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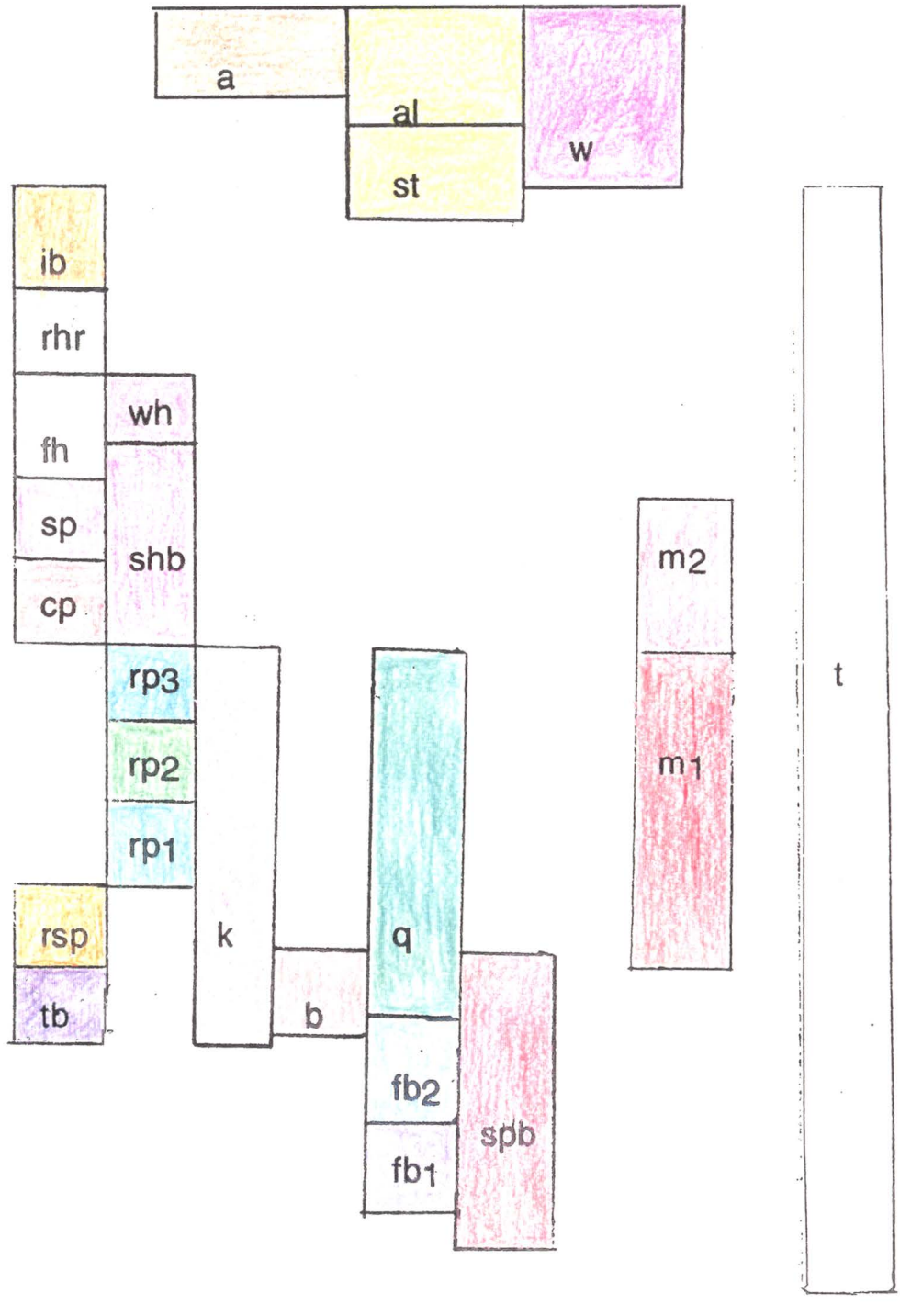
SURFICIAL GEOLOGY OF THE WEST HALF OF THE MOUNT MONADNOCK QUADRANGLE, CHESHIRE COUNTY, NEW HAMPSHIRE

BY

CAROL. T. HILDRETH

1997

CORRELATION OF MAP UNITS



SURFICIAL GEOLOGY OF THE WEST HALF OF THE MONADNOCK QUADRANGLE (TROY), CHESHIRE COUNTY, NEW HAMPSHIRE

DESCRIPTION OF MAP UNITS

By

Carol T. Hildreth

(NOTE: ALL UNITS ARE QUARTERNARY IN AGE AND SYMBOLS NORMALLY WOULD BE PRECEDED BY A "Q")

(Mapped in 1996 at 1:25,000 Scale and plotted on a 1:24,000 blowup of that base map)

A layer of windblown sand and silt, generally mixed with underlying glacial deposits, is present over much of the map area but is not shown.

NOTE: Correlation between isolated deposits and between map units is tentative.

a ARTIFICIAL CUT AND FILL--Manmade. Material of fill varies from natural sand and gravel to quarry wastes to sanitary landfill. Depth of cuts and thickness of fill variable.

al ALLUVIUM (HOLOCENE)--Sand, silt, gravel and minor muck in flood plains along present rivers and streams. As much as 3 meters (10 feet) thick. Extent of alluvium indicates most areas flooded in the past which may be subject to future flooding. In places, indistinguishable from swamp deposits (w).

w SWAMP DEPOSITS (HOLOCENE)---Muck, peat, silt, and sand. Generally 1/2 meter to 3 meters (1 foot to 10 feet) thick. In places indistinguishable from alluvium (al).

st STREAM-TERRACE DEPOSITS (HOLOCENE AND LATE PLEISTOCENE)--Sand, gravel, silt and minor muck on terraces built by the late-glacial and post-glacial South Branch Ashuelot River and Shaker Brook as these streams cut down their channels when their base levels dropped due to lowering of Glacial-lake Ashuelot and Glacial-lake Shaker Brook.

ib GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS ASSOCIATED WITH THE INDIAN BROOK OUTLET OF GLACIAL-LAKE ASHUELOT (PLEISTOCENE)--Sand, gravel and minor silt and clay deposited by south-flowing meltwaters beyond nearby ice as lake-bottom, deltaic, and alluvial-fan deposits associated with an outlet at the headwaters of Indian Brook in the Winchester quadrangle southwest of Swanzey Lake at elevation 156+ meters. Partly contemporaneous with stream-terrace deposits (st) As much as 21 meters (70 feet) thick.

rhr GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS ASSOCIATED WITH THE RABBIT HOLLOW ROAD OUTLET OF GLACIAL-LAKE ASHUELOT (PLEISTOCENE)-- Sand,gravel, and minor silt and clay deposited in contact with and beyond adjacent ice as kame-terrace deposits laid down by south-flowing meltwaters associated with an outlet along Rabbit Hollow Road in the approximate center of the east half of the Winchester quadrangle at elevation 210+ meters. As much as 30 meters (100 feet) thick.

fh GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS ASSOCIATED WITH THE FRANCONIA MOUNTAIN-HEWES HILL OUTLET OF GLACIAL-LAKE ASHUELOT (PLEISTOCENE)-- Sand, gravel, and minor silt and clay deposited in contact with and beyond adjacent ice as kame-terrace deposits laid down by south-flowing meltwaters associated with an outlet through notches at the north end of the Franconia Mountain Range and south of Hewes Hill near the east edge of the Winchester quadrangle between elevations 210 and 246 meters. Contemporaneous with West Hill (wh) and Shaker Brook (shb) deposits. As much as 18 meters (60 feet) thick.

sp GLACIAL-STREAM AND GLACIAL-LAKE DEPOSITS ASSOCIATED WITH THE SANDY POND OUTLET OF GLACIAL-LAKE ASHUELOT (PLEISTOCENE)--Sand, gravel, silt and clay deposited in contact with or beyond adjacent ice as ice-channel fillings, kame-terrace, kame-delta and lake-bottom deposits laid down by south-flowing meltwaters graded to Sandy Pond (282+ meters in elevation) in the southeastern part of the Winchester quadrangle. As much as 18 meters (60 feet) thick.

cp GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS ASSOCIATED WITH THE CASS POND OUTLET OF GLACIAL-LAKE ASHUELOT (PLEISTOCENE)-- Sand, gravel, silt and clay deposited in contact with or beyond adjacent ice as kame-terrace and kame-delta deposits graded southward to the Cass Pond divide in the Mount Grace quadrangle immediately southwest of the southwest corner of this quadrangle at 324+ meters elevation and partly to a 306+ meter elevation gap in the hills east of Buffum Hill. As much as 9 meters (30 feet) thick.

GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS OF FASSET BROOK (PLEISTOCENE)--Sand, gravel, silt and clay deposited in contact with or beyond adjacent ice as kame-terrace and kame-delta deposits. Unit fb_1 deposits are graded eastward to the divide (456-462 meters [1496-1516 feet] elevation) on Route 124 near the intersection with the Halfway House Road in the east half of the Monadnock qudrangle, and some of these deposits may be graded southward to the 408-meter divide east of Gap Mountain; unit fb_2 deposits are are graded southward and westward, first to the 408+ meter divide east of Gap Mountain and later to a 390+ -meter divide west of Gap Mountain.

fb_2 Kame-terrace and kame-delta deposits as much as 6 meters (20 feet) thick.

fb_1 Kame-terrace and kame-delta deposit as much as 9 meters (30 feet) thick.

wh GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS IN THE VALLEY EAST AND SOUTH OF WEST HILL IN THE MARLBOROUGH QUADRANGLE(PLEISTOCENE)--Sand, gravel, silt, and clay deposited in contact with or beyond adjacent ice as kame- terrace, kame-delta and outwash deposits laid down by south-flowing meltwaters. Contemporaneous with unit fh deposits (q.v.) and graded to the same outlet at 210 to 246 meters elevation; as much as18 meters (60 feet) thick.

shb GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS OF THE SHAKER BROOK AREA (PLEISTOCENE)--Sand, gravel, silt and clay deposited in contact with or beyond adjacent ice as kame-terrace, kame-delta, lake-bottom, and outwash deposits laid down by south-flowing meltwaters in the valley of Shaker Brook and the upper reaches of the South Branch Ashuelot River (SBAR) just north of the village of Troy. Apparently graded to several different outlets, each of which is at 306+ meters elevation, in the north-trending ridge that separates the south-flowing Shaker Brook from the north-flowing SBAR. The present juncture of these streams occurs just north of a gorge cut through bedrock where the railroad and Route 12 cross the SBAR. During late-glacial and post-glacial time the 306+ meter outlets were abandoned for a 288+ col in this ridge immediately north of the modern gorge. This 288+ col(not shown on map due to lack of space for symbol) served as the outlet for Glacial-Lake Shaker Brook during the latter stages of its existence, until meltwaters started carving down the modern gorge. At least two heads of outwash are identified in the quadrangle, and the lobe-shaped deposit at the north edge of the quadrangle marked by a triangle (▲) appears to be a delta. Partly contemporaneous with deposits of units fh, sp, cp, and wh. As much as 18 meters (60 feet thick, but generally less than than 6 meters (20 feet) thick.

spb GLACIAL-STREAM DEPOSITS OF THE SCOTT POND AND BROOK AREA (PLEISTOCENE)--Sand and gravel deposited beyond glacial ice by south-flowing meltwaters in the valley of Scott Pond and Scott Brook, as outwash deposits graded to the glacially swollen stream course. Meltwaters draining areas where Units fb_2, q, and b followed a course south and west down Fasset Brook and its tributaries and Quaker Brook and its tributaries; thence, these meltwaters flowed south toward Bowker Pond; thence northeastward through a valley occupied by modern-day swamp deposits (w) to a col at 358+ elevation; thence southeastward to Scott Pond. These meltwaters then followed several channels southward from Scott Pond, one of which is occupied by modern-day Scott Brook and the other channel , which trends southwest from Scott Pond is currently occupied by large swamps. The two separate channels meet at Stone Pond near the southeast corner of the quadrangle, and the meltwaters joined here to carve a deep channel in the valley of modern-day underfit Scott Brook south of Stone Pond. These meltwaters were primarily erosional forces, leaving only minor deposits along their course. Deposits are much as 3 meters (10 feet) thick.

GLACIAL-STREAM AND GLACIAL-LAKE DEPOSITS OF ROCKWOOD POND VALLEY (PLEISTOCENE)--Sand, gravel, silt, and clay deposited in contact with or beyond adjacent ice by meltwaters flowing southward through a 348+ meter elevation gap in the till hills south of Rockwood Pond. Three units are distinguished based primarily in the presence of ice-contact features in the deposits. Unit rp_1 occupies a narrow valley southwest of Rockwood and may be contemporaneous with Unit rsp. Unit rp_2 has a head of outwash slightly north of rp_1, within the same narrow valley and unit rp_3 has a head of outwash north of the village Troy. During the early history of the village of Troy, a fairly large pottery industry was based on the clay deposits found in this unit and possibly deposits of shb as well. Part of the ponded area southwest of the village was probably due to excavation of the clay deposits. The author found no evidence of present-day clay mining, but did find abandoned kiln works foundations in that area.

rp_3 Kame-terrace and kame-delta deposits; as much as 24 meters (80 feet) thick.

rp_2 Kame-terrace, kame-delta, and lake-bottom deposits; as much as 18 meters (60 feet) thick.

rp_1 Kame-terrace, kame-delta, and lake-bottom deposits; as much as 18 meters (60 feet) thick.

rsp GLACIAL-STREAM AND GLACIAL-LAKE DEPOSITS IN AND NEAR RHODODENDRON STATE PARK (PLEISTOCENE)--Sand, gravel, and minor silt and clay deposited in contact with or beyond adjacent ice as kame-terrace and kame-delta deposits laid down by meltwaters that flowed south over one or two 354+ meter divides in the hills south of the deposits. Probably contemporaneous with unit rp_1. As much as 12 meters (40 feet) thick.

tb GLACIAL-STREAM DEPOSITS IN THE VALLEY OF TULLEY BROOK (PLEISTOCENE)--Sand, gravel, and minor silt and clay deposited in contact with or beyond adjacent ice as outwash deposits laid down by meltwaters that flowed south down the valley of Tulley Brook. As much as 6 meters (20 feet) thick.

b GLACIAL-STREAM DEPOSITS NORTHEAST OF BOWKER POND (PLEISTOCENE)--Sand, gravel, and minor silt and clay deposited in contact with or beyond adjacent ice as outwash deposits laid down by meltwaters that flowed southeast toward a col at 358+ meters elevation through a channel presently occupied by swamp deposits northeast of Bowker Pond. As much as 3 meters (10 feet) thick.

k GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS IN THE KEMP BROOK VALLEY (PLEISTOCENE)--Sand, gravel, silt, and clay deposited in contact with or beyond adjacent ice as kame- terrace, kame-delta and outwash deposits laid down by south-flowing meltwaters. Contemporaneous with units tb, rsp, rp_{1-3}, b, q, fb_2, m_1, and spb. Unit k deposits were graded to a 960-990 foot elevation cut in till hills along Kemp Brook Road about 1 mile south of the quadrangle border in the Royalston quadrangle, prior to this divide being eroded down to its present level. As much as12 meters (40 feet) thick.

q GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS IN THE QUAKER BROOK VALLEY (PLEISTOCENE)--Sand, gravel, silt, and clay deposited in contact with or beyond adjacent ice as kame- terrace, kame-delta and primarily lake-bottom deposits laid down by southwest-flowing meltwaters. Contemporaneous with units tb, rsp, rp_{1-3}, b, k, fb_2, m_1, and spb. Associated with meltwaters graded to the 358+ elevation col northeast of Bowker Pond. As much as12 meters (40 feet) thick.

GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS IN THE MOUNTAIN BROOK VALLEY (PLEISTOCENE)--Sand, gravel, silt, and clay deposited in contact with or beyond adjacent ice as kame- terrace, kame-delta and ouwash deposits laid down by southwest-flowing meltwaters. Unit m_1 deposits are graded to a 402+ meter elevation col and are contemporaneous with units rsp, rp_{1-3}, q, k, and perhaps fb_2 and and spb. Unit m_2 deposits are graded to two or more 366+ meter elevation cols in the till ridge to the south and west and are contemporaneous with units shb, sp and cp.

m_2 Kame-terrace deposits; as much as 3 meters (10 feet) thick.

m_1 Kame-terrace, kame-delta and lake-bottom deposits: as much as 9 meters (30 feet) thick.

t TILL (PLEISTOCENE)--Light- to dark-gray, nonsorted to poorly sorted mixture of clay, silt, and, pebbles,cobbles and boulders; contains some gravel. Thickness varies but generally is less than 20 feet, but is commonly more than 80 feet under the crest of most drumlins.

BEDROCK EXPOSURES--Individual outcrops not shown completely. Solid is individual outcrop; closely ruled pattern covers large areas of outcrop (most notable is the summit of Mt. Monadnock); and widely ruled pattern indicates areas of abundant exposures and areas where surficial deposits are generally less than 10 feet thick. Mapped in part from aerial photos, Soil Surveys (Simmons and others, 1949, and Rosenberg, 1985), and data from bedrock geologic maps (Fowler-Billings, 1949, and Thompson, 1985).

MATERIALS OBSERVATIONS--Surficial materials in exposures, well holes and test holes. Letters indicate texture in decreasing order of abundance. Number indicates thickness in feet.

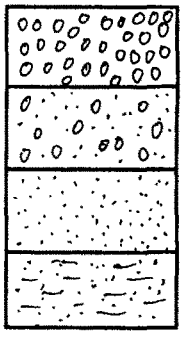
g gravel
b boulder
c cobble
p pebble
s sand (as separate beds; not including sand in matrix of gravel)
F fine sand
s silt
c clay
t till
B bedrock

WELL-HOLE AND TEST-HOLE DATA--Materials for some holes described. Approximately located from Harte and Johnson (1995) and Moore and others (1994).

● 37t Well or test hole that reached bedrock or refusal at depth indicated (in feet below surface).

O 6 Well or test hole that did not reach bedrock or refusal. Depth reached indicated (in feet).

TEXTURE OF STRATIFIED DEPOSITS--Indicated to a depth of at least I meter (3 feet)



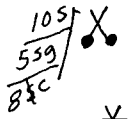
Pebble to boulder gravel

Mixed sand and gravel

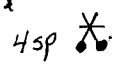
Sand

Sand, fine sand, silt and clay

Δ Delta



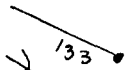
Borrow pit, small



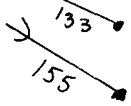
Borrow pit, small-abandoned

Borrow pit, large, or cut bank

Direction of glacial meltwater flow over outwash deposits

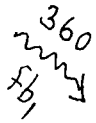


Glacial striations. Point of observation is at southern end of line.



Glacial groove. Point of observation is at south end of line

Drumlin form. Indicates general direction of glacial ice movement This part of the Monadnock area has an unusually large number of drumlins and they partly occur in peculiar formation. Arcuate eat-west rows of drumlins alternate with swamps and lakes,suggesting some type of end moraine formation, and some of them do line up with mapped heads of outwash (See attached tentative ice-frontal position sketch map Any ideas on how these drumlin rows formed will be welcomed.



Threshold (outlet) to which designated glacial deposits are graded. Number gives approximate elevation in meters. Symbol(s) is (are) unit(s) graded to the threshold.

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