**GEOLOGIC MAP SERIES 92-1** 

### **DESCRIPTION OF MAP UNITS**

Pattern indicates area of insufficient outcrop to determine bedrock formation. Clay, silt, gravel, boulders or thick saprolite. Does not necessarily denote Quaternary deposits.

**NEW JERSEY GEOLOGICAL SURVEY** 

# SEDIMENTARY ROCKS

Marcellus Shale (Middle Devonian) Dark-gray to black shale, locally arenaceous, weathers medium-gray; fissile, predominantly thin-bedded, locally thick-bedded and massive: limonite-stained, fossiliferous. Upper contact with the Mahantango Formation not exposed but regionally is gradational, spanning several feet and marked by a fairly abrupt change from lighter colored, harder, siltstone to darker colored, softer, silty shale (Alvord and Drake, 1971; Herpers, 1951). Thickness is approximately 900 feet. Lower contact covered but probably an abrupt change from black shale to silty limestone (Alvord and Drake, 1971; Epstein, 1973). To the northwest in Pennsylvania, drill core suggests a lower contact gradational over a 40-foot interval from a black shale downwards through a limy shale into the silty limestone of the Buttermilk Falls Limestone (Fletcher and Woodrow, 1970).

Buttermilk Falls Limestone (Middle Devonian) -Medium- to dark- gray, clayey to silty limestone: locally contains bedded and nodular black chert. Limestone weathers light- to medium-lightgray and is thin- to medium-bedded, flaggy, and ossiliferous. Thickness is approximately 270 feet. Lower contact is gradational through several feet, from silty limestone into the interbedded limestone and calcareous siltstone of the Schoharie Formation.

Schoharie Formation (Lower Devonian) Medium- to thick-bedded, silty to shaly, locally dolomitic limestone containing local thin ribs or pods of black chert; weathers yellowish-gray to locally pale-olive. Grades downward into medium- to dark-gray calcareous siltstone at base. Bioturbated (Taonurus). Thickness approximately 175 feet. Gradational lower contact is at the first massive siltstone (Alvord and Drake, 1971).

Esopus Formation (Lower Devonian) Medium- to dark-gray, shaly to finely arenaceous siltstone, minor calcareous siltstone near top. Laminated to medium-bedded with local massive thick-bedded layers. Weathers medium-gray with limonite staining in places. Bioturbated (Taonurus). Cleavage is developed in the southwest part of outcrop belt but not in the northeast. Thickness approximately 300 feet. Lower contact is sharp and unconformable where the formation is underlain by coarse sandstones of the Ridgely (Epstein 1984). Where the clastics are absent, the lower contact is reported by Spink (1965) to be conformable and gradational through an interval of several feet in which arenaceous and calcareous siltstones become interbedded with, then replaced by, silty limestones.

Oriskany Group (Lower Devonian), undivided Ridgely Sandstone - Medium-gray, medium- to thick-bedded quartz-pebble conglomerate and coarse quartz sandstone. Sand grains are moderately well sorted and subrounded. Rock has a carbonate cement and contains abundant brachiopods. Unit first occurs west of Peters Valley, thickens to the southwest. Thickness ranges from 0 to 32 feet.

> Shriver Chert - Black to dark-gray siltstone and shale containing interbedded mottled, black and white chert and medium-gray, thin-bedded, medium-crystalline limestone. Lower contact is gradational. Unit only found in the southwestern part of the map area. Thickness ranges from 0

Glenerie Formation - Medium- to dark-gray, fossiliferous, thin- to medium-bedded, cherty, fine-grained silty limestone. Unit is thin in the southwest and thickens to the northeast where it constitutes most of the Oriskany Group. Lower contact is gradational. Formation thickness ranges from 55 to 170 feet. Total thickness of Oriskany Group is approximately

Helderberg Group, undivided Port Ewen Shale, Minisink Limestone, New Scotland Formation and Coeymans Formation. Only on cross sections.

Port Ewen Shale (Lower Devonian) - Upper section is dark- to medium-dark-gray; calcareous siltstone and shale, fossiliferous. Lower section is medium-dark-gray, calcareous silty shale, irregularly bedded, nonfossiliferous. Thickness is approximately 150 feet. Lower contact is abrupt and marked by the first occurrence of limestone (Epstein and others,

Minisink Limestone and New Scotland Formation, undivided

Minisink Limestone (Lower Devonian) Medium-gray, fine-grained argillaceous limestone, medium-bedded, some nodules and lenses of a more calcium-rich limestone. Maintains a uniform thickness of 20 feet (Epstein and others 1967). Lower contact covered but gradational elsewhere in the region (Epstein and others,

New Scotland Formation (Lower Devonian) Upper section dark-gray, siliceous, laminated shale containing medium-dark-gray, very fine-grained limestone pods; also scattered beds and lenses of medium-gray, fine-grained argillaceous, fossiliferous limestone. Limestone contains small, dark-gray chert nodules. Lower section is medium-dark-gray, siliceous, calcareous, fossiliferous shale containing beds and lenses of medium-gray, fine-grained, argillaceous, very fossiliferous limestone. Contains nodules, lenses and local irregular beds of dark-gray chert. Total thickness of formation is approximately 75 feet. Lower contact is abrupt, at the top of a calcareous quartz sandstone.

Coeymans Formation (Lower Devonian) Stormville Member, a medium-light- to medium-gray, fine- to coarse-grained calcareous sandstone containing lenses of arenaceous limestone. Lower contact marked by scoured surface. Northeast of Wallpack Center, the Stormville member is replaced by the Kalkberg Limestone, a medium-bedded, medium-gray, medium-grained silty limestone with lenses and nodules of black chert. Southwest of Wallpack Center the Kalkberg Limestone grades into the Shawnee Island Member, a medium-gray, medium- to coarse-grained limestone, medium-bedded, flaggy to massive, with local bioherms. Throughout the map area the basal Depue Limestone Member consists of medium-dark-gray, very fine- to fine-grained limestone, thin- to medium-bedded, massive to flaggy. Total thickness of all units approximately 90 feet. All units are fossiliferous. The lower contact of each member is gradational unless otherwise stated. Lower contact of formation is abrupt and marked by first occurrence of argillaceous limestone (Epstein and others,

Rondout and Decker Formations, undivided Rondout Formation (Lower Devonian and Upper Silurian) - Upper part of formation is medium-dark-gray, very fine- to fine-grained, medium-bedded, argillaceous limestone. The middle part is medium-gray argillaceous dolomite; medium-bedded, massive to laminated, locally forms deep desiccation columns, weathers grayish-orange. Basal beds consist of medium- to dark-gray, very fine- to medium-grained limestone, medium-bedded. Total thickness approximately 40 feet. Silurian-Devonian boundary is within the middle part of the unit (Denkler and Harris 1988). Lower contact is abrupt, marked by first

occurrence of quartz sandstone.

Decker Formation (Upper Silurian) - Unit is light- to medium-gray, calcareous quartz siltstone and sandstone, locally fine-pebble conglomerate. Locally interbedded with medium-gray, mediumto coarse-grained, thin- to medium-bedded limestone and very fine-grained dolomite. Total thickness approximately 72 feet. Lower contact is gradational (Epstein and others, 1967).

Bossardville Limestone (Upper Silurian) Medium-gray to medium-dark-gray, very fine-grained, argillaceous limestone and limestone, weathers medium bluish gray. Thin-bedded, laminated to ribbon-textured. Desiccation columns and cracks occur in southwestern part of map area. Total thickness is approximately 100 feet. Lower contact is gradational and placed at top of uppermost

Poxono Island Formation (Upper Silurian) Greenish-gray, finely crystalline to aphanitic dolomite containing discontinuous lenses with disseminated, rounded quartz grains; local quartz sandstone beds and argillaceous dolomite. Unit is thin- to medium-bedded, and flaggy. Thickness unknown but thought to be approximately 600 feet, based on well data south of map area. Lower contact thought to be gradational (Spink, 1967; Alvord and Drake, 1971; Epstein, 1973). Exposed only near Hainesville and along Little Flat Brook between Layton and Hainesville. Unit delineated by drill

data (table 1).

Bloomsburg Redbeds (Upper and Middle Silurian) - Grayish-red, thin- to thick-bedded siltstone, sandstone, and local quartz-pebble conglomerate, poorly to moderately sorted, massive, with local planar to trough cross-bedded laminations. Conglomerate consists of matrix-supported quartz pebbles in grayish-red, fine-grained sandstone. Rock near the base is greenish-gray to light-gray, locally grayish-orange quartz sandstone to siltstone with subrounded grains; massive, planar-tabular to trough cross-bedded. Thickness is approximately 1500 feet. Lower

Shawangunk Formation, undivided.

sandstone.

Shawangunk Formation (Middle Silurian) Tammany Member - Locally thin, black to dark-greenish-gray shale near upper contact. Medium- to medium-dark-gray, dark-greenish-gray, medium- to thick-bedded, sandstone and pebble conglomerate; well rounded grains, some limonite staining. Conglomerate consists of matrixsupported quartz pebbles as large as 2 inches in a poorly- to well-sorted, planar-tabular to trough cross-bedded sandstone. Contains subordinate shale clasts. Lower contact is gradational (Epstein and Epstein, 1972).

contact is abrupt, at last occurrence of red

Lizard Creek Member - Light- to medium-dark-gray or greenish-gray, interbedded sandstone and shale, thin- to medium-bedded, planar-tabular to trough cross-bedded; grains well rounded, moderately to well sorted. Sparse graphite flakes. Member is discontinuous and found to the southwest of the map area. Lower contact is gradational (Epstein and Epstein, 1972).

Minsi Member - Light- to medium-gray to light-olive-gray, thin- to thick-bedded, poorly- to well-sorted, cross- to planar-bedded, quartzitic and feldspathic sandstone, quartzite, and quartz-pebble conglomerate. Most clasts are quartz, some are dark-gray argillite and black chert; all are matrix-supported. Local limonite staining. Locally approaches an arkosic composition. Total thickness of Shawangunk Formation is approximately 1,400 feet. Lower contact is covered but within the region varies from an unconformity to a disconformity (Epstein and Lyttle, 1987) to a fault of small

Martinsburg Formation - High Point Member (Upper Ordovician) - Medium-gray to medium-dark-gray, medium-grained quartz sandstone with calcareous to siliceous cement, medium- to thick-bedded, massive, containing rip-ups of medium- to dark-gray shale and siltstone, weathers light-yellowish-gray. In terms of Bouma (1962) turbidite model, contains Tab to Ta sequences. Interbedded with medium-dark-gray, thin- to medium-bedded shale to fine sandstone corresponding to turbidite sequences Tb-e to Tc-e. Thickness regionally estimated at 4,500 feet thick, but feathers out in map area. Unit has a facies contact with the Ramseyburg Member along strike to the southwest. Lower contact is gradational and placed at bottom of last observed thick-bedded, silica-cemented quartz sandstone with shale rip-ups (Drake, 1991).

Ramseyburg Member (Upper and Middle Ordovician) - Medium-gray to brownish-gray graywacke siltstone and sandstone, thin- to thick-bedded, carbonate-cemented, fine- to medium-grained, interbedded with medium-gray to dark-gray, thin-bedded shale. Interbedded graywacke and shale may form complete Bouma (1962) turbidite sequences, Ta-e, but basal cut out sequences, T<sub>c-e</sub>, dominate. Approximately 5,500 feet thick. Lower contact is gradational, placed at bottom of last occurrence of thick-bedded graywacke siltstone to sandstone (Drake and Epstein, 1967).

Bushkill Member (Middle Ordovician) Medium- to medium-dark-gray, thin-bedded slate and subordinate interbeds of thin graywacke siltstone cemented by both carbonate and silica. Complete Bouma turbidite sequences occur in places although one or more of the basal beds is most commonly absent. These are classified as Tb-e, Tc-e or Td-e. Approximately 1,500 feet thick. Lower contact is gradational and placed at last occurrence of dark-gray slate.

Jacksonburg Limestone (Middle Ordovician) -Upper part (cement-rock facies), when present, is dark-gray to black, thin- to medium-bedded or massive, argillaceous limestone. Lower part (cement limestone facies) is dark-gray, mediumto coarse-grained limestone, medium-bedded, locally a fossil hash, weathers medium-bluish-gray. Dolomite-cobble conglomerate may occur at the basal contact and in the lower section of the lower facies. Formation approximately 80 feet thick. Lower contact is the Beekmantown unconformity.

#### KITTATINNY SUPERGROUP Beekmantown Group

Beekmantown Group, upper part (Lower Ordovician) - Locally preserved upper sequence consists of thin- to thick-bedded, aphanitic to medium-grained dolomite, medium-light to medium-gray, locally laminated and slightly fetid, weathers light- to mediumgray to yellowish-gray. Grades downward into a medium- to thick-bedded, medium- to coarse-grained, medium-dark to dark-gray dolomite; strongly fetid, with a mottled weathered surface and pods and lenses of dark-gray to black chert. Cauliflower-textured black chert beds of variable thickness also occur locally. Grades downward into the laminated to thin-bedded, fine- to medium-grained dolomite of the Beekmantown Group, lower part. Thickness varies because of erosion at the Beekmantown unconformity, generally averages 200 feet. Contains North American Midcontinent Province conodont fauna high C through low D, so unit is of Ibexian (Tremadocian) age. Unit consists of Rickenbach and Epler Formations of Drake and Lyttle (1985) and Drake and others (1985), and is the Ontelaunee Formation of Markewicz and Dalton (1977).

Beekmantown Group, lower part (Lower Ordovician) - Very thin- to thick-bedded, interbedded dolomite and minor limestone. The upper section of the unit consists of laminated, fine- to medium-grained, very thin- to thick-bedded, light-olive- to dark-gray dolomite, may weather dark-yellowish-orange. The middle section of the unit is fine-grained dolomite with silty dolomite laminas and thin- to medium-bedded, fine-grained limestone. The dolomite is dark-gray, aphanitic to fine-grained, locally well laminated, and weathers olive-gray, light-brown, and dark-yellowish-orange. The limestone is medium-dark to dark-gray, typically displays dolomitic "reticulate" mottling, characterized by anastomosing, light-olive-gray to grayish-orange laminas surrounding lenses of limestone, weathers light-gray to light-bluish-gray. The lower section of the unit consists of aphanitic to coarse-grained, thinly laminated to medium-bedded dolomite having very thin to thin, black chert beds, quartz-sand laminas, and rare oolites. The dolomite is medium-light to dark gray, massive, mottled, vuggy and locally slightly fetid. A lensing, very coarse to coarse-grained, light-gray dolomite occurs in the lower part of the sequence. "Floating" quartz sand and quartz-sand stringers occur near the base of the unit. Unit thickness is about 600 feet. Lower contact is placed on top of a distinctive steel-gray quartzite. The Beekmantown Group, lower part, does not crop out in study area, but is described from regional data; shown only in cross section. Contains North American Midcontinent Province conodont fauna A to mid C, so is of Ibexian (Tremadocian) age. Unit is the Stonehenge Formation of Drake and Lyttle (1985) and Drake and others (1985), and consists of the Rickenbach Formation and Epler Formation of Markewicz and Dalton

Allentown Dolomite (Lowest Lower Ordovician O€a to Upper Cambrian) - Very thin- to very thick-bedded, interbedded dolomite with minor clastics. Upper dolomite is generally mediumto very thick-bedded, fine- to medium-grained with local coarse-grained beds, medium-dark to medium-light gray. "Floating" quartz sand and two sequences of medium-light to very light-gray, thin-bedded quartzite and discontinuous dark-gray chert lenses occur directly below the upper contact. A rhythmically-bedded lower dolomite sequence is medium- to very light-gray weathering, contains oolites and stromatolites. Weathered exposures characterized by alternating lightand dark-gray beds. Ripple marks, cross-bedding, edgewise conglomerate, mud cracks and paleosol zones occur in the lower unit. Interbedded shaly dolomite increases in abundance towards the lower gradational contact. Crops out only in the southeast corner

# INTRUSIVE ROCKS

of the map area. Thickness from estimates

made outside the map area is about 1,900 feet.

Mafic dike (Lower Silurian) - Medium-gray to greenish-gray, containing feldspar phenocrysts in a fine-grained groundmass. Thought to be related to the Beemerville Intrusive Suite for which Zartman and others (1967) obtained a K-Ar date corrected to 443 ± 20 Ma by Eby and others (1992) who obtained a fission-track date

of 422 ± 14 Ma.

MAP SYMBOLS Contact - solid where known; dashed where approximate; dotted where con-

cealed; queried where uncertain. Thrust faults - solid where known; dashed where approximate; dotted where concealed; queried where uncertain sawteeth on overthrust plate. Syncline, showing trace of trough line and

direction of plunge Anticline, showing trace of crest line and direction of plunge

Anticline, gently inclined to recumbent showing trace of crest line, direction of dip of limbs, direction of plunge Syncline, gently inclined to recumbent showing trace of trough line, direction of dip of limbs, direction of plunge

Cleavage trough, showing trough line and direction of plunge MINOR FOLDS Minor syncline - showing trough line and

Minor asymmetric fold - showing bearing and plunge of axis. fold viewed down plunge.

> PLANAR FEATURES Strike and dip of beds - ball indicates top

known from sedimentary structures Overturned

Strike and dip of slaty or spaced cleavage LINEAR FEATURES Bearing and plunge of intersection of bed-

Bearing and plunge of extension lineation Bearing and plunge of small fold seen in

Mine, quarry or open pit - r, road metal Domestic well showing rock unit - see table 1

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Table 1. Well records used to outline Bloomsburg Red Beds and Poxono Island Formation contact, Culvers Gap quadrangle. Well No. N.J. Permit Depth Driller's Log

21-6,643 0-60 gravel and sand 60-75 shale and 2 21-5,628 0-75 sand and gravel 75-100 shale 3 21-4,914 0-10 clay and boulders sand and gravel limestone (soft) 50-68 limestone 68-70 seam (water) 4 21-6,298 0-52 sand, clay, gravel overburden 52-150 shale 5 21-6,154 0-75 gravel and sand 75-125 limestone 6 21-5,564 0-81 sand and gravel 81-105 red rock 9 21-5,653 0-30 boulder and gravel 30-105 red rock 10 21-5,152 0-58 overburden with 58-123 red rock 11 21-5,258 0-15 overburden 15-250 red rock 12 21-5,113 0-50 overburden with lay, gravel and 50-123 red shale, blue shale, yellow shale Sp 13 21-5,168 0-55 overburden with boulders and gravels
red rock
brown rock
121 red rock
-122 soft rock
2-160 red rock 160-164 water 164-173 red rock 14 21-4,434 0-50 overburden<sup>1</sup> 50-145 shale 15 21-4,932 0-35 clay and gravel 35-180 slate rock 16 21-5,569 0-20 overburden 20-175 red rock 17 21-1,654 0-77 overburden<sup>1</sup> 77-84 limestone rock 0-20 overburder 20-123 red rock 19 21-7,721-5 0-5 gravel consisting of red sandstone 5-15 fine medium sand alternating beds of coarse gravel and fine gravel
41-50 medium to coarse

50-52 quartzite boulder 52-56 coarser, pebbly sand

56-61 red shale-High Falls Formation

In absence of driller's log noting overburden thickness, depth of casing has been used for overburden.

# Helderberg ANGULAR UNCONFORMITY UNCONFORMITY Beekmantown Group Kittatinny Supergroup Base map from U.S. Geological Survey Culvers Gap, 1954, Photorevised 1971 Photoinspected 1976 Lake Maskenozha, 1954, Photorevised 1969, 1973 3000 ft - 3 SEA LEVE

