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Lithologic sections from the New London area, southeastern Connecticut

by

Richard Goldsmith[1]

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[1]National Center, Reston, VA 22092

Lithologic sections from the New London area, southeastern Connecticut

Lithologic sections (Plate I) were measured in the New London area, Connecticut (fig. 1), to illustate the nature of the rock sequences and as an aid in determining the stratigraphy in the Late Proterozoic terrane of southeastern Connecticut. Sections were measured by pace and compass in areas where exposures were abundant within the six quadrangle area mapped by Goldsmith (1967a-d, 1985a) and supplemental sections derived from the geologic map and field notes were obtained for purpose of comparison (fig. 1). Pace and compass traverses were over an area of abundant outcrops on the north side of Hunts Brook near Bougue Brook Reservoir in the Montville quadrangle, section I; along the Connecticut Turnpike, now I-395, during construction of the turnpike in the Uncasville quadrangle, sections II and III; and across a series of ledges west and north of Wyassup Lake in the northeast Old Mystic quadrangle, section V. Map-derived sections were prepared for an extension of the Wyassup Lake section, V; and from an area of abundant ledges west of Salem airport and Forsyth Hill south to Fairy Lake in the northwest corner of the Montville quadrangle, section IV.

Lithologic sections II, III, and IV are primarily from rock sequences on the northern, upright limb of the Montville dome, the north-dipping strata below the Honey Hill fault. Section I is from the tectonically thinned, steep southern limb of the Montville dome, the Selden Neck dome of Lundgren (1963). Section V is on the north limb of the Potter Hill dome (Goldsmith, 1985a). Positioning the Waterford Group above the Plainfield Formation in the sequences, and designating upper, middle and lower parts of the Plainfield are based on the interpretation that the moderately north-dipping section below the Honey Hill fault is right side up. There is no topping evidence, however, to show that this is so. Thus the lowest member of the Plainfield is represented in section III near Uncasville, and the Waterford Group lies above the Plainfield in sections I, IV and V. The top of the Waterford Group is not reached in the north limb of the anticlinorium as the north-dipping Honey Hill fault cuts down into the Waterford Group. The Hunts Brook schist lies above the Waterford Group in the Hunts Brook syncline (Goldsmith, 1980, 1985b). The Hunts Brook schist, which may or may not be conformable above the Waterford Group, is not described here. It is inferred to be stratigraphically equivalent to the some part of the Tatnic Hill Formation in the upper plate above the Honey Hill fault.

The sections shown in the Montville dome are approximately matched in the Lyme dome to the south. The top of the sequence lies at the Hunts Brook syncline. The base of the Plainfield is not recognized in either dome, however, but may be present in the core of the Lyme dome in the Darrow Pond area, although inferred early isoclinal folding may have repeated the section here.

A more complex structural interpretation than that used to construct these sections, features the Montville dome as a refolded isoclinal fold. This would require that the upper and lower members of the Plainfield are equivalent and the middle Plainfield (Cochegan member) is equivalent to part of the Mamacoke Formation. Although both the upper and lower parts of the Plainfield are quartzitic, and the middle Plainfield contains lithologies that might be found in the Cohanzie member of the Mamacoke, enough differences

exist between the possibly equivalent units so that the simpler structural and stratigraphic interpretation of these sections is preferred. One puzzling area which supports the more complex interpretation is near the submarine base at Groton, east of the Thames River, Uncasville quadrangle, where the Mamacoke Formation doubles back around the plunging nose of the refolded Hunts Brook syncline (Goldsmith, 1961).

The lithologic sections (Plate I) are illustrative of the two major divisions of layered rock in the Late Proterozoic terrane of southeastern Connecticut. The rocks lie in the sillimanite-muscovite zone of metamorphism in the north and east and in the sillimanite-orthoclase zone in the south and southwest. Section IV, section V, and the northern part of section II are in the sillimanite-muscovite zone. Sections I and III and the southern part of section II are in the sillimanite-orthoclase zone. In all the sections, the layered sequence is interrupted by intervals of alaskitic and granitic gneiss. These semi-concordant sheets, although possibly representing metamorphosed volcanic rock, are not discussed here. Their lithology and formational names are indicated however in the sections.

Divisions of the Waterford Group were established in the south limb of the Montville dome (see section I), and in the Lyme dome, (Goldsmith, 1976, 1980). The divisions of the Waterford established in the Hunts Brook area are not as clear on the north limb of the anticlinorium, and the divisions there are inferred. The Waterford Group is interpreted as having a protolith consisting mostly of volcanic and plutonic rocks but also a minor component of sedimentary material that is in large part volcaniclastic.

The Plainfield Formation is primarily a metasedimentary unit in which quartzitic rocks are prominent. The upper Plainfield is characterized by thin-bedded quartzite, and thin pelitic schist sections, the lower Plainfield is characterized by thick-bedded quartzite and thick sections of pelitic schist. The middle Plainfield, the Cochegan member, is poor in quartzite and tends to be calcareous and feldspathic. Remarks pertaining to the sections are given below from top to bottom of each section.

Section I: Bogue Brook Reservoir

Most of the rocks of the Bogue Brook Reservoir section are the Waterford Volcanic-Plutonic Suite. The section is oriented south to north to match the sections on the north limb of the Montville dome. The section measured is similar to the section to the east traversed during the New England Intercollegiate Geological Conference, October, 1985 (Goldsmith, 1985b, Stop 4).

At the top of the section is the poorly exposed contact of the Rope Ferry Gneiss with the Hunts Brook schist. The contact zone is marked by an interval one to two meters wide of thinly layered mafic and felsic rock. Similar rock can be seen at stop 4 of the NEIGC trip mentioned above and along either side of the Niantic River at and opposite stop 2. The Rope Ferry Gneiss is a typically massive homogeneous unit containing only elongate inclusions of amphibolite. It is interpreted to be of plutonic origin. Only the thinly layered amphibolite and plagioclase gneiss phase of the New London Gneiss is present in this section. The meta-plutonic granodiorite gneiss phase of the New London first appears in the sequence in the Miller Pond area to the east

and has its maximum expression in New London city. The Joshua Rock Granite Gneiss, preferably now called Joshua Rock Granite, and shown to be of Permian or late Carboniferous age (R. E. Zartman, written commun. 1983) forms a concordant sheet approximately between the New London interlayered amphibolite and plagioclase gneiss and gneiss of the Mamacoke Formation. The assemblage of diverse thin rock types in the Cohanzie member of the Mamacoke is distinctive and elements of it can be recognized as far east as the Poquonock Bridge area, Groton, where they are seen only as thin screens or as inclusions in granitic rock. In the Lyme dome, the different rock types in the unit thicken unsystematically as can be seen in the long hill west of the Niantic River.

The typical gneiss of the Mamacoke Formation is a gray, granitoid, indistinctly layered plagioclase gneiss containing prominent magnetite. The rock is interpreted to be a relatively homogeneous, intermediate to felsic volcanic rock. It locally contains elongate inclusions of amphibolite but they are not as abundant as a rule than in the Rope Ferry Gneiss. Indistinct, flattened clasts that may have been pumice can be seen in exposures of gray gneiss along Route 2A west of the bridge over the Thames River, Uncasville quadrangle in the north limb of the dome. The contact of the gray gneiss with the light-colored alaskite gneiss is in places indistinct as if the two were gradational. However, the bulk chemistry of the two rocks differ and apparent gradational contacts are interpreted in most places to be due to smearing during tectonic thinning.

The rocks of the Waterford Group are well displayed in the Lyme dome and east of the dome in the eastward plunging structure extending from the New London area to and beyond the Stonington area. The formational divisions become less distinct in the Mystic area. The gneiss in the vicinity of Stonington (the Stonington gneiss of L. H. Martin (1925) contains hornblende as does the Rope Ferry Gneiss and texturally resembles the Rope Ferry, but because it appears to be gradational with the Mamacoke Formation, and plots in the granodiorite field (Plate I), it was assigned to the Mamacoke Formation by Goldsmith (1985a). An assemblage of hornblende gneiss and amphibolite (Zha, Goldsmith, 1985a) occupying a spoon-shaped synform in the southern Old Mystic quadrangle north of the Pequot Trail and straddling I-95 is not correlated with any part of the section to the west and its position in the stratigraphy is indeterminate.

The quartzite at the bottom of the section is a screen in biotite granite gneiss (Potter Hill Granite Gneiss) but the quartzite is interpreted as representing the top of the Plainfield Formation. The latter, however is very thin on this limb of the dome, and in fact, the three divisions of the Plainfield can not be readily distinguished because of the thinness of the section and the amount of granitic material therein.

Section II: Connecticut Turnpike - Cochegan Rock

Section II, measured in fresh rock along the Connecticut turnpike from about opposite Cochegan Rock to near Raymond Hill Road, Uncasville quadrangle, encompasses almost the complete section of middle Plainfield. A parallel section in which the rocks appear in their natural weathered aspect lies in a series of ledges on the hill to the west of the highway between Raymond Hill Road and Cochegan Rock. The highway and the parallel section are considered the type section for the Cochegan member.

The biotitic and feldspathic quartzite at the top of the column is probably near the top of the Cochegan member. At this horizon at other places beds of creamy white quartzite 0.5 to 1 m thick is present. The rocks to the south of and below this quartzite are certainly part of the member. The layers of plagioclase gneiss, although superficially resembling plagioclase gneiss of the Waterford Group are typically more calcareous and quartzitic (R. Goldsmith, unpublished data) and are intepreted to be primarily metasedimentary rather than meta-volcanic.

A diagnostic calc-silicate quartzite and associated calc-silicate gneiss is exposed at the south end of the section near the concealed contact with the Potter Hill Granite Gneiss. This distinctive rock can be traced across the entire tier of quadrangles in the New London area. It crops out near the contact with the Potter Hill southeast of Long Pond, north of North Stonington in the Old Mystic quadrangle, and layers of calc-silicate quartzite are prominent in the shallowly dipping fold nose in the Gallup Hill area in the southeast Old Mystic quadrangle and adjacent Uncasville quadrangle.

The Cochegan section is matched in the Lyme dome in a belt of rocks east and west of Chesterfield in the Montville quadrangle, south of the resistant ridge formed by upper Plainfield quartzite. It is not a significant unit in the Old Mystic and Mystic quadrangles where it is subordinate to granite gneiss and where the Plainfield is primarily the upper member.

Section III: Connecticut Turnpike - Uncasville

Rocks typical of the lower Plainfield are exposed along the Connecticut Turnpike, I-395, and its entrance and exit ramps near Uncasville. The section has been pieced together by projecting and correlating exposures along the ramps and the two lanes of the turnpike. Minor faulting is evident in the exposures and the rocks do not project from one road cut to another directly in every case. Mesoscopic folding may also be responsible for this. The pelitic schist in the southbound exit ramp is much thicker than seen in other places. To the south and southwest it forms an extensive envelope around the Gay Hill granite pluton in the core of the Montville dome. Similarly the thick interval of quartzite in the upper part of the section and which makes up Houghton Mountain is much thicker than intervals of quartzite elsewhere in the area. Possibly the thick section of quartzite along the turnpike and in Houghton Mountain represents a fold nose. Exposures along the shore of the Thames River to the east from Point Breeze to beyond Kitemaug are of alternate intervals of quartzite and pelitic schist rather than entirely quartzite. Quartzite and schist of the lower Plainfield is well exposed along the power line on the south end of Gungywamp Hill, Uncasville quadrangle. Here again the quartzite interval is much thinner. The top of the lower Plainfield is

placed at the top of a sequence of relatively thick quartzite beds and intercalated schist. Calcareous beds are scarce or absent. As mentioned above, the contact with the Cochegan member is not usually seen because of intervening granite gneiss. The base of the lower Plainfield has not been identified as mentioned above, although it may be present near Darrow Pond in the Lyme dome. The Uncasville section of lower Plainfield has its equivalent in the Lyme dome. The thick quartzite and feldspathic quartzite of section III is represented by the sillimanite-bearing nodular quartzite in the Silver Falls area (Goldsmith, 1985b, Stop 3A) and to the south toward Bride Lake in the Montville and Niantic quadrangles. The pelitic schist is exposed in ledges east of Latimer Brook, northeast of Darrow Pond, but it seems to be appreciably invaded by granite to the south. Rocks typical of the lower Plainfield are absent in the Mystic and Old Mystic quadrangles where rocks higher in the stratigraphic column prevail.

Section IV: Salem Airport - Forsyth Hill

The abundance of amphibolite as screens in Hope Valley Alaskite Gneiss in the upper part of the section suggests that these screens may be part of the New London Gneiss. The hornblende and biotite plagioclase gneisses below in the vicinity of Route 82 are not particularly definitive, but are most readily assigned to the Mamacoke Formation. They are similar to layers of Mamacoke Formation in the southeast Old Mystic and northern Mystic quadrangles. On the quartz-plagioclase-K-feldspar diagram (Plate I), a sample of Mamacoke Formation from Route 82 and another from the Mamacoke in the Mystic area fall with the Rope Ferry Gneiss in the tonalite field. Poorly exposed epidote-rich rock adjacent to sillimanite-bearing schist below and south of the interval of plagioclase gneiss is interpreted as equivalent to part of the Cohanzie member of the Mamacoke (section I). The sillimanite schist could be metasomatized to the sillimanite-bearing nodular gneiss of the Cohanzie. Below an interval of plagioclase gneiss are pelitic schists assigned to the Plainfield Formation. The top of a thick interval of thin-bedded quartzite lies just south of Forsyth Road. The top of the middle member of the Plainfield is placed where a thin-bedded quartzite passes into calcareous schists and quartzite. The base of the middle member is placed below the distinctive ledge-forming calc-silicate quartzite (see section II) outcropping near Fairy Lake. Invariably, however, this rock tends to be at or near the contact with thick masses of biotite granite gneiss (Potter Hill Granite Gneiss) so that direct contact of middle Plainfield with lower Plainfield is never seen. Exposures are poor south of Fairy Lake. The interval equivalent to the column of section II is indicated by tie lines.

Section V: Wyassup Lake

The detailed (1:2,400) section at Wyassup Lake is the most complete section of upper Plainfield in the New London area. Rocks of the Waterford Suite differ substantially from the sequence of section I to the west in that amphibolite is more abundant at the top of the section and that lower down, rocks similar to those in the Plainfield are interspersed with the gray plagioclase gneisses.

The top of the detailed section barely reaches the sequence of thick amphibolites. Below this are Plainfield-like lithologies that may be folded in, faulted in, or may be part of the sequence, the assumption followed

here. Minor folds are prominent in these rocks, but there is little evidence for faulting. This sequence was assigned on the geologic map of the Old Mystic and Mystic quadrangles (Goldsmith, 1985a) to a new unit (Zmhq) of the Waterford not recognized elsewhere. The base of the Waterford in this section is marked by a distinctive fine-grained gray gneiss containing scattered hornblende megacrysts. This marker unit can be traced to exposures along Route 2 north of Lantern Hill. Below this layer is thin-bedded quartzite typical of the upper Plainfield and below the quartzite is interlayered pelitic schist and subordinate quartzite. The location of the base of the upper Plainfield is not exposed. It may lie above the amphibolite shown on the map-derived section that lies above the thick sheet of Hope Valley Alaskite Gneiss on Stewart Hill. The quartzite below the alaskite gneiss is interpreted as an interval of quartzite near the top of the Cochegan member. If so, it is thicker than in the sections to the east. A pure, thick, cream-colored quartzite layer is characteristic elsewhere of this interval. But again, as in section II, if it weren't for intervals of non-exposure and the intervening granite and alaskite sills, it might be seen that this quartzite would actually be more appropriately assigned to the upper Plainfield. The marker calc-silicate horizon adjacent to Potter Hill Granite Gneiss is near the base of the Cochegan section. However, the intervening feldspathic gneisses do not appear to be as calcareous as those in section II.

Quartzite and schist similar to that in the upper Plainfield in the Wyassup section are exposed in the southern Old Mystic quadrangle along Route 184 near Burnetts Corner west of Old Mystic. Other thin zones of quartzite and schist interspersed and infolded in the voluminous rocks of the Waterford Suite in the Stonington and Mystic areas also are assigned to the upper member of the Plainfield.

Chemistry and petrology of the rocks

Comparisons of chemical composition of rocks of the Plainfield with rocks of the Waterford Group and with other major units of southeastern Connecticut are shown on the SiO_2 - CaO - Al_2O_3 ternary plot. The data were derived from chemical analyses of rocks in the New London area in the files of Richard Goldsmith and from unpublished data on rocks elesewhere in eastern Connecticut in the files of H. R. Dixon, G. L. Snyder, and from published data by Snyder (1964).

The Plainfield pelites are on the whole more calcic than the pelites of other formations in eastern Connecticut. The calcareous rocks are more silicious than those in the Hebron Formation. The primarily quartzitic nature of the Plainfield is readily seen. An overlap exists with rocks of the Waterford Group, which is not suprising considering that they are part of a continuous metamorphosed sedimentary - volcanic section.

Most of the Waterford Group plot in the granodiorite and tonalite fields on the quartz-plagioclase-K feldspar diagram (Plate I) and on a ternary ab-an-or diagram (not shown) indicating the intermediate character of the igneous event that produced them. Quartz dioritic and granitic phases are subordinate. Some mafic-poor layers interspersed with amphibolite in the New London Gneiss are trondhjemitic according to a plot of chemical data on a ternary ab-or-an diagram (not shown). No diorite or gabbro is present. Amphibolites (not shown) plot in the diorite/gabbro/anorthosite field on, or

close to, the quartz-plagioclase tie line. The spread of plots of rocks of the Cohanzie member of the Mamacoke Formation reflect the distinctive variety of rock types of this unit. The two samples from the Cohanzie member that plot toward the quartz end of the ternary diagram are considered to be volcaniclastic. That the Waterford Group may be the mafic end of a mafic to felsic igneous sequence in which the granitic rocks (Potter Hill Granite Gneiss, Hope Valley Alaskite Gneiss) (not plotted) shown in the sections may be the felsic end, is a possibility that should be more appropriately discussed elsewhere.

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Modes of rocks in the Waterford Group, Section I
(tr-trace; nd-not determined; percent anorthite determined optically on grains oriented perpendicular to crystallographic axis a)

Points counted	1186	1310	1154	1329	1366	1054	1137	1262	1207	1051	1318	1221
Sample Number	1	2	3	4	5	6	7	8	9	10	11	12
Field Number	C-479	C-450	C-480	C-481	C-482	C-483	C-487	C-488	C-489	C-492	C-493	C-496a
Quartz	31	29	10	23	13	0	0	35	41	35	39	28
K-feldspar	4	0.4	2	2	1	0	0	9	37	19	22	0
Plagioclase	47	47	53	57	52	31	34	50	20	44	36	42
Biotite	16	10	7	11	0.3	1	0	6	2	0.8	2	25
Hornblende	2	13	0.3	6	27	67	60	tr	0	tr	0	0
Pyroxene	0	0	0	0	5	0.1	5	0	0	0	0	0
Iron oxide	tr	0.2	0.4	0.5	0.9	0.9	0.6	1	0.4	1	0.6	0.2
Sphene	tr	0.1	0.4	tr	0.7	0.1	0.4	tr	0	tr	0	0
Garnet	0	0	0	0	0	0	0	0	tr	0	0	4
Muscovite	0.4	tr	0	0.1	0	0	0	0	0	0.3	0.2	0
Sillimanite	0	0	0	0	0	0	0	0	0	0	0	tr
Apatite	0.1	0.3	0.1	0.5	0.4	0	0.1	tr	0	0	0	0.5
Allanite	tr	0.1	0	0.2	0	0	0	tr	tr	0	tr	0
Zircon	tr	tr	tr	0	tr	0	0	0	tr	tr	0	tr
Scapolite	0	0	0	0	0	0	0	0	0	0	0	0
Chlorite/ epidote	0	tr	0.1	tr	0	0.2	0.1	0	0	tr	tr	0
Carbonate mins.	0	0	0	0	0	0	0	0	0	0	0	0
Percent anorthite	36	30	33	29	35	38	49	28	32	12	nd	nd

Modes of rocks in the Waterford Group, Section I, continued
(tr-trace; nd-not determined; percent anorthite determined optically
on grains oriented perpendicular to crystallographic axiz a)

Points counted	1137	1045	901	1084	1262	1201	1160	1151
Sample Number	13	14	15	16	17	18	19	20
Field Number	C-496b	C-497	C-500	C-502	C-503	C-504	C-505	C-506
Quartz	34	46	61	45	25	32	28	27
K-feldspar	0	4	0	32	15	17	14	9
Plagioclase	39	27	12	16	49	41	46	51
Biotite	15	21	0	3	7	10	10	12
Hornblende	0	0	0.2	0	0	tr	0	0
Pyroxene	0	0	2	0	0	0	0	0
Iron oxide	1	2	0.3	1	2	0.2	0.7	0.5
Sphene	0	0	0.6	0	0	0	0	0
Garnet	10	0	0.1	0	0	0	0	0
Muscovite	0.3	0.9	0	3	0.9	0.6	0.3	0.2
Sillimanite	0	0	0	0.4	0	0	0	0
Apatite	0.2	0	0.2	0	0.3	0	0.3	0.1
Allanite	0.1	0	tr	0	0	0.2	0	0
Zircon	tr	tr	0	tr	0	tr	tr	tr
Scapolite	0	0	7	0	0	0	0	0
Chlorite/ epidote	tr	0	0	0	1	0	0.1	0.1
Carbonate mins.	0	0	4	0	0	0	0	0
Percent anorthite	65	35	78	nd	nd	29	nd	nd

Modes of rocks in the Plainfield Formation, Section II (tr-trace; percent anorthite determined optically on grains oriented perpendicular to crystallographic axis a. Modes determined by visual estimate)

Sample Number	1	2	3	4	5
Field Number	C-541	C-535	C-536	C-532	C-730
Quartz	90	50	15	60	75
K-feldspar	0	2	0	0	5
Plagioclase	3	30	60	30	10
Biotite	3	13	12	2	0
Muscovite	2	tr	0	1	0
Sillimanite	0	0	0	0	0
Garnet	0	0	0	0	0
Iron oxide	1	1	tr	1	tr
Hornblende	0	0	10	1	2
Diopside	0	0	0	0	3
Scapolite	tr	0	0	0	2
Sphene	tr	0	1	1	1
Apatite	tr	tr	tr	0	tr
Allanite	0	0	tr	tr	0
Zircon	tr	tr	0	0	0
Epidote	0	0	1	1	3
Chlorite	tr	tr	1	1	tr
Carbonate mins.	tr	0	tr	tr	tr
Percent anorthite	60	31	37	70	78

Modes of rocks of the Plainfield Formation, Section III (tr-trace; nd-not determined; percent anorthite determined optically on grains oriented perpendicular to crystallographic axis a. Modes detemined by visual estimate)

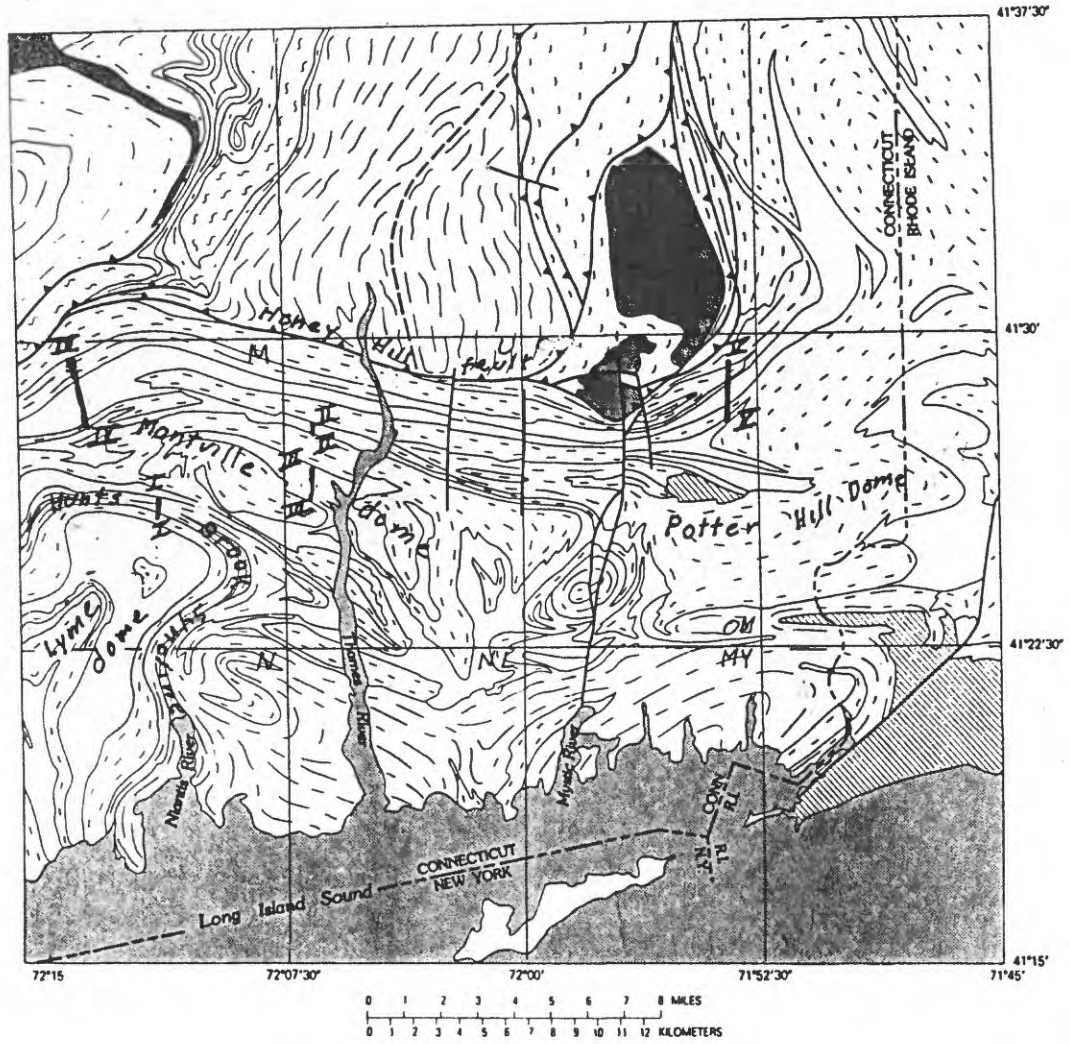
Sample Number	1	2	3	4	5	6	7
Field Number	C-518	C-517	C-520	C-521	C-522	C-529	C-530
Quartz	90	95	55	25	25	40	30
K-feldspar	5	0	2	0	0	0	15
Plagioclase	0	0	5	45	43	28	45
Biotite	2	2	20	25	25	17	25
Muscovite	1	2	tr	tr	0	1	tr
Sillimanite	0	0	5	0	0	0	0
Garnet	0	0	5	8	7	1	tr
Iron oxide	1	1	0	tr	tr	tr	0
Rutile	0	tr	0	tr	0	0	0
Apatite	0	0	tr	tr	tr	tr	tr
Zircon	tr	tr	0	0	tr	tr	tr
Tourmaline	0	0	0	tr	tr	0	0
Chlorite	0	0	tr	0	0	tr	0
Carbonate mins.	0	0	tr	tr	0	0	0
Percent anorthite	nd	nd	32	34	33	28	29

Modes of rocks in the Waterford Group and Plainfield Formation, Section V
(tr-trace; nd-not determined; percent anorthite determined optically on grains oriented perpendicular to crystallographic axis a. Modes determined by visual estimate)

Sample Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Field Number	927	924	928	923	922b	922a	929	921	931a	920	967d	918b	918a
Quartz	10	1	25	25	30	2	93	25	35	20	15	35	40
K-feldspar	0	0	20	10	25	0	0	tr	20	2	0	0	15
Plagioclase	30	35	35	35	45	45	3	45	35	0	50	25	30
Biotite	tr	tr	20	25	1	tr	2	25	3	50	25	40	2
Hornblende	55	60	0	1	0	50	tr	2	0	3	5	0	10
Iron Oxide	3	3	tr	1	tr	2	1	0	tr	0	0	1	0
Sphene	2	1	tr	1	tr	2	0	tr	0	1	1	0	1
Muscovite	0	0	0	0	0	0	1	0	1	0	0	0	0
Sillimanite	0	0	0	0	0	0	0	0	tr	0	0	0	0
Apatite	tr	tr	tr	tr	tr	tr	tr	tr	0	tr	tr	tr	0
Allanite	tr	0	tr	tr	0	0	tr	tr	0	0	tr	tr	tr
Zircon	0	0	tr	tr	0	0	tr	tr	tr	0	0	0	tr
Tourmaline	0	0	0	0	0	0	tr	0	0	0	0	0	0
Scapolite	0	0	0	0	0	0	0	0	0	25	0	0	0
Chlorite	tr	tr	0	0	tr	0	1	0	0	0	0	0	0
Epidote	tr	tr	0	tr	0	0	0	3	0	tr	tr	tr	1
Carbonate mins.	tr	0	tr	0	0	tr	tr	0	0	1	0	0	0
Percent anorthite	42	30	35	35	17	36	nd	30	12	nd	46	38	32

Modes of rocks of the Waterford Group and Plainfield Formation, section V continued
(tr-trace; nd-not determined; percent anorthite determined optically on grains oriented perpendicular to crystallographic axis a. Modes determined by visual estimate)

Sample Number	14	15	16	17	18	19	20	21	22
Field Number	917f	917e	917d	917c	917a	967a	967b	966	1420
Quartz	25	27	45	90	25	72	40	25	25
K-feldspar	0	0	0	0	0	0	0	0	25
Plagioclase	40	25	25	2	30	20	40	50	30
Biotite	30	45	27	8	0	8	20	20	8
Hornblende	0	3	0	0	45	0	0	0	0
Iron oxide	1	1	0	tr	1	tr	0	1	tr
Sphene	0	0	0	0	0	0	0	tr	0
Garnet	1	1	0	0	0	0	0	tr	0
Muscovite	0	0	1	tr	tr	tr	1	2	0
Sillimanite	0	0	tr	0	0	0	0	tr	0
Apatite	tr	tr	tr	tr	tr	tr	tr	tr	tr
Allanite	0	0	0	tr	0	0	tr	tr	1
Zircon	tr	tr	tr	tr	0	tr	tr	tr	0
Tourmaline	tr	0	0	tr	0	0	0	tr	0
Chlorite	0	0	0	tr	0	tr	0	1	0
Epidote	0	0	0	0	0	tr	0	0	1
Carbonate mins.	0	0	0	0	tr	0	0	0	0
Percent anorthite	40	70	39	nd	60	nd	36	38	48



EXPLANATION

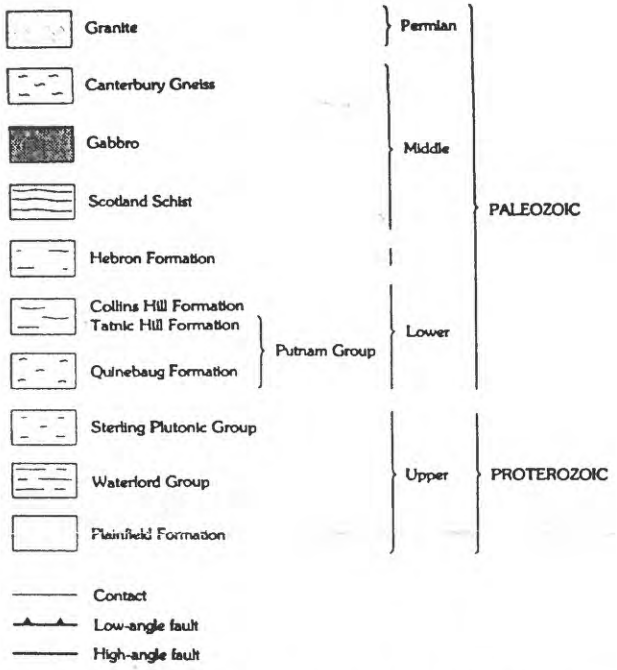


Figure 1.--LOCATION OF LITHOLOGIC SECTIONS. M, Montville; U, Uncasville; OM, Old Mystic; M, Mystic; NL, New London; N, Niantic quadrangles