CORRELATION OF MAP UNITS*

Rocks North of Clinton-Newbury Fault	Rocks Between Clinton-Newbury and Parker River Faults	Rocks South of Parker River Fault		
d	d			TRIASSIC(?)
Trap dikes	Trap dikes			
		DSnp, DSnr, DSnd, DSnl, DSnb, DSna, DSnt, DSni, DSn	Gedinnian(?) to Pridoli	DEVONIAN(?) AND SILURIAN
		Newbury Volcanic Complex		
	qm			MIDDLE(?) PALEOZOIC
	Pink quartz monzonite	md		
	sd			
	Sharpners Pond Diorite			
Onp, Onqm, Onb			Middle Ordovician	ORDOVICIAN OR OLDER
Newburyport Quartz Diorite				
m, s, b				
Merrimack Group (m) and related(?) rocks				
	ag			PALEOZOIC(?) OR PRECAMBRIAN(?)
	Metamorphic rocks in Sharpners Pond Diorite			
		tg		PRECAMBRIAN(?)
		Topsfield Granodiorite		

*Formations of the individual columns are separated by faults of large displacements. Age data are scanty. The sequence of formations in a given column is firmly established but relative positions (as well as most of the ages) from column to column are speculative and subject to modification

EXPLANATION FOR PRELIMINARY GEOLOGIC MAPS OF NEWBURYPORT WEST AND EAST QUADRANGLES, MASSACHUSETTS-NEW HAMPSHIRE

SHEET 1

m MERRIMACK GROUP (PRE-MIDDLE ORDOVICIAN)--Massive-splitting to very friable medium-light-gray to dark-gray phyllites, which range compositionally from those almost wholly of muscovite and quartz to those in which the dominant minerals--other than quartz--are biotite and/or carbonate; albite is a constituent of some. Pyrite is sparse to abundant. The nonfriable rocks weather pale brown to dark yellowish orange, and in all the phyllites rust-encrusted joint and fracture surfaces are characteristic

s Metasandstones in Seabrook--Gray, micaceous quartz-feldspar schists (metamorphosed feldspathic sandstone in which compositional layering is relict). Locally includes sillimanite. Sparsely pyritic but very rusty weathering

b Amphibolite at mouth of Merrimack River--Massive dark-gray to olive-black very fine grained, pyritic amphibolite (metabasalt?). Foliation poorly developed. Rock is composed mostly of hornblende and derived chlorite and includes little plagioclase; some with 10 percent or more of plagioclase also contains inclusion-riddled oligoclase(?) laths suggestive of relict microphenocrysts. Distribution shown is wholly speculative

ag METAMORPHIC ROCKS ENGULFED IN SHARPNERS POND DIORITE (PALEOZOIC? OR PRECAMBRIAN?)--Massive-layered rocks ranging from fine-grained amphibolites to coarse-grained feldspathic gneisses. In many places distinguished only with difficulty from the diorites pervasively intrusive into them. Locally includes calc-silicate or fine-grained marble lenses and pyritic hornfels derived, respectively, from argillaceous or cherty dolomites and anaerobic muds; thin quartzite lenses are sparse

tg TOPSFIELD GRANODIORITE (PRECAMBRIAN?)--Medium- to coarse-grained granodiorite, composed of grayish-orange-pink feldspar, translucent light-gray quartz, grayish-yellow-green epidote and dark-greenish-gray to greenish-black aggregates of chlorite and epidote. In this area the Topsfield rarely lacks foliation that is a consequence of widespread cataclasis. This foliation is defined by lenticular aggregates of quartz, which with the conspicuously orangish and more nearly equidimensional feldspar grains, appear in contrast to the wispy to irregularly splotchy greenish matrix, darkly tinted by the mafic minerals. The latter, altered presumably from hornblende and biotite, are sparse in thin section, and are megascopically apparent out of proportion to their volume. In little-foliated rock leafy chlorite speckles freshly broken surfaces but may be inconspicuous on weathered surfaces. In the foliated granodiorite potassium feldspar is almost everywhere absent, apparently obliterated by cataclasis; though fractured and commonly thoroughly sericitized the plagioclase shows the least obliteration of original grain outlines. In many localities a bluish cast typifies the quartz leases, which are notably coarser than the plagioclase relicts; furthermore the quartz content is generally too high--locally in excess of 40 percent--to be representative of the original plutonic rock

MAP SYMBOLS

——— Contact--Dashed where approximately located; short dashed where inferred beneath extensive cover or poorly defined in zone of intrusion breccia

——— Fault--Dashed where approximately located; short dashed where inferred

Strike and dip of beds (and of flow-banding in lavas)--Ball indicates tops known from sedimentary structures

50 Inclined

Vertical

60 Overturned

Strike and dip of joints

70 Inclined

Vertical

Strike and dip of foliation--Where shown in sd and gn is on xenoliths of ag too small to depict on map

40 Inclined

Vertical

Strike and dip of primary foliation in plutonic rocks--Shown only in Newburyport Quartz Diorite; defined mainly by mafic inclusions; some symbols in Onp reflect aligned phenocrysts

75 Inclined

Vertical

Strike and dip of shear zone

60 Inclined

Vertical

Strike and dip of veins--Most fillings are quartz or calcite; a few include sulfides

40 Inclined

Vertical

X Prospect pits and abandoned mines

Note: Intersection of combined symbols is at point of observ

Bedrock exposures--Solid color indicates individual outcrops. Ruled pattern indicates areas where surficial deposits are mostly less than 2 m thick--individual outcrops, commonly numerous, are not everywhere shown. Outcrops shown in waterways are exposed at lowest tides

EXPLANATION FOR PRELIMINARY GEOLOGIC MAPS OF NEWBURYPORT WEST AND EAST QUADRANGLES MASSACHUSETTS-NEW HAMPSHIRE

...ts (Newburyport East quad.) Geol 1:24,000 1974. SHEET 3

sheet 5
cop. 1

76-422m

DESCRIPTION OF MAP UNITS

d TRAP DIKES (TRIASSIC?)--Dark-gray to dark-greenish gray, fine-grained mafic rocks, mostly in dikes too small to be shown except by symbol. Principal variety is altered olivine diabase, subophitic to intergranular in texture. In a less abundant variety the primary mafic mineral is hornblende. Pyrite sparse to abundant

NEWBURY VOLCANIC COMPLEX (DEVONIAN? AND SILURIAN)

DSni Micrographic rhyolite intrusions--Brownish-gray to orange-pink, aphanitic to sugary-textured massive felsite, characterized by micrographic and spherulitic intergrowths; spherulites megascopically visible in some outcrops

DSnp Porphyritic andesite member--Propylitized grayish-green to dark gray andesite, typified by plagioclase phenocrysts. Nonstratified volcaniclastic layers, ranging from fine-grained tuffs to boulder breccias, are much more voluminous than intercalated flows; stratified graywacke is subordinate. Sparsely fossiliferous. Conglomerate containing rhyolite pebbles derived from DSnr shown by line of dots. 1,650 m thick

DSnr Flow-banded rhyolite vitrophyre member--Dense, lithoidal vitrophyre, mostly grayish red and conspicuously laminated; large parts not porphyritic; includes sparse lenses of vitric tuff; locally basal 120 m is pumiceous tuff. 580-670 m thick

DSnd Basalt(?) member--Dense, tough, dark gray, structureless rock. 0-90 m thick

DSnl Vitric rhyolite lapilli tuff member--Grayish-green, friable, hackly fracturing tuff, in which flattened pumice fragments are abundant in shard-rich matrix. 0-52 m thick

DSnb Basalt flow member--Uniformly fine-grained propylitized flows, devoid of fragmented materials; each 30 m or more thick, and separated by thin lithified soil(?) zones. 250-300 m thick

DSna Fine-grained andesite(?) member--Thoroughly propylitized, very fine grained, olive to olive-brown rock; part conspicuously to vaguely laminated, part massive and amygdaloidal(?). 275(?) m thick

DSnt Rhyolite tuff member--Flinty yellow-brown to brownish-gray vitroclastic rock, studded with darker fragments that are felsed in texture. 64 m thick

DSn Newbury Complex undivided, where completely covered by unconsolidated materials

qm PINK QUARTZ MONZONITE (MIDDLE? PALEOZOIC)--Pinkish-gray to grayish-orange-pink, rusty-weathering, medium- to coarse-grained seriate-textured rock, characterized by grayish-orange-pink translucent perthitic microcline of very irregular outline, clear gray quartz, and minute (<1 mm) ragged flakes of bright biotite. Quartz and milky white oligoclase each compose about one-third of the rock, microcline somewhat less, and biotite about 5 percent. The characteristic inequigranular texture varies with size of the microcline grains; as these progressively increase in size the texture becomes, first, subtly porphyritic, then obviously porphyritic with phenocrysts as much as 20 mm in length. Phases most nearly equigranular are dominant and are mostly quartz monzonite; the distinctly porphyritic phases are granodiorite. Contaminated phases, found especially in border zones where intrusion breccias with dioritic wall rocks were formed, lack the pinkish tint, are medium- to fine-grained, and include both hornblende and biotite, both--in contrast to biotite of the normal rock--dulled by chloritization. Where ghosted outlines of xenoliths are not apparent the more mafic parts of these contaminated zones, in places tens of metres in width, are difficult to distinguish from the lighter-colored, coarser parts of the Sharpners Pond Diorite

sd SHARPNERS POND DIORITE (MIDDLE? PALEOZOIC)--Fine-grained, medium- to dark-gray, biotite-hornblende diorite; a thin grayish-orange-pink weathering rind characterizes many outcrops. Quartz content quite variable: quartz is rarely absent, commonly is 2-8 percent, and in some areas very locally exceeds 15 percent. Where diorite occurs as intrusion breccias in combination with metamorphic host rocks, it may be lighter in color than usual and is streaked with feldspathic veins or appears foliated--owing either to flow-banding or to relict foliation of partially assimilated schists. These breccias may be difficulty distinguishable from the "nonfoliated"--as opposed to "streaked"--light-colored breccias formed where the diorite was in turn inflated by pink quartz monzonite

md Pink quartz monzonite and Sharpners Pond Diorite undivided, where completely covered by unconsolidated materials

NEWBURYPORT QUARTZ DIORITE (MIDDLE ORDOVICIAN)--Formation is characterized by saussuritized andesine as conspicuous, blocky crystals, thick books of chloritized biotite that are in part obviously euhedral, pink to green mottling on weathered surfaces, and ovoid inclusions that are mineralogically and texturally similar to the host but are fine-grained and contain 50 percent or more of the mafic minerals

Onqm Medium-grained, greenish-gray to light-olive-green equigranular rock that forms core and largest part of Newburyport pluton; ranges compositionally from quartz monzonite in southern outcrops to mafic granodiorite in northern exposures. Hornblende may occur in equal proportions to biotite in the more mafic phases. Reddish-brown sphene commonly apparent to unaided eye. Ubiquitous pyrite is cause of rust-stained outcrops

Onp Porphyritic granodiorite--Is similar to the least mafic parts of the core rock, Onqm, except that orthoclase is confined almost wholly to phenocrysts, which are as much as 6 by 9 cm in dimensions, and hornblende is entirely absent. Locally, two or more sets of thin aplite dikes abundantly rib the porphyritic granodiorite

Onh Greenish-black, medium-grained hornblendic segregation, in which hornblende plus biotite compose 45 to 75 percent of the rock and orthoclase plus sericitized plagioclase--quite variable in their proportions--make up most of the remainder. Sphene is ubiquitous

EXPLANATION FOR PRELIMINARY GEOLOGIC MAPS OF NEWBURYPORT WEST AND EAST QUADRANGLES, MASSACHUSETTS-NEW HAMPSHIRE

SHEET 2

U. S. Geological Survey
OPEN FILE MAP 76-488

CORRELATION OF MAP UNITS*

Rocks North of Clinton-Newbury Fault	Rocks Between Clinton-Newbury and Parker River Faults	Rocks South of Parker River Fault		
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		DSnp, DSnl, DSnr, DSnd, DSn, DSnl, DSnb, DSna, DSnt Newbury Volcanic Complex	Gedinnian(?) to Pridoli	DEVONIAN(?) AND SILURIAN
	qm Pink quartz monzonite; sd Sharpners Pond Diorite; md			MIDDLE(?) PALEOZOIC
Onp, Onqm, Onh Newburyport Quartz Diorite			Middle Ordovician	ORDOVICIAN OR OLDER
m, s, b Merrimack Group (m) and related(?) rocks				
	ag Metamorphic rocks in Sharpners Pond Diorite			PALEOZOIC(?) OR PRECAMBRIAN(?)
		tg Topsfield Granodiorite		PRECAMBRIAN(?)

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...tte (Newburyport East quad). Map 1:24,000 1976. SHEET 1

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EXPLANATION FOR PRELIMINARY GEOLOGIC MAPS OF NEWBURYPORT WEST AND EAST QUADRANGLES, MASSACHUSETTS-NEW HAMPSHIRE

SHEET 2