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UNITED STATES DEPARTMENT OF THE INTERIOR

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U.S. GEOLOGICAL SURVEY

[Report - Open file series]

PRELIMINARY BEDROCK GEOLOGIC MAP OF THE
MIDDLE HADDAM QUADRANGLE,
MIDDLESEX COUNTY, CONNECTICUT

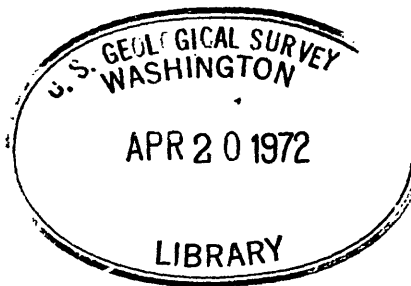
By Gordon P. Eaton and John L. Rosenfeld

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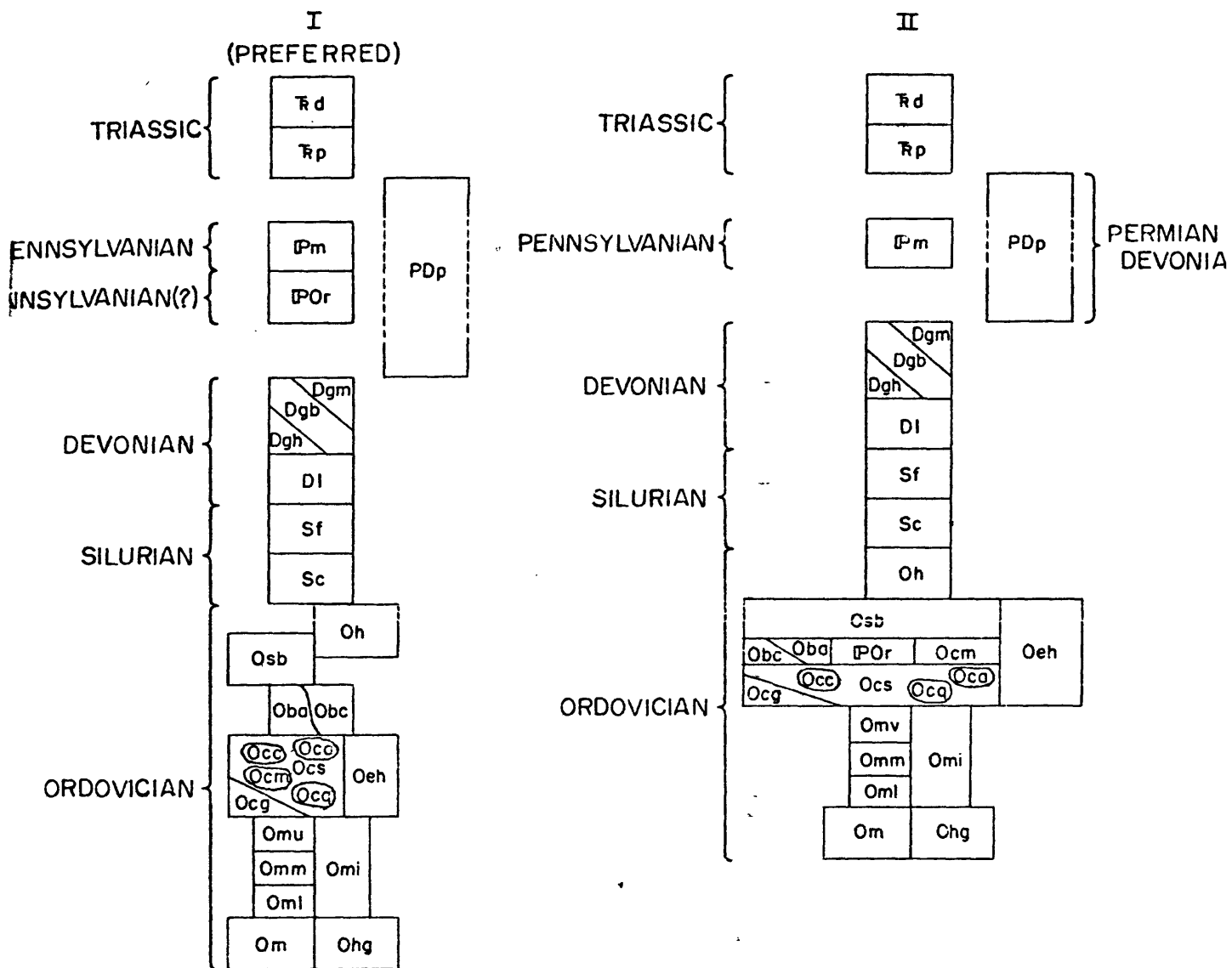


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This report is preliminary and has not been
edited or reviewed for conformity with U.S.
Geological Survey standards or nomenclature

EXPLANATION

Alternative correlations of map units



DESCRIPTION OF MAP UNITS

Ep

PORTLAND ARKOSE--reddish-brown to pale-brown arkoses ranging from micaceous mudstones to coarse sandstones and coarse (>30 cm) polymict conglomerates containing angular to rounded clasts of the metamorphic rocks present east of the border fault (but of lower metamorphic "grade"), pegmatite, and, rarely, vesicular basalt. Conglomerates become more abundant and coarser, and clasts become more angular, toward the border fault. Clasts show varying degrees of "retrograde" or diagenetic alteration. Clasts of quartzite, probably from the Clough Formation, are found only from Duck Hill north

Ed

DIABASE DIKE--dark-gray, tough, ophitic, hypersthene-bearing augite-plagioclase-magnetite diabase, locally containing biotite and hornblende; characterized by interstitial micrographic granite and microclusters of augite

PDp

PEGMATITE, UNDIVIDED--pink to white granitic pegmatite possibly of more than one age; it contains, in addition to microcline, microperthite, and (or) albite : quartz, highly variable amounts of muscovite and biotite, and minor beryl, apatite, black tourmaline, sphalerite, and several uranium minerals. Includes foliated and nonfoliated bodies, both concordant and discordant

Pm

MAROMAS GNEISS--very light gray to orangish-gray, massive to coarsely foliated microcline- and oligoclase-bearing biotite, biotite-hornblende, and biotite-muscovite granite gneiss, with subordinate granodiorite to quartz diorite gneiss containing minor sphene, zircon, and garnet. Includes some possible xenolithic, thin, lenticular bands of feldspathic biotite-muscovite schist, plagioclase-quartz-diopside-garnet granulite, hornblende-biotite-quartz-plagioclase gneiss, and garnetiferous hornblende-biotite schist

POr

AMPHIBOLITE OF RESERVOIR BROOK--dark-gray to black, massive to flaggy, mainly schistose to granulose, biotite-hornblende amphibolite containing oligoclase or andesine; minor sphene, apatite, and ilmenite; and, locally, microcline. Less abundant rock types include biotite-oligoclase schist and gneiss and dike- and sill-like bodies of granite augen gneiss, locally containing few dark minerals and resembling the Maromas Gneiss. Rocks show extensive alteration near the Triassic border fault

Dgm

GLASTONBURY GNEISS

Muscovitic phase--light-gray, massive to moderately well foliated, porphyroblastic to augenoid, muscovite- and (or) sericite-bearing granite gneiss consisting primarily of microcline (and locally orthoclase), oligoclase, and quartz (the total of which constitutes 92 percent of the rock) and also biotite, locally with minor sphene, garnet, zircon, allanite, and magnetite and sparse calcic scapolite. Potash feldspar commonly in the form of augen

GLASTONBURY GNEISS--(Continued)

- Dgb** Biotitic phase--light- to medium-gray, locally orange-stained, massive to foliated, microcline-bearing biotite granite and granodiorite gneiss; distinguished from muscovitic phase by absence or near-absence of muscovite and the local presence of epidote and a trace of hornblende, and a little garnet. Locally contains minor coarse-grained allanite. Here and there are flattened clots and spindles of dark-gray hornblende gneiss resembling xenolithic inclusions
- Dgh** Hornblendic phase--medium- to dark-gray, massive to subschistose hornblende-biotite granodiorite to quartz diorite gneiss; distinguished from biotitic phase by the presence of abundant hornblende, a much greater abundance of epidote and a lower proportion of microcline.
- Dl** LITTLETON FORMATION--Mainly silvery-gray to lead-gray muscovite-biotite-staurolite-garnet-plagioclase schist, with subordinate interbedded light-gray "sugary" feldspar-quartz-mica-garnet granofels, and distinctly subordinate muscovite-biotite-garnet-albite schist and bytownite-hornblende-clinzoisite-garnet granofels. Length of staurolite crystals commonly exceeds 2 inches. Lead-gray color due to finely disseminated graphite
- Sf** FITCH FORMATION--medium-gray, finely laminated, fine-grained calc-silicate schist and granofels containing highly variable proportions of plagioclase (commonly bytownite), quartz, biotite, muscovite, microcline, calcite, diopside, clinzoisite, tremolite-actinolite, garnet, sphene, and scapolite and minor tourmaline, apatite, graphite, pyrrhotite, ilmenite, allanite, and zircon. Outcrops are characteristically fluted and pitted and commonly display extremely tight folding.
- Sc** CLOUGH FORMATION--white to very light gray, muscovitic, locally garnet-bearing, quartzite and quartz pebble conglomerate, with subordinate laminae and stringers of silvery muscovite-biotite-garnet schist. Contains subordinate kyanite, tourmaline, rutile, and zircon. Garnet in schist commonly occurs as thin wafers having the thicknesses of the including laminae
- Oh** HEBRON FORMATION--interbedded gray to brownish-gray quartz-biotite-plagioclase schist and pale-greenish-gray, quartz, plagioclase-biotite-microcline-actinolite or hornblende-diopside calc-silicate rock, containing subordinate sphene, graphite, and rarely, calcite; locally contains major amounts of scapolite

Os b

CALC-SILICATE ROCKS AND SCHISTS OF BODKIN ROCK

Highly varied, well-bedded formational unit consisting largely of three major rock types (all showing considerable cataclasis and alteration near the Triassic border fault):

(1) Greenish-gray calc-silicate granofels and light-gray calcite marble containing highly variable proportions of calcite, diopside, calcic amphibole (mainly hornblende), calcic plagioclase, clinozoisite, garnet, quartz, sphene, and apatite. Although natural outcrops suggest that this lithology is subordinate to that of the schists, artificial cuts reveal that it is abundant throughout the section

(2) Rusty-weathering muscovite-biotite-garnet schist commonly containing albite, coarse kyanite (with or without fibrolitic sillimanite), graphite (either finely divided or in coarse flakes), and staurolite; also subordinate, but nearly ubiquitous, are rutile, brown tourmaline, apatite, ilmenite, and pyrite

(3) Light-purplish-gray well-banded plagioclase-biotite gneiss and granofels commonly containing muscovite, scattered small garnets, and subordinate brown tourmaline, ilmenite, and graphite

METAVOLCANIC ROCKS OF BIBLE ROCK BROOK

Ob a

Dark-gray to very dark gray laminated feldspathic amphibolite and hornblende schist containing hornblende, plagioclase (An 35-An 70; not uncommonly in the form of larger megacrysts), fine-grained garnet, and lesser amounts of biotite, diopside, epidote, ilmenite, and sphene. Locally, some massive amphibolite and epidote-rich lenses are present

Ob c

Pinkish-gray finely-laminated highly resistant rock composed largely of very small manganiferous garnets, quartz, and oligoclase and containing variable, but usually lesser, amounts of hornblende, biotite, cummingtonite(?), apatite, and locally coarse-grained euhedral magnetite (coticule). This rock is finely interlaminated with a subordinate gray feldspar-quartz-biotite schist and granofels. It is a prominent ledge and cliff former throughout its mapped length

Oeh

SCHIST OF EAST HAMPTON--principally gray to rusty-weathering muscovite-biotite schist commonly containing subordinate garnet, sodic plagioclase, coarse graphite, ilmenite, pyrrhotite, tourmaline, sillimanite (not uncommonly associated with orthoclase porphyroblasts), rutile, and zircon and locally characterized by the presence of pegmatitic stringers and a migmatitic appearance. Relatively poorly developed schistosity with coarse discordant muscovite. Quartz contains dispersed hairlike rutile needles. A less abundant rock type within this unit is bytownite-hornblende gneiss containing subordinate biotite and garnet. May be correlative with the Collins Hill Formation

COLLINS HILL FORMATION

Ocs

Highly varied unit somewhat similar, except for the common presence of feldspathic amphibolites, to the calc-silicate rocks and schists of Bodkin Rock and consisting largely of four principal rock types, listed in order of relative abundance:

(1) Rusty-weathering muscovite-biotite-garnet schist, commonly containing sodic plagioclase, kyanite, sillimanite (commonly in fibrolitic clusters approximately equal in size to associated kyanite), staurolite, and graphite and minor rutile, brown tourmaline, apatite, and ilmenite

(2) Greenish-gray calc-silicate granofels containing highly variable amounts of calcite, diopside, calcic amphibole (mainly hornblende), plagioclase (mostly bytownite), scapolite, clinozoisite, biotite, garnet, quartz, sphene, and apatite and, rarely, zoisite and microcline

(3) Gray-banded plagioclase-biotite gneiss and granofels, commonly containing muscovite, scattered small garnets, and minor rutile, graphite, ilmenite, and apatite

Oca

(4) Dark-gray to very dark gray massive to laminated amphibolite, hornblende gneiss, and hornblende schist, containing intermediate plagioclase (some as megacrysts) and locally containing biotite, garnet, sphene, and ilmenite. Locally associated with laminar cotecule. Some outcrops display euhedral porphyroblasts of dark-red garnets, as much as 10 mm across, weathered into sharp relief. Larger bodies are shown separately on the map. Smaller ones occur scattered throughout the schist (Ocs)

Occ

Beds, laminae, and contorted nodules consisting largely of pinkish-gray, fine-grained cotecule (garnet-quartz granofels) with subordinate plagioclase, biotite, and, locally, cummingtonite(?). Only the larger bodies are shown separately on the map. Smaller ones occur scattered throughout the schist (Ocs)

Ocm

Mottled dark-gray and light-greenish rock consisting of interdigitating and irregular flattened lenses, from 6 inches to several feet long, of hornblende-plagioclase rock (amphibolite) and diopsidic calc-silicate rock. Only one large body in the southeastern part of map is shown separately. Others occur throughout the schist (Ocs)

Ocq

Rusty-weathering muscovite quartzite, locally garnetiferous

Ocg

Very light gray oligoclase-quartz-biotite-muscovite gneiss, commonly containing considerable magnetite. Locally displays abundant small pebblelike discoid lenses composed primarily of quartz and fibrolite, etched into relief by weathering

Oml
Omu

MIDDLETOWN GNEISS

Very light gray to rusty orange-stained layered sodic plagioclase gneiss and granofels characterized by variable amounts of subcalcic amphiboles, cummingtonite, anthophyllite, and gedrite (commonly as large radiating clusters in the plane of the foliation) and also containing hornblende, chlorite, garnet, biotite, magnetite, and ilmenite. Subordinate amphibolite and plagioclase-quartz-biotite gneiss interlayered throughout

Omm

Light-gray to medium-gray oligoclase-quartz-biotite gneiss commonly containing hornblende, garnet, and magnetite and, less commonly, cummingtonite or orthoamphiboles

Oml

Predominantly dark-gray interlayered amphibolite and hornblende gneiss containing intermediate to calcic plagioclase, epidote, diopside, garnet, magnetite, and sphene; some lighter colored plagioclase-quartz-biotite gneiss containing cummingtonite or orthoamphibole is interlayered with the amphibolites

Om

MONSON GNEISS--light- and dark-gray interlayered sodic plagioclase-quartz-biotite-hornblende gneiss and granulite, biotite-hornblende gneiss, biotite gneiss, and very dark gray amphibolite. Some of the gneisses contain microcline, garnet, and epidote and minor allanite and sphene. Distinguished from the Middletown Gneiss principally by the total absence of orthoamphiboles

Ohg

HADDAM GNEISS--generally light-gray thickly layered sodic plagioclase-quartz-biotite-hornblende gneiss and sodic plagioclase-quartz-hornblende gneiss commonly containing magnetite, garnet, sphene, epidote, and, rarely, clinopyroxene. May be equivalent to the Monson gneiss, although it displays a very much lower proportion of interlayered amphibolites

Contact

Dashed where approximately located, dotted where concealed.

Fault

Dashed where approximately located, dotted where concealed.

PLANAR FEATURES

25
└─┘

Strike and dip of bedding in sedimentary rocks.

25
└─▲─┘
Inclined

25
└─◆─┘
Vertical

25
└─▲─┘
Inclined, with
variable strike

Strike and dip of schistosity or foliation of metamorphic rocks.
(Generally parallel to compositional layering except at the noses
of folds).

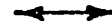
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Strike and dip of planar parting due to pronounced lineation.

LINEAR FEATURES



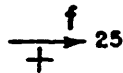
Plunging



Horizontal

Tail of single-headed arrow or center of double-headed arrow at point of observation. Letter symbol indicates nature of lineation, as follows: f, fold axis; c, crinkle axis (microfold with amplitude of a few mm) or axis of crenulation caused by slip cleavage cutting schistosity; b, axis of thinning in boudinaged rock; s, intersection of schistosity with compositional layering; q, rod of quartz; g, grooves; m, general mineral lineation; H, hornblende, B, biotite trains.

MINOR FOLDS OR CRINKLES



Plunging asymmetrical fold. + sign on right of arrow looking in direction of its flight indicates counterclockwise (sinistral) shear, + sign on left indicates clockwise (dextral) shear.



Horizontal

Well penetrating buried rocks of formation within which it is located on map.



Location of critical float judged to be close to source.



Axis of narrow, elongate aeromagnetic anomaly judged to be due to hidden diabase dike.