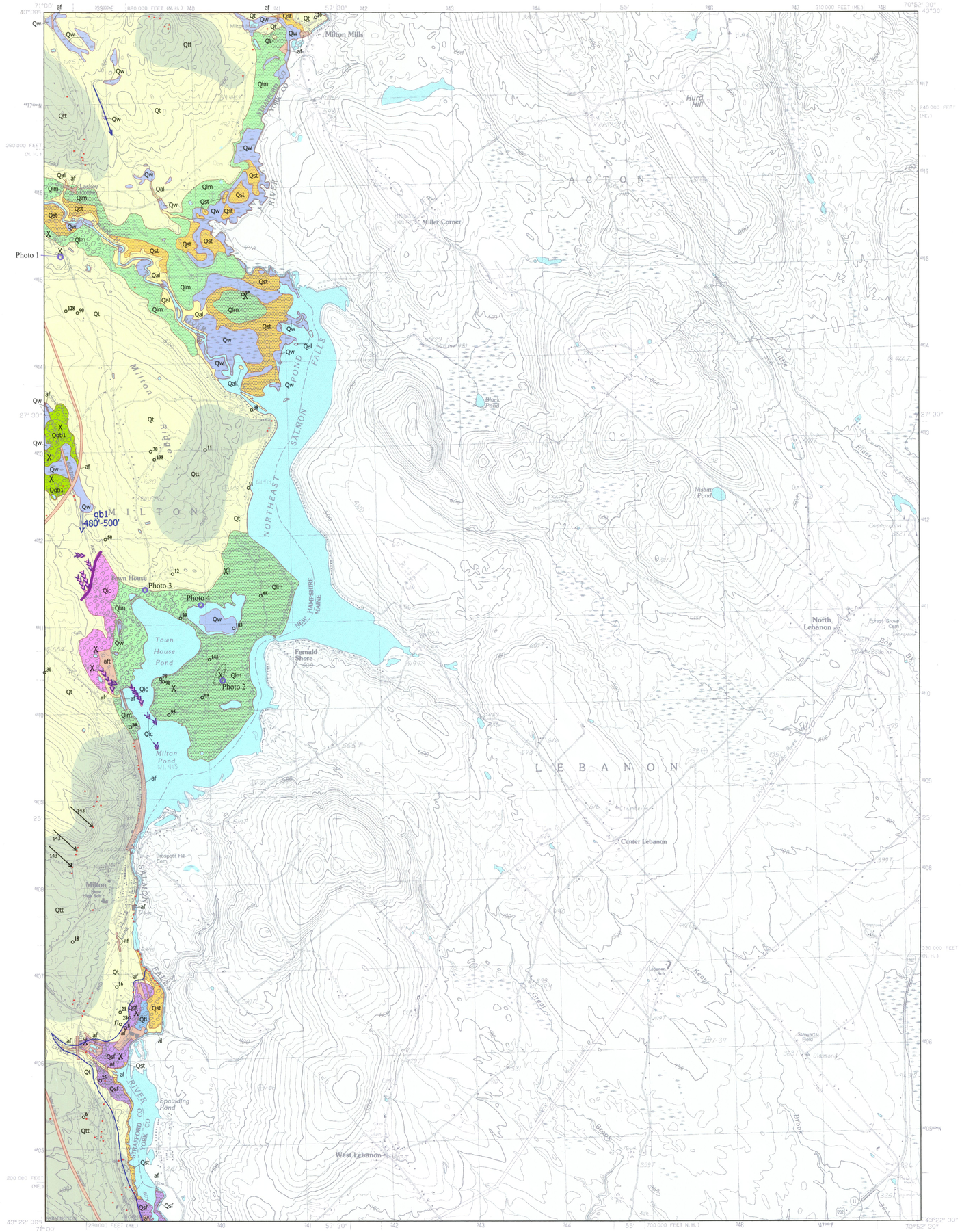


Figure 3: An exposure of glaciofluvial, ice contact deposits, laid down by glacial meltwater in close proximity to the receding ice mass. Grain-size varies from sand to boulders, all well-rounded by movement and deposition in fast-moving water.

Figure 4: Fish Pond, Milton, New Hampshire. Pond is the remnant of a large ice block that prevented sedimentation of the area. Holocene wetlands continue to encroach on the remaining open water.



Scale = 1:24,000

CONTOUR INTERVAL 20 FEET

Topographic base from U.S. Geological Survey Milton, New Hampshire, Quadrangle, scale 1:24,000.

Magnetic North / True North / 15.0mg

Quadrangle Location

GRANIT Tile No. 128

MAP PREPARATION

Surficial Mapping completed by Daniel J. Tinkham (consulting geologist at Emery & Garrett Groundwater, Inc.) during the 2005 field season. Unit designations and contacts matched to adjacent New Hampshire quadrangles, when available.

LEGEND / SURFICIAL UNITS

DESCRIPTION OF MAP UNITS

af ARTIFICIAL FILL - Areas of extensive reworking of the natural surface or filling with non-native materials. Solid waste landfills are designated with "aft". As much as 50 feet (15 meters) thick.

Qal ALLUVIUM (HOLOCENE)- Sand, pebbles, cobbles, and boulders in active flood plains along rivers and streams. As much as 15 feet (5 meters) thick.

Qw SWAMP DEPOSITS (HOLOCENE)- Muck, peat, silt, and sand. Generally 5 to 10 feet (1.5 to 3 meters) thick.

Qst STREAM-TERRACE DEPOSITS (HOLOCENE AND PLEISTOCENE) - Very fine sand to boulders on terraces cut into former glacial-lake deposits or ablation till. Formed in part during late glacial time. From 10 to 30 feet (3 to 9 meters) thick.

Qfl GLACIOFLUVIAL DEPOSITS (PLEISTOCENE) - Sand to cobbles on terraces deposited by glacial meltwater. From 10 to 50 feet (3 to 15 meters) thick.

Qgb1 BRANCH RIVER DEPOSITS - GLACIOLUCASTRINE (PLEISTOCENE) - Deposits grading from cobbles (proximal) to all sand (distal) laid down in a small glacial lake between receding ice and an outlet to the southeast at 480 to 500 feet (146 to 152 meters). From 10 to 50 feet (3 to 15 meters) thick. Name taken from Goldsmith, 1993.

Qic ICE CONTACT DEPOSITS (PLEISTOCENE) - Generally coarse-grained, poorly-sorted, water-laid sediments deposited englacially, subglacially, or in close proximity to active ice. Deposits are generally sand to cobbles, with some boulders. Ice crevasse fillings / eskers, formed within or beneath the ice mass, and are demarcated by red solid lines on the map. From 10 to 50 feet (3 to 15 meters) thick.

Qlm GLACIAL LAKE MILTON (PLEISTOCENE) - Deltaic and lake bottom deposits associated with Glacial Lake Milton. Glacial Lake Milton appears to have started draining southward over a bedrock outlet at 440 to 460 feet (134 to 140 meters) in Lebanon, Maine, approximately 2800 feet (854 meters) east of Milton. Later glacial drainage took advantage of the present course of the Salmon Falls River. Most of the Glacial Lake Milton deposits grade to an elevation of 420 to 440 feet (128 to 134 meters), suggesting that most were constructed while Glacial Lake Milton drained through the existing outlet, albeit at a higher elevation than at present. At the northern end of the quadrangle, Glacial Lake Milton deposits presently show maximum elevations of 440 to 460 feet (134 to 140 meters) due to rebound following deglaciation. Those deposits along the Branch River match with those of Goldsmith (1993) labeled "gb2". Materials consist primarily of well-sorted sand in distal locations to a mix of sand to cobbles in ice-proximal locations. From 10 to 120 ft (3 to 37 meters) thick.

Qsf GLACIOMARINE DEPOSITS (PLEISTOCENE) - Deltaic and submarine deposits that graded to sea level as the ice retreated up the Salmon Falls River valley. The deposits match those of Koteff (1991) on the Rochester Quadrangle. Elevations of deposits reflect the rapid change in sea level discussed by Koteff et al (1993). Deposits are generally sand to pebbles with local cobbles. From 10 to 60 feet (3 to 18 meters) thick.

Qt TILL (PLEISTOCENE)- Non-sorted to poorly-sorted mixture of silt, sand, pebbles, cobbles, and boulders. Much of the till has a high percent of sand and contains less than 10 % silt. Thickness is generally interpreted to be more than 10 ft (3 m).

Qtt THIN TILL (PLEISTOCENE) AND BEDROCK EXPOSURES - Areas of abundant bedrock exposures and till deposits interpreted to be generally less than 10 ft (3m) thick.

TEXTURE OF STRATIFIED DRIFT DEPOSITS

Pebbles to boulders with subordinate sand

Sand and pebbles; some cobbles

Fine to medium-grain sand

Well or test well reported as ending in bedrock - Number is depth to bedrock in feet; "na" labels refer to data that are not available. Well information from NHGS Water Well Inventory.

Contact

Generalized maximum extent of the late Wisconsinan synglacial sea.

gb1 480'-500' Melt-water spillway - controlled deposition of glacial lake deposits. Letter symbol indicates map unit controlled by spillway. Number indicates elevation of spillway (in feet).

Melt-water channel - cut chiefly in till.

Eskers / Ice Channel Fill Deposits: appear as steep-sided, sinuous, narrow ridges in areas of ice contact deposits.

Retreatal ice position of stagnant ice front

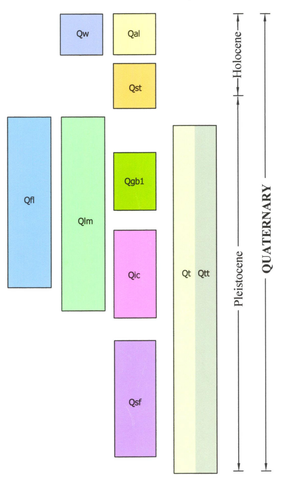
Direction of glacial striations: Observation is at arrow tip. Value is degrees rotation from true north.

Excavation Pit - Extent shown by hatchures

Bedrock Exposures

Photo 1 Photograph Location and Number

Correlation of Map Units



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Surficial Geologic Map of the Milton Quadrangle Strafford County, New Hampshire

Surficial Geologic Map Series No. NH-OFM-05-02

Surficial Geologic Mapping By: Daniel J. Tinkham

Digital Compilation By: Emery & Garrett Groundwater, Inc.

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