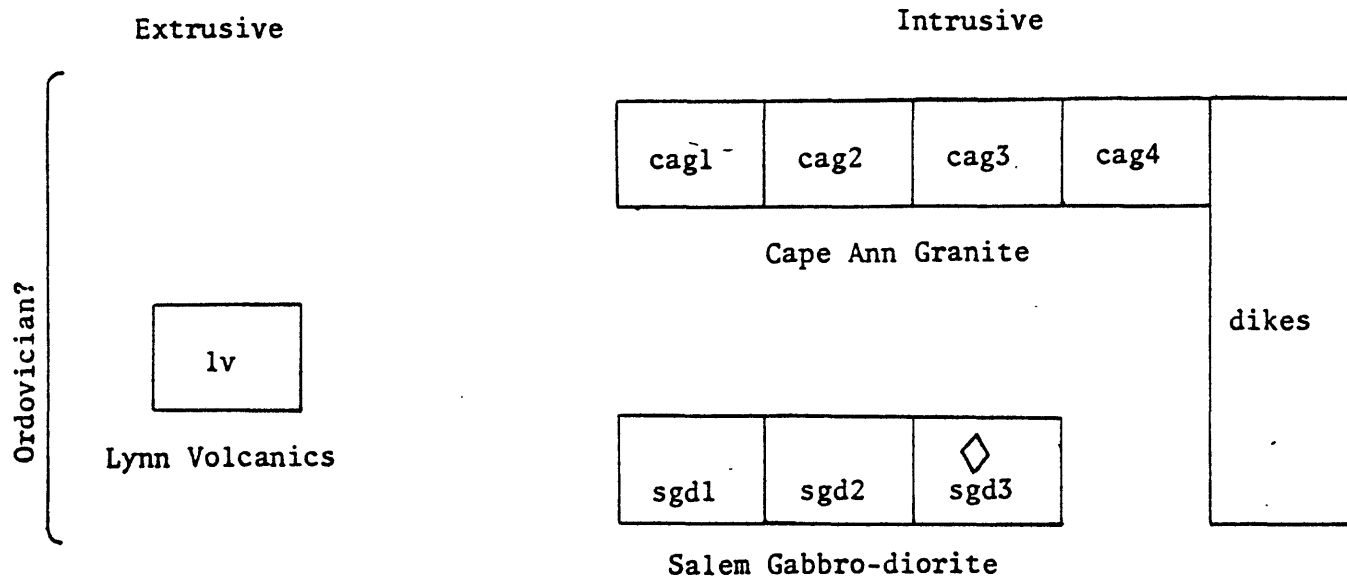


PRELIMINARY BEDROCK GEOLOGIC MAP OF THE MARBLEHEAD NORTH QUADRANGLE, MASSACHUSETTS

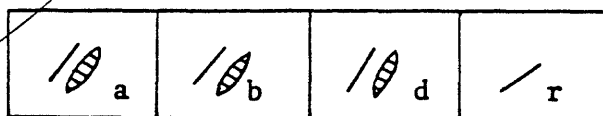
Correlation of Map Units



U. S. Geological Survey
 OPEN FILE REPORT 75-543
 This report is preliminary and has
 not been edited or reviewed for
 conformity with Geological Survey
 standards or nomenclature.

PRELIMINARY BEDROCK GEOLOGIC MAP OF THE MARBLEHEAD NORTH QUADRANGLE, MASSACHUSETTS

Description of Map Units



Dike Rocks - a = syenite; b = basalt or gabbro; d = diabase; r = rhyolite. Where appropriate, rock-type symbols are combined with p (= porphyritic) and (or) s (= dike is separated into isolated angular blocks surrounded by unfoliated country rock).

Syenite and feldspathoidal syenite dikes. Texture variable including trachytic, massive, and pegmatitic types.

Potash feldspar dominant, 0-10 percent nepheline and sodalite. 5-15 percent mafic minerals. Occasionally well crystallized magnetite.

Fine to medium-grained mafic rocks with granular and porphyritic textures. Texturally and mineralogically variable. Plagioclase altered, commonly labradorite. Hornblende dominant mafic mineral, also pinkish pigeonite, pale green augite, and biotite; rare olivine. Accessory apatite, sphene, magnetite, and pyrite. Often separated and cut by unfoliated granite. Chilled margins typical but fractured ends of separated blocks not chilled.

Medium-grained mafic rock with diabasic texture; otherwise as b.

Porphyritic rhyolite. Medium gray, aphanitic, with sparse, potash feldspar phenocrysts.

Cape Ann Granite: Predominantly unfoliated fine-, medium- to coarse-grained (0.3 to 1.5 cm) leucocratic alkali granite to alkali syenite. Ranges and medians of the principal minerals are: potash feldspar, 58-85 (63) percent; plagioclase (An_{6-12}), 0-22.5 (2.8) percent; quartz, 0-41 (24) percent; ferrohornblende, 0.1-17 (4.5) percent; biotite, 0-3.2 (0.8) percent; and opaques 0.2-7.5 (1.0) percent. Augite occasionally present. Accessory minerals include sphene, zircon, apatite, fluorite, allanite, magnetite, and ilmenite. Feldspars in unaltered rock are pale green-gray, have a greasy luster, and weather to a faintly pinkish tan or white. Potash feldspar is the dominant mineral--usually microcline microperthite but sometimes homogeneous microcline; albite or oligoclase is present in minor quantities. Quartz is glassy, shows weak strain shadows, and contains dust-size inclusions. Feldspar and quartz as large single grains and grain clusters partly to completely surrounded by finer grained interstitial quartz and feldspar. Ferromagnesian minerals, variable in amount and appearance, occur as ragged clots, wisps, single subhedral crystals and zonally arranged reaction aggregates. Augite is colorless to pale green as a core partly or completely surrounded by pale-green amphibole, darker-green soda-iron amphibole, and reddish-brown biotite with magnetite granules scattered throughout the reaction aggregate. Isolated crystals and clots of soda-iron amphibole, biotite, or both. Rock fabric is principally uneven granitoid, but varies to subporphyritic and is locally an accumulate.

cag1

Beverly Syenite Facies, Cape Ann Granite: Predominantly unfoliated medium- to coarse-grained, texturally variable alkali syenite. Textural extremes include very coarse-grained (2-5 cm) massive and coarse-grained brachytic phases whose mineral composition, except for lack of quartz and common presence of nepheline and sodalite, is identical with Cape Ann Granite. Modal quartz content measured on outcrop less than 5 percent.

cag2

Cape Ann Granite: Modal quartz content measured on outcrop 5-15 percent.

cag3

Cape Ann Granite: Modal quartz content measured on outcrop 15-25 percent.

cag4

Cape Ann Granite: Modal Quartz content measured on outcrop greater than 25 percent.

1
2
3
4
5-
6
7
8
9
10-
11
12
13
14
15-
16
17
18
19
20-
21
22
23
24
25-

Salem Gabbro-diorite: Medium- to medium coarse-grained texturally variable mottled black and greenish-white ferrohornblende-biotite diorite containing variable amounts of augite, pigeonite, and quartz. The rock consists of 55-65% plagioclase as twinned andesine (zoned crystals An_{20} to An_{35}) and untwinned albite or oligoclase, 5% potash feldspar, 1-5% quartz, 0-25% pale-green augite, 0-10% pinkish titaniferous pigeonite, 10-30% green pleochroic iron-rich hornblende, 0-10% reddish-brown biotite, and 1-5% opaques as scattered granules and exsolved blades in pyroxenes. Accessory apatite, zircon, and sphene are also present as grains and as rims on opaque granules. Chlorite, iron oxides, and calcite are present as alteration products. Mafic minerals are always somewhat poikilitic and commonly occur in zonally arranged aggregates that represent a reaction series from augite to biotite with magnetite granules dispersed throughout the aggregate. Biotite occurs as irregularly shaped and scattered flakes. The feldspars are pale gray-green with a greasy luster. The fabric is irregular and uneven. The rock is commonly brecciated and cut by salmon-pink felsic stringers.

sgd1

Salem Gabbro-diorite: Less than 5% pink felsitic veins.

sgd2

Salem Gabbro-diorite: Identical with sgd1 but contains more than 5% pink felsitic veins.

sgd3

Salem Gabbro-diorite: Hornblende-diorite porphyry characterized by large (as much as 10 x 20 cm) white-weathering red-purple labradorite phenocrysts. Found only as xenoliths.

lv

Lynn Volcanic Complex: Dark-purplish-red to black, massive, flow-banded, and agglomeratic porphyritic rhyolite. Sparse sericitized phenocrysts of subhedral to euhedral feldspar, 1 to 4 mm; very fine-grained bladed and felted devitrified matrix, some microlites; scattered lenticular and spheroidal aggregates of fine-grained quartz. Mafic minerals, principally biotite, make up less than 5 percent of the rocks. Opaque constituents make up less than 2 percent of the rocks and consist of tiny blebs and strings, rarely magnetite crystals. Chemical composition (range and median of 5 samples): SiO_2 , 67.8-76.0 (73.2) percent; Al_2O_3 , 12.0-16.5 (13.7) percent; total iron as Fe_2O_3 , 1.26-5.61 (2.61) percent; MgO , 1.38-2.47 (1.73) percent; CaO , 0.16-1.89 (0.42) percent; Na_2O , 1.50-4.17 (3.28) percent; K_2O , 0.94-4.40 (2.04) percent.

1		Symbols
2	---	Lithologic contact of principal formations. Approximately located
3	- - - -	Lithotypic contact of rock types within principal formations. Approximately located
4		Strike and dip of beds
5		Inclined
6		Vertical
7		Strike and dip of primary foliation
8		Inclined
9		Vertical
10		Strike, dip, movement sense, and b-lineation of shearing
11		Inclined
12		Vertical
13		Strike and dip of joints
14		Inclined
15		Vertical
16		Dikes
17		More than 10 feet wide
18		Less than 10 feet wide
19		Melange
20		a-syenite, b=basalt, or gabbro, d=diabase, r=rhyolite
21		Fault. Dashed where approximately located; queried where inferred; dotted where concealed. U, up- thrown side; D, downthrown side. Arrows show direction of relative movement; — on upper plate of thrust faults
22		Granite and syenite
23		Station for modal analysis
24		Subporphyritic or cumulose texture
25		Aplite or pegmatite present
		Non-cognate inclusion
		Cognate inclusion
		Pink phase
		Coarse-grained phase, Beverly Syenite

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25



Individual outcrops

Area of abundant outcrop



Cataclased rocks



Glacial striae. Observation at top of arrow



Sand or gravel pit

Massachusetts (Marblehead North quad). Sheet 1:24,000. 1975
sheet 3
cop. 1

open file
75-543