Phoenix Quadrangle, Geologic Map

EXPLANATION

UNCONSOLIDATED STRATA — QUATERNARY

Qal — **Alluvium**

Poorly bedded, variably sorted gravel, sand, silt and clay, locally showing a crudely upward-fining sequence. Composition is variable, with coarse grained units consisting of clasts of vein quartz and of local lithologies, and the fines dominated by quartz, micas, and kaolinitic clays. Deposits are typically confined to perennial stream channels and flood plains. Thickness ranges from .1 to 5 meters. Structural symbols on alluvium indicate bedrock outcrops exposed through the sediment.

unconformity

INTRUSIVE ROCKS — MESOZOIC

Diabase

Accumulations of rounded, rusty-weathering boulders and cobbles of a hard, massive, fine- to medium-grained, dark gray rock. Pyroxene and plagioclase dominate, but dark green amphibole is locally important. Minor veins of amphibole and quartz also occur. A Mesozoic age is inferred due to the unmetamorphosed and unfoliated character of the rock.

top of the crystalline stratigraphic section

PRECAMBRIAN — CAMBRO-ORDOVICIAN(?) — GLENARM SUPERGROUP* — WISSAHICKON GROUP

Loch Raven Schist

l — *Loch Raven Schist. Uniform, medium- to coarse-grained schist consisting of biotite-oligoclase-muscovite-quartz plus any combination of the following: chlorite, garnet, staurolite, kyanite, and tourmaline. Minor concordant and discordant quartz pods and stringers. Local concordant zones from decimeters to meters thick of a relatively quartzo-feldspathic, mica-poor schist. Thickness of Loch Raven Schist may exceed 2000 meters on the northwestern flank of the Phoenix Dome.*

p — *Pegmatite. Crops out as concordant lenses and layers; coarse grained, with clear quartz, chalky-weathering feldspars, and large muscovite books (to 2 cm.).*

ea — *Epidote amphibolite. Fine- to medium-grained gneiss with a distinct millimeter-scale banding caused by the alternation of biotite-amphibole-plagioclase-epidote laminae with more plagioclase-rich zones. Epidote weathers yellowish-green and comprises no more than 10% of the rock.*

ac — *Actinolite schist. Dominated by tiny unaligned to weakly aligned actinolite needles, locally in a chloritic matrix. Minor associated talc schist.*

ns† — *Nonserpentinized ultramafic rock. One or more of the following: (in order of decreasing abundance) talc schist or massive talc rock, chlorite schist, actinolite schist.*

u† — *Undifferentiated ultramafic rock. Mostly olive green to black, massive or schistose serpentinite. Antigorite dominates, with some relict olivine and pyroxene. Slickensided fracture surfaces show varied mineralization including chrysotile, magnesite, calcite and molybdenite. Biotite schist, chlorite schist, and actinolite schist are subordinate.*

Cockeysville Marble

c — *Cockeysville Marble undivided. Low, hummocky-weathering outcrops and float; strongly silicified rock containing minor calcite and rarely dolomite. Locally a yellow-brown-weathering, "honeycombed" appearing rock consisting of fine-grained silica pseudomorphing tremolite. Thickness ranges from 0.5 - 150 meters.*

cml — *Massive metalimestone member. Medium- to coarse-grained calcite marble with minor phlogopite and rare dolomite nodules. Thickness ranges from 0.5 - 350 meters.*

Setters Formation

sgs — *Garnet schist member. Medium-grained, garnet-biotite-muscovite-oligoclase-quartz schist, usually with accessory staurolite and/or kyanite, locally with tourmaline. Megascopically identical to the Loch Raven Schist. Thickness ranges from 0.5 - 220 meters.*

sg — *Gneiss member. Fine- to medium-grained muscovite-biotite quartzo-feldspathic gneiss with accessory garnet and tourmaline. Millimeter-scale laminations continuous over several meters. Local interlayers of biotite-rich schist and gneiss. Thickness ranges from 0.5 - 130 meters.*

sq — *Quartzite member. Fine- to medium-grained, centimeter-scale layered, flaggy weathering, muscovite-microcline quartzite. Locally rich in tourmaline lying parallel to the bedding (?) planes. Locally, cleaner quartzite and biotite schist. Thickness ranges from 0.5 - 550 meters, but the upper value may represent tectonic thickening in the northeast closure of the Phoenix Dome.*

q — *A single, roughly concordant lens of quite pure massive quartzite southeast of Phoenix.*

sgc — *Conglomerate lens. Two lenses of microcline-poor, muscovite quartzite with abundant stretched quartz pebbles. Occurs at the base of the Setters Formation.*

unconformity

PRECAMBRIAN

Baltimore Gneiss

pCbl — *Layered gneiss member. Variously layered biotite-quartz-feldspar gneiss containing muscovite, garnet, tourmaline, and rare sillimanite. Layering ranges from millimeter-scale and quite continuous to a more massive, quartzo-feldspathic rock with discreet clots of biotite. Concordant to discordant pegmatites and quartz veins are common. Maximum thickness appears to be about 1500 meters, but due to complex folding, this figure is a rough estimate.*

overprint. Areas in which amphibolite, interlayered with the above lithologies, comprises at least 20% of the gneiss. Fine- to medium-grained amphibole-biotite-plagioclase ± microcline and quartz gneiss.

* *Stratigraphic nomenclature after Crowley, W. P., 1976, The geology of the crystalline rocks near Baltimore and its bearing on the evolution of the Eastern Maryland Piedmont: Maryland Geol. Survey Rept. of Inv., no. 27, 40 p.*

contact — approximated by distribution of rock exposures, float, and contrasts in soil composition and topography

anticline; overturned anticline; syncline; overturned syncline

trace of the axial surface of F_2 folds.

---------- ? ----------

trace of the axial surface of F_1 nappe structure (see schematic below). queried in areas where location is poorly known.

vertical; inclined; horizontal

S_1 foliation or schistosity (virtually parallel to compositional layering except in the noses of F_1 minor folds).

S_2 schistosity or cleavage (inclined)

S_3 schistosity or fracture cleavage (inclined)

L_1 mineral elongation (rare), axis of minor F_1 fold, or intersection of compositional layering (bedding ?) with S_1 **

L_2. Mineral elongation, axis of minor F_2 fold of indeterminate symmetry, or intersection of compositional layering or S_1 with S_2 schistosity or cleavage

sinistrally asymmetric; dextrally asymmetric

symmetry of minor F_2 folds

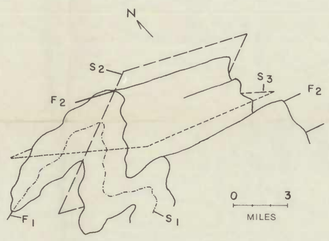
L_3. Axis of minor F_3 fold or intersection of compositional layering and/or S_1 with S_3 schistosity or fracture cleavage.

** horizontal linear structures are indicated with pointers on each end.

Kyanite / Staurolite

Metamorphic zone boundary, approximately located, marks the first appearance of the mineral on the hachured side of the line in rocks of pelitic composition. Does not necessarily represent a specific metamorphic reaction.

Zone of retrograde metamorphism (indicated by fine-grained chlorite partially or wholly pseudomorphing garnet porphyroblasts).



Schematic three-dimensional representation of macroscopic folding in the Phoenix Quadrangle. Surface outlined by the solid line represents the contact between the Baltimore Gneiss and the Paleozoic sequence.

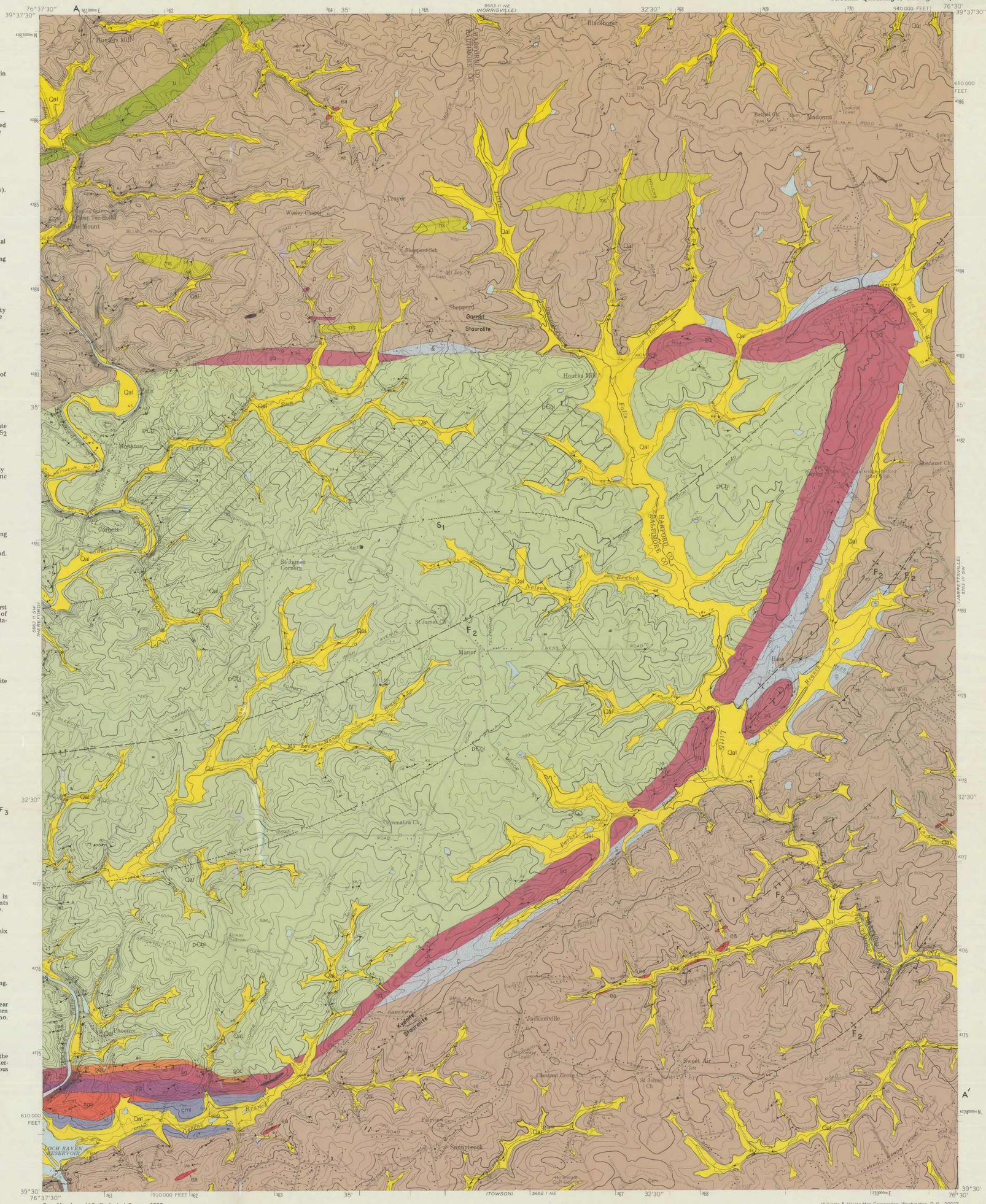
Axial surface of early (F_1) nappe (the Texas-Phoenix nappe of Crowley, 1976***).

Representative axial surface of F_2 folding.

Representative axial surface of late (F_3) folding.

*** Crowley, W. P., 1976, The geology of the crystalline rocks near Baltimore and its bearing on the evolution of the Eastern Maryland Piedmont: Maryland Geol. Survey Rept. Inv. no. 27, 40 p.

† Editorial Note: Ultramafic rocks in the Loch Raven Schist on the north side of the Phoenix Dome (designated ns and u) are interpreted by Crowley*** (p. 26-27, Plate 1 and 2) to be allochthonous masses with thrust faults along their southern boundaries.



Base Map from U.S. Geological Survey, 1957
(photorevised 1974) Phoenix Quadrangle 7½ Minute Series.

Field work conducted 1977-78.

Map scribed by Margaret K. McCabe.

GEOLOGIC MAP OF THE PHOENIX QUADRANGLE, MARYLAND

By

Stuart A. Moller

1979

STATE OF MARYLAND
DEPARTMENT OF NATURAL RESOURCES
MARYLAND GEOLOGICAL SURVEY
Kenneth N. Weaver, Director

Copies of Map available from
Maryland Geological Survey
Johns Hopkins University
Baltimore, Maryland 21218

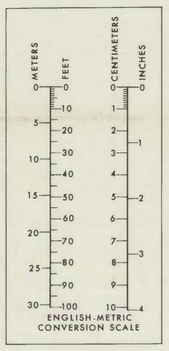
SCALE 1:24 000

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETRE

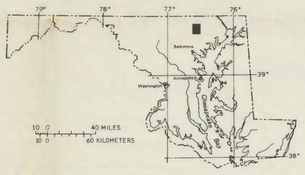
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MN 8½° 151 MILS; GN 1°00' 18 MILS

UTM GRID AND 1974 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET



QUADRANGLE LOCATION



CROSS SECTION A–A'
Horizontal scale same as map scale,
no vertical exaggeration.
Folded surface is S_1; F_2 Folds and S_2 Cleavage are Schematic