U.S. DEPARTMENT OF THE INTERIOR
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PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY

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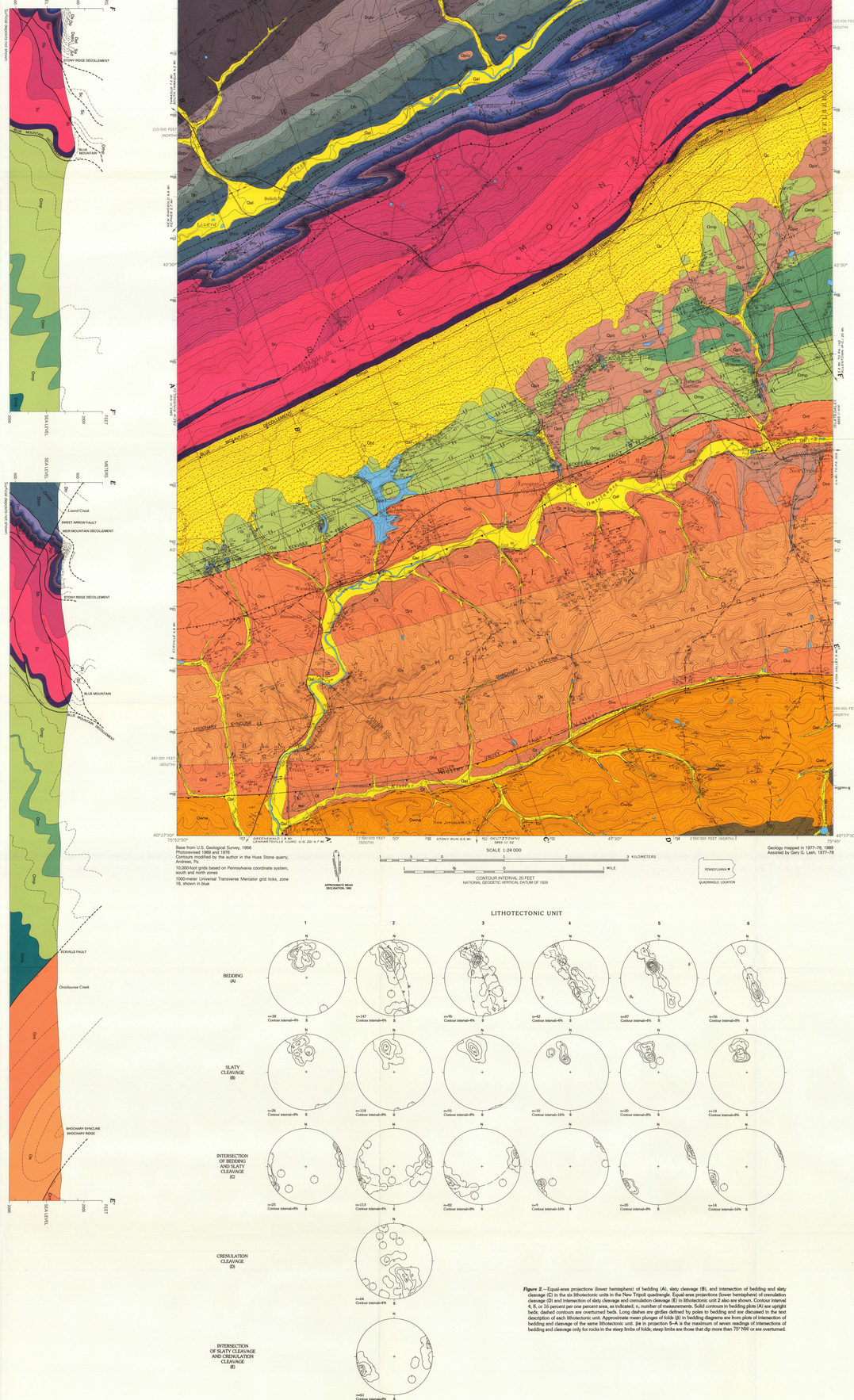
PLATE 1




## CORRELATION OF MAP UNITS




## DESCRIPTION OF MAP UNITS

### SURFICIAL DEPOSITS

**d** **Dumps**—Slate waste in hills as much as 50 ft (15 m) high from abandoned quarrying in the Martinsburg Formation south of Blue Mountain and waste piles from quarry operations at Andreas (shown only on fig. 1 on pl. 1)

**Qal** **Alluvium and flood-plain deposits (Holocene and Pleistocene)**—Stratified clay and silt, with minor sand and scattered cobbles and pebbles in streambeds and adjacent flat valley floors. Generally less than 20 ft (6 m) thick

**Qbf** **Boulder field (Holocene and Pleistocene)**—Area veneered with loose angular to subrounded boulders as much as 10 ft (3 m) long. The fields are more than 6 ft (2 m) deep and have an open-work texture and few or no interstitial fine sediments. Fields occur on Blue Mountain on slopes of 7°–13°

**Qfa** **Talus (Holocene and Pleistocene)**—Loose angular boulders, many more than 10 ft (3 m) long, lying on the steep southeast slope of Blue Mountain, produced by mechanical disruption of the Tuscarora Sandstone in cliffs above. The extensive deposits that were mapped generally formed beneath outcrops containing overturned beds

**Qc** **Colluvium (Holocene and Pleistocene)**—Poorly sorted and unconsolidated mixture of boulders to clay occurring throughout the quadrangle but mapped only along the moderate to steep south slope of Blue Mountain, where it probably ranges to 50 ft (15 m) or more in thickness and consists of very poorly sorted moderate-yellowish-brown (10YR 5/4) clayey silt with shale fragments derived from the underlying Martinsburg Formation and pebbles to boulders of conglomeratic quartzite from the Tuscarora Sandstone. A concentration of lag boulders, some more than 10 ft (3 m) long, covers the surface of the colluvium almost everywhere. Boulders become smaller and generally better rounded downslope. The upper contact of the unit is arbitrarily placed at the Martinsburg-Tuscarora contact, except in the northeast, where it lies below and in contact with talus (Qfa). Unit may be as old as pre-Illinoian

**Qt** **Terrace deposits (Pleistocene, pre-Illinoian)**—Moderate-brown (5YR 4/4) to moderate-yellowish-brown (10YR 5/4) clayey silt and medium to coarse sand containing subrounded to angular shale and graywacke chips generally 0.75 in. (2 cm) long, although some are longer than 1 ft (30 cm). In terraces as much as 30 ft (9 m) above the beds of Ketler and Oriskiluvier Creeks south of Blue Mountain and 100 ft (30 m) above Lizard Creek north of Blue Mountain

**Qpln** **Outwash (Pleistocene, pre-Illinoian)**—Scattered rounded cobbles of sandstone and conglomeratic sandstone, probably derived from the Stormville Formation, Oriskany Group, or Palmerton Sandstone, from 3 in. to more than 1 ft (8 to 30 cm) long, resting on flat-lying terrace remnants and dissected slopes at altitudes of about 660 to 700 ft north of Lizard Creek

**Qplt** **Till (Pleistocene, pre-Illinoian)**—Poorly sorted, unstratified, and unconsolidated grayish-orange (10YR 7/4) to light-reddish-brown (5YR 5/6) till containing rounded to subangular sandstone and quartzite pebbles and cobbles and shale fragments in a clayey silt matrix. Lacks any constructional topography. Probably more than 30 ft (9 m) thick in many places

**Glacial erratic (Pleistocene, pre-Illinoian)**—Polished and faceted boulders 3 to 6 ft (1–2 m) long, consisting of grayish-orange (10YR 7/4)-weathering conglomeratic quartzite derived from the Tuscarora Sandstone and laminated to thin-bedded graywacke from the Shoohary Sandstone and possibly the Martinsburg Formation. Seven of these erratics were found, all of which are in the southeast corner of the quadrangle south of Ketler Valley, about 2 mi (3 km) south of the southernmost mapped body of pre-Illinoian drift. Thus, these erratics are probably even older than the drift

### BEDROCK UNITS

**Catskill Formation (Upper Devonian)**

**Dctsr** Long Run Member—Grayish-red (5R 4/2 to 10R 4/2) to grayish-red-purple (5RP 4/2) and minor greenish-gray (5GY 6/1) to light-olive-gray (5Y 6/1), laminated to thick-bedded siltstone and shale containing minor ripple marks, burrows, mudcracks, root casts, and dark-yellowish-orange (10YR 6/6) ferroan dolomite nodules; medium-gray (N5) to medium-dark-gray (N4), greenish-gray (5GY 6/1) to olive-gray (5Y 4/1) and light-olive-gray (5Y 5/2), and grayish-red (5R 4/2), laminated to thick-bedded, planar-bedded and minor crossbedded, silty, limonitic and micaceous sandstone; and rare quartz-pebble conglomerate. Some sandstone beds have channeled bases, load casts, ripple marks, shale chips, bivalves, crinoid columnals, and plant fragments. Many fining-upward cycles. Lower contact gradational, placed at base of lowest red bed above gray rocks of Beaverdam Run Member. About 2,400 ft (730 m) thick, but only lowest 900 ft (300 m) exposed in quadrangle

**Dcve** Beaverdam Run Member—Light-gray (N7) to medium-dark-gray (N4), olive-gray (5Y 5/1) to medium-gray (5GY 7/1), and light- (5YR 6/1) to moderate-brownish-gray (5YR 5/1), laminated to thick-bedded, planar-bedded and crossbedded, very fine to fine-grained, limonitic and partly hematitic, micaceous, partly silty sandstone with some load casts, ripples, channeled bases, burrows, and shale chips, and generally thin-bedded siltstone and shale. Several beds are fossiliferous and contain Tentaculites, crinoid columnals, and brachiopods. Base placed at top of uppermost red bed of underlying Wicksville Member. About 800 to 900 ft (240–270 m) thick

**Dwv** Wicksville Member—Grayish-red (5R 4/2) to medium-brownish-gray (5YR 5/1), and olive-gray (5Y 5/1) to greenish-gray (5GY 6/1), laminated and ripple-laminated to thick-bedded, bioturbated, partly mudcracked siltstone and silty shale containing irregular ferroan dolomite nodules and some root casts, and medium-gray (N5) to moderate-greenish-gray (5GY 5/1), grayish-red-purple (5RP 4/2), very fine to medium-grained, planar-bedded and crossbedded, thin- to thick-bedded, limonitic sandstone. Many beds in upward-fining cycles. Lower contact placed at base of first red bed above non-red rocks of the Towamensing Member. About 600 to 650 ft (180–200 m) thick

**Dot** Towamensing Member—Medium-light-gray (N6) to medium-dark-gray (N4), and olive-gray (5Y 5/1) to greenish-gray (5GY 6/1), partly silty, very fine to medium-grained, thin- to thick-bedded, generally flaggy, planar-bedded and lesser crossbedded and rippled, partly graded, limonitic sandstone, and lesser light-olive-gray (5Y 6/1) to medium-greenish-gray (5GY 5/1) and dark-gray (N3), laminated to thin-bedded and ripple-bedded siltstone and silty shale. Locally contains brachiopods, crinoid columnals, paleocypods, Tentaculites, and plant fragments. Lower contact placed at base of lowest sandstone above predominantly blocky siltstone of the Trimmers Rock Formation. About 250 ft (76 m) thick

**Dtr** **Trimmers Rock Formation (Upper Devonian)**—Medium-gray (N5) to medium-dark-gray (N4), and rare olive-gray (5Y 4/1), very thin to medium-bedded (beds as much as 1 ft (0.3 m) thick), planar-bedded and cross-laminated, siliceous, blocky, graded, fossiliferous, medium-olive-gray (5Y 5/1) siltstone to fine-grained slightly limonitic sandstone that weathers brownish gray (5YR 4/1) to moderate yellowish brown (10YR 5/4), and less abundant dark-gray (N3) silty shale that weathers moderate yellowish brown (10YR 5/4) to dark yellowish orange (10YR 6/6) and contains burrows, load casts, groove casts, scour-and-fill structure, ball-and-pillow structure, wavy laminations, faser bedding, and fossil debris. Lower contact is transitional and is placed at base of dominantly siliceous siltstones, which are the bottoms of the ridge-forming sequence. About 900 ft (300 m) thick

**Mahantango Formation (Middle Devonian)**—Medium-dark-gray (N4) to dark-gray (N3), poorly and irregularly bedded, and laminated to thin-bedded, bioturbated, fossiliferous shaly siltstone and silty shale. Weathers moderate yellowish brown (10YR 5/4) to dark yellowish orange (10YR 6/6). Fossils, including brachiopods, paleocypods, crinoids, bryozoans, corals, trilobites, and gastropods, are diverse and vary from scarce to abundant in different parts of the formation. At about 600 ft (200 m) from the top of the formation is the Nis Hollow Siltstone Member (Dmhn), a medium-light-gray (N6) to medium-dark-gray (N4) and olive-gray (5Y 4/1), laminated to thin-bedded beds as much as 1/2 in. (25 cm) thick, becoming more abundant and thicker towards the top), irregularly bedded, partly rippled, siliceous, slightly fossiliferous, blocky coarse siltstone to very fine grained sandstone interbedded with dark-gray (N3) shale. Weathers moderate yellowish brown (10YR 5/2) to dark yellowish orange (10YR 6/6). The Nis Hollow is at least 20 ft (6 m) thick and thins to the west as the amounts of interbedded shale increase. Near the base of the Mahantango is a poorly exposed, medium-gray (N5) to light-olive-gray (5Y 6/1), blocky, very fine grained, limonitic sandstone having a salt-and-pepper texture. This unit is similar to the "lower shale member" of the Mahantango mapped 9.5 mi (15.3 km) to the west in the Orwigsburg quadrangle (Wood, 1973). The lower contact of the Mahantango is not exposed in the New Tripoli quadrangle but is probably gradational. Thickness is about 2,000 ft (600 m)

**Dm** **Marcellus Shale (Middle Devonian)**—Medium-dark-gray (N4) to grayish-black (N2), laminated to poorly bedded, sparingly fossiliferous shale and silty shale that weather dark yellowish orange (10YR 6/6) to dark yellowish brown (10YR 4/2) and medium olive gray (5Y 5/1). The Tioga Ash Bed, a pyritic, micaceous, tuffaceous shale occurring in three thin beds, and several layers of dark-gray (N3) shaly limestone and limestone concretions are exposed within the lower 28 ft (9 m) along the Northeast Extension of the Pennsylvania Turnpike in the Lehighton quadrangle, 6 mi (10 km) northeast of the New Tripoli quadrangle (Epstein and others, 1974). The Tioga is not exposed in the New Tripoli quadrangle but is undoubtedly present under cover. The Marcellus at many exposures is partly sheared or brecciated. Thickness uncertain because of poor exposure and shearing. Probably about 250 ft (76 m) thick

**Ds** **Selinsgrove Limestone (Middle Devonian)**—Deeply leached, grayish-orange (10YR 7/7)- to moderate-yellowish-brown (10YR 5/6)- and moderate-brown (5YR 4/4)- to blackish-red (5R 2/2)-weathering, medium-gray (N5) to medium-dark-gray (N4), very fine grained, very thin to thin-bedded (beds are 1–10 in. (2.5–25 cm) thick), very fossiliferous limestone and cherty limestone. Fossils, including corals, brachiopods, bryozoans, crinoids, and gastropods, make 2 in. (5 cm) of silty and shaly limestone and dark-gray (N3) pyritic shale. Dark-gray (N3) shale in lower 8 ft (2.4 m) may be the Needmore Shale, previously recognized only at Schuylkill Haven, 18 mi (29 km) southwest of the New Tripoli quadrangle (Wood and others, 1969, p. 18), although the facies relations among the Selinsgrove, the Needmore, and the chert-bearing Buttermilk Falls Limestone to the east were earlier recognized by Willard (1936). Regional relations of the Selinsgrove Limestone-Esopus Formation interval were discussed by Epstein (1984). Fossiliferous, moderate-brown (5YR 3/4) and dusky-yellowish-brown (10YR 2/2) siltstone and silstone, which weather dark yellowish brown (10YR 4/2) to dark yellowish orange (10YR 6/6), of the Hazard paint ore near the middle of the Selinsgrove have been mined in the surrounding area for paint pigment. The Hazard is not exposed and is probably less than 2 ft (0.6 m) thick. In the Pen Argyl Member with the decrease of carbonate and pyrite and shafts. Lower contact abrupt. About 40 ft (12 m) thick

**Dp** **Palmerton Sandstone (Middle and Lower Devonian)**—Grayish-orange (10YR 7/4)- and very pale orange (10YR 8/2)- to dark-yellowish-orange (10YR 6/6)-weathering, iron-stained, very coarse grained to conglomeratic quartz pebbles as much as 1 in. (2.5 cm) long, but averaging about 0.25 in. (6 mm) long), medium- to thick-bedded (some beds are as much as 5 ft (1.5 m) thick), indistinctly bedded to planar-bedded sandstone; siliceous siltstone and white (N9) to light-gray (N7) chert replace some sandstone near the lower transitional contact with the Schoharie Formation. Rare low-angle crossbeds, ripples, and scoured surfaces. Thickness is 45 to 52 ft (14–16 m)

**Dsch** **Schoharie-Esopus Formations, undivided, and Oriskany Group (Lower Devonian)**

Schoharie-Esopus Formations, undivided (**Dse** on fig. 1 on pl. 1)—Weathered, white (N9) to light-gray (N7) and iron-stained (dark-yellowish-orange (10YR 6/6) and light-brownish-gray (5YR 6/1) to moderate-brown (5YR 3/4)), thin- to medium-bedded siliceous siltstone, containing scattered coarse sand grains averaging about 0.1 in. (3 mm) long and very fine grained sandstone. Some chert at bottom. The trace fossil *Taonurus*, which is characteristic of these rocks farther east, was not seen in the New Tripoli quadrangle. In fresh exposures outside the quadrangle, *the unit is medium-gray (N5) to greenish-black (N5)* and calcareous. Thickness is 16 ft (5 m)

Oriskany Group (**Do** on fig. 1 on pl. 1)—Weathered, pale-yellowish-orange (10YR 8/6) to dark-yellowish-orange (10YR 6/6), moderate-brown (5YR 4/4) to dark-reddish-brown (10R 3/4), and very light gray (N8) to yellowish-gray (5Y 8/1), partly hematitic, dusky-red (5R 3/4), very thin to medium-bedded (beds range in thickness from about 1 to 12 in. (2.5–30 cm)), planar-bedded to partly crossbedded, coarse-grained and conglomeratic sandstone, containing rounded quartz pebbles as much as 1.5 in. (3.8 cm) long and spiriferid molds in lower 8 ft (2.4 m), and fossiliferous (table 2 in text, locs. 5 and 6), very light gray (N8) to medium-light-gray (N6) chert; siltstone and coarse-grained sandstone are present in the upper 30 ft (9 m). Minor laminae of medium-light-gray (N6) shale near bottom. Lower contact abrupt, irregular, and probably unconformable. Top 5 ft (1.5 m) consists of weathered dark-yellowish-orange (10YR 6/6) clayey silt and dusky-red (5R 3/4) clayey medium-grained oolite in the quarry at Andreas. Unit deposited in beach and shallow subtidal environments. Thickness is 37.7 ft (11.5 m) in the quarry at Andreas

**Dsl** **Stormville Formation (Lower Devonian)**—Very light gray (N8) to light-gray (N7) and very pale orange (10YR 8/2) to grayish-orange (10YR 7/4) and light-brownish-gray (5YR 6/1), planar-bedded and crossbedded (trough crossbedding), lenticular (beds may disappear within a few hundred feet in hundred meters), thin- to thick-bedded, partly hematitic, coarse-grained sandstone and conglomeratic sandstone containing rounded to subrounded quartz pebbles as much as 1 in. (2.5 cm) long and lesser chert clasts as much as 0.1 in. (3 mm) long; unit contains many scoured basal surfaces. The crossbedding is unidirectional, suggesting a fluvial environment; however, the upper part, at least, is marine as it contains thin conglomerates interbedded with marine rocks. Fossiliferous, light-gray (N7) to bluish-gray (5B 8/1), dark-yellowish-orange (10YR 6/6) to moderate-yellowish-brown (10YR 5/4) siltstone, very fine grained, thin-bedded and rippled sandstone, and rare laminae of medium-light-gray (N6) shale. The brachiopods and crinoids are poorly preserved and are not useful in pinning down the age of this unit (John Pojeta, USGS, *oral commun.*, 1984), although poorly preserved molds of *Gypidula coeymanensis*(?) and regional stratigraphic relations suggest that these rocks are correlative with the Stormville Member of the Coeymans Formation near Saylorsburg, 34 mi (55 km) northeast of the New Tripoli quadrangle (Epstein, 1987). Because the calcareous sandstones and conglomerates of the Stormville Member become thicker and apparently replace the other limestone-bearing members of the Coeymans Formation southward in Saylorsburg, it is believed that only the Stormville remains in the New Tripoli quadrangle. The Stormville is therefore upgraded to formation rank in the New Tripoli quadrangle and replaces the Coeymans. Thickness is 27 to 35 ft (8–11 m)

**Se** **Andreas Red Beds (Lower Devonian or Upper Silurian)**—Grayish-red (5R 4/2), dusky-red (5R 3/4) to moderate-reddish-brown (10R 4/6), and lesser light-gray (N7) to pinkish-gray (5YR 8/1), laminated to medium-bedded (beds as much as 1.5 ft (0.5 m) thick) lenticular shale, siltstone, and fine- to coarse-grained sandstone, slightly conglomeratic in places, containing quartz pebbles as much as 0.5 in. (1.3 cm) long, and minor shale-chip conglomerate. Weathers dark yellowish orange (10YR 6/6) to light brown (5YR 5/6). Unit is planar bedded, crossbedded, rippled, and burrow mottled and contains some channels. Crossbeds trend to the northwest, perpendicular to strike of beds. Channels trend parallel to strike of beds. Some upward-fining cycles suggest a tidal flat or meandering fluvial origin. The lowest bed contains ostracodes and a paleocypod (Deisler, in Lash and others, 1984, p. 102–104), which are not useful in constraining the age of the Andreas Red Beds. Correlates with either the Coeymans Formation or the upper part of the Decker Formation to the northeast in Pennsylvania. Thickness is 65 ft (20 m). The Andreas Red Beds was named by Swartz and Swartz (1941) after the town of Andreas, just north of the New Tripoli quadrangle. A type section was not designated; we propose a reference section in the active quarry, 3,700 ft (1,130 m) due south of Andreas, where the formation is completely exposed

**Sd** **Decker Formation (Upper Silurian)**—Light-gray (N7) to dark-gray (N3), laminated to thick-bedded (beds may be more than 2 ft (0.6 m) thick), fine- to medium-grained limestone, shaly and silty limestone, and calcareous siltstone and shale and a few thin beds of lenticular fossiliferous (ostracodes, conodonts, bryozoans, brachiopods, and paleocypods; table 2 in text, loc. 4), coarse-grained limestone. Partly nodular, ripple laminated, graded, and burrowed. Weathers grayish orange (10YR 7/4) to moderate yellowish brown (10YR 5/4). Probably latest Silurian (Pridolian) in age on the basis of conodont studies (Deisler, in Lash and others, 1984, p. 102–104). Carbonate has been leached to depths of several tens of feet in most surface exposures. Unit deposited in shallow subtidal environments. Thickness is 59 ft (18 m)

**Sbl** **Bossardville Limestone (Upper Silurian)**—Medium-gray (N5) to dark-gray (N3) and olive-gray (5Y 4/1), laminated and irregularly thin-bedded and wavy-bedded, very fine to fine-grained, graded, cross-laminated, partly mudcracked shaly limestone, containing scattered leperditiid ostracodes, and argillaceous and partly dolomitic limestone. Unit deposited in an intertidal environment. Unit is 70 ft (21 m) thick in quarry at Andreas and thins to about 50 ft (15 m) near western end of quadrangle

**Sb** **Poxono Island Formation (Upper Silurian)**—Cyclical mixture of interlaminated (*alga*?) to thin-bedded, medium-gray (N5) (with a purplish tinge) limestone, locally containing dolomite and shale intraclasts, laminated greenish-gray (10GY 5/2) to medium-gray (N5) shale, and greenish-gray (5GY 6/1) dolomite, grading up into massive (beds as much as 8 ft (2.4 m) thick) to partly laminated, greenish-gray (5GY 6/1), mudcracked, very fine to fine-grained dolomite, which may be irregularly replaced by medium-dark-gray (N4) dolomite. The cycles are from 1 ft (30 cm) to nearly 20 ft (6 m) thick. Contains scattered leperditiid ostracodes. Gradational downward into the Bloomsburg Red Beds through interbedded green and red shale and siltstone. Supratidal and intertidal. Thickness probably about 100 to 150 ft (30–46 m) but could be many tens of feet (tens of meters) thicker

**Sc** **Bloomsburg Red Beds (Upper Silurian)**—Grayish-red (5R 4/2) to dark-reddish-brown (10R 3/4), pale-red (5R 6/2) to grayish-red-purple (5RP 4/2), and minor greenish-gray (5GY 6/1) to pale-green (5G 7/2), crossbedded and planar-bedded, laminated to thick-bedded shale, siltstone, very fine to coarse-grained sandstone, and minor conglomeratic sandstone with cut-and-fill structures, mudcracks, dark-yellowish-orange (10YR 6/6) ferroan dolomite nodules, and red mudstone intraclasts as much as 3 in. (8 cm) long. Weathers pale yellowish orange (10YR 8/6) to dark-yellowish-orange (10YR 6/6) and pale red (5R 6/2). Contains many fining-upward cycles. Lower contact is gradational and is placed at base of lowest red bed above gray rocks of the Clinton Formation. About 1,500 ft (457 m) thick

**Sc** **Clinton Formation (Middle Silurian)**—Light-gray (N7) to dark-gray (N3) and light-olive-gray (5Y 6/1) to dark-greenish-gray (5GY 4/1), very fine to coarse-grained, laminated to very thick bedded, planar-bedded, crossbedded, rippled, partly channeled, burrowed quartzite containing flattened argillite cobbles as much as 4 in. (10 cm) in diameter; minor dark-grayish-red-purple (5RP 3/2), fine-grained, burrowed, hematitic quartzite, interbedded with medium-light-gray (N6) to dark-gray (N3) and olive-gray (5Y 4/1) to greenish-gray (5GY 6/1), laminated to thin-bedded, faser-bedded, burrowed siltstone and shale. Locally contains float of red shale similar to shales in the Bloomsburg Red Beds. At Lehigh Gap, 8 mi (13 km) northeast of the quadrangle, scattered thin sandstone beds contain nodules of collophane and siderite rimmed with chlorite, quartz pebbles as much as 0.25 in. (0.6 cm) long, and *Lingula* and eurypterid fragments. Lower contact is probably transitional from abundant argillites of the Clinton into quartzites of the underlying Tuscarora. About 1,400 ft (427 m) thick

**Sto** **Tuscarora Sandstone (Middle and Lower Silurian)**—Very light gray (N8) to dark-gray (N3) and light-olive-gray (5Y 6/1) to greenish-gray (5GY 6/1), planar-bedded and crossbedded, thin- to thick-bedded, fine- to coarse-grained, partly conglomeratic quartzite containing pebbles of quartz and minor chert as much as 2.3 in. (6 cm) long and cobbles of shale as much as 7 in. (18 cm) in diameter; minor medium-dark-gray (N4) to dark-gray (N3) and greenish-gray (5GY 6/1), laminated to thin-bedded siltstone and shale. Lower contact abrupt and unconformable. About 250 ft (76 m) thick

**Martinsburg Formation (Upper and Middle Ordovician)**

**Omp** Pen Argyl Member (Upper and Middle Ordovician)—Dark-gray (N3) to grayish-black (N2), thin- to thick-bedded, evenly bedded slate, commonly more than 4 ft (1.2 m) thick that weathers yellowish gray (5Y 7/2) and grayish orange (10YR 7/4) to moderate yellowish orange (10YR 5/6); rhythmically interlayered with carbonaceous slate, sandy slate, and very fine to medium-grained graywacke with parallel laminations, lenticular bedding, convolute bedding, microchannels, and sole marks. Units in fining-upward sequences (turbidite-flysch sequence). Fossiliferous (graptolites and very rare nautiloid cephalopods). Formerly quarried for slate ("soft slate" of Pennsylvania quarrymen). Contact with the Ramseybury Member is gradational and is placed where graywacke (of the Ramseybury) exceeds 5 percent of the sequence and supplies abundant float. Thickness ranges from about 5,000 to at least 7,000 ft (1,500–2,000 m). The Pen Argyl thickens to the west as the Ramseybury Member pinches out (fig. 2 in text)

**Omr** Ramseybury Member (Middle Ordovician)—Medium-gray (N5) to dark-gray (N3), thin- to thick-bedded slate that alternates, in part cyclically, with light-gray (N7) to medium-gray (N5), thin- to medium-bedded, very fine to medium-grained graywacke and graywacke siltstone (turbidites). Sparse graptolites. Graywacke probably makes up 5 to 10 percent of the member but may be more than 20 percent in some areas. Lower contact with the thin-bedded slates of the underlying Bushkill Member is not exposed in the quadrangle. Elsewhere, it is placed at the base of lowest conspicuous graywacke bed, generally recognized by abundant float. The Ramseybury is about 1,200 ft (366 m) thick at the eastern edge of the quadrangle, and it pinches out within 2 mi (3.2 km) to the southwest into the Pen Argyl Member with the decrease of carbonate and pyrite and shafts. Lower contact abrupt. About 40 ft (12 m) thick

**Omb** Bushkill Member (Middle Ordovician)—Laminated and thin-bedded slate. Shown in section only

**Os** **Shochary Sandstone (Upper and Middle Ordovician)**—Medium-dark-gray (N4), thin- to thick-bedded (beds 2–30 in. (5–76 cm) thick), calcareous, pyrite-rich, graywacke turbidites that weather light olive gray (5Y 6/1) and grayish orange (10YR 7/4) to pale yellowish orange (10YR 8/6). The turbidites are interbedded with medium-dark-gray (N4) slate, calcilutite, and minor thin beds of conglomerate that all weather light olive brown (5Y 5/6). The amount of graywacke ranges from 10 to 20 percent with rare instances of 50 percent, particularly near the top of the exposed section. Beds become thicker and coarser upwards. Graywacke beds contain abundant faunal debris. Sedimentary structures in some turbidites are obliterated in places by bioturbation. Rusty-weathering channels filled with coarse-grained sandstone, abundant shelly fauna, and pyrite are common in graywackes that weather light olive brown (5Y 5/6). Graywacke beds also contain rare clasts of rounded chert. Upper part of unit has been removed by faulting and erosion. Lower contact is transitional through 50 ft (15 m) with underlying New Tripoli Formation and is placed where sandstones generally make up less than 10 percent and beds are less than 2 to 4 in. (5–10 cm) thick. Thickness ranges from 2,250 ft (686 m) in the western part of the quadrangle to 4,200 ft (1,300 m) in the eastern part

**Ont** **New Tripoli Formation (Middle Ordovician)**—Medium-dark-gray (N4), thin-bedded to laminated and evenly bedded, calcareous graywacke and interbedded with fairly thick slate and calcilutite beds (as much as 20 in. (50 cm) thick); the unit weathers light olive gray (5Y 6/1), light olive brown (5Y 5/6) to light brown (5YR 5/6), and grayish orange (10YR 7/4) to yellowish gray (5Y 8/1). The calcilutite beds are most commonly 1 to 2 in. (2–5 cm) thick and are more resistant to weathering, giving the rock a ribbed appearance that contrasts with the ribbon slate of the Bushkill Member of the Martinsburg Formation. Shelly fossil debris is common, especially near the upper contact of the unit, but not abundant. The contact between the Bushkill Member and the New Tripoli Formation is a thrust fault representing significant structural telescoping. Lower contact not exposed because of faulting of both Taconic and Alleghanian age. Minimum thickness ranges from 3,675 ft (1,120 m) in the western part of the quadrangle to 3,900 ft (1,200 m) in the eastern part; accurate estimates impossible because of faulting

**Windsor Township Formation (Middle and Lower Ordovician)**

**Owrtw** Weisenberg Member—Light-olive-gray (5Y 6/1) to grayish-olive (10Y 4/2), flasile to poorly cleaved shale and mudstone to micaceous siltstone that weather moderate yellowish brown (10YR 5/4) to grayish orange (10YR 7/4) and pale reddish brown (10R 5/4). Also present are minor amounts of medium-dark-gray (N4) to dark-greenish-gray (5GY 4/1) silicified shale, mudstone, and argillite. In some places, thin-bedded siltstone and limonitic and feldspathic fine- to coarse-grained graywacke sandstone and debris flows of dark-gray (N3) chert and silicified mudstone are interbedded with the shale and mudstone. Soft-sediment slump folds are common. Local channels contain a very distinctive conglomerate with chalky-white-weathering feldspar grains and rare dark volcanic rock fragments. This conglomerate is best exposed 0.2 mi (0.3 km) east of Worleys Corner in the Stateside 7.5-min quadrangle. Minimum thickness about 4,600 ft (1,400 m)

**Owrr** Red beds within the Weisenberg Member—Dusky-red (5R 3/4), grayish-yellow (5Y 7/2) to light-green (5G 7/4), locally silicified mudstone and argillite, interbedded with very thin to thick-bedded siltstone, sandstone, black (N1) calcilutite to calcarenite; chert also is present. Carbonate is found locally as clasts and megaclasts within a matrix of varicolored shale and argillite. Maximum thickness about 600 ft (200 m)

## EXPLANATION OF MAP SYMBOLS

**Contact**—Long-dashed where approximate; short-dashed where inferred; dotted where concealed; queried where uncertain

**Thrust fault**—Sawteeth on upper plate. Dashed where approximate; dotted where concealed; queried where uncertain

**High-angle fault**—U, upthrown side; D, downthrown side; shown only in fig. 1 on pl. 1

**Shear zone**

### FOLDS

(Dashed where approximate; dotted where concealed)

**Anticline**—Showing trace of axial surface

**Overturned anticline**—Showing trace of axial surface and direction of dip of limbs

**Syncline**—Showing trace of axial surface

**Overturned syncline**—Showing trace of axial surface and direction of dip of limbs

**Minor arch in bedding**—Showing direction and amount of plunge

### PLANAR FEATURES

**Strike and dip of beds**—Cross tick marks site of observations. Ball indicates top known from sedimentary structures

- Inclined
- Vertical
- Overturned
- Rotated more than 180°

**Strike and dip of regional slaty cleavage**

- Inclined
- Vertical

**Strike and dip of bedding and slaty cleavage with identical strike and varying dip**—Where only one number is shown, dip is identical

**Strike and dip of cremulation cleavage**

- Inclined
- Vertical

### LINEAR FEATURES

**Bearing and plunge of slickenlines on bedding**

**Bearing and plunge of intersection of bedding and slaty cleavage**

- Inclined
- Horizontal

**Bearing and plunge of intersection of slaty cleavage and cremulation cleavage**

- Inclined
- Horizontal

### OTHER FEATURES

**Erosional scarp**

**Glacial erratic**—See Description of Map Units

**Quarry, prospect, or pit**—q, slate quarry or prospect; l, limestone quarry; ss, sandstone quarry; sh, shale pit

**Prospect pit in the Hazard paint ore of the Selinsgrove Limestone**

**Fossil locality**—See table 2 in text for list of species at the seven sites





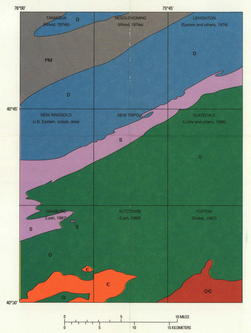


*Figure 1.*—Geologic map and section of the Huss Stone quarry at Andreas, Pa. See Description of Map Units and Explanation of Map Symbols for description of geologic units, contacts, faults, folds, bedding, and cleavage. Units are shaded where overlain by dumps (d). Topographic map prepared from altimetry on low-altitude aerial photograph. Contour interval 20 ft.

LITHOTECTONIC UNIT




*Figure 2.*—Equal-area projections (lower hemisphere) of bedding (A), slaty cleavage (B), and intersection of bedding and slaty cleavage (C) in the six lithotectonic units in the New Tripoli quadrangle. Equal-area projections (lower hemisphere) of cremulation cleavage (D) and intersection of slaty cleavage and cremulation cleavage (E) in lithotectonic unit 2 also are shown. Contour interval 4, 8, or 16 percent per one percent area, as indicated; n, number of measurements. Solid contours in bedding plots (A) are upright beds; dashed contours are overturned beds. Long dashes are girdles defined by poles to bedding and are discussed in the text description of each lithotectonic unit. Approximate mean plunges of folds (β) in bedding diagrams are from plots of intersection of bedding and cleavage of the same lithotectonic unit. βA in projection 5–Ā is the maximum of seven readings of intersections of bedding and cleavage only for rocks in the steep limbs of folds; steep limbs are those that dip more than 75° NW or are overturned.


75°00'
40°45'
URSINUS
Wood, 1974b
NEW RICHMOND
U.S. Epstein, unpub. data
NEW TRIPOLI
Epstein, 1984
BARTONSVILLE
Little and others, 1980
KUTZTOWN
Epstein, 1987
TOPTON
Wang, 1987
PM
D
S
O
OC
C
0
5
10
15