STATE OF MARYLAND
DEPARTMENT OF NATURAL RESOURCES
MARYLAND GEOLOGICAL SURVEY
Emery T. Cleaves, Director

SURFICIAL GEOLOGIC MAP OF THE DELTA QUADRANGLE, MARYLAND-PENNSYLVANIA

by Frank J. Pazzaglia

1998

LEGEND

Anthropogenic

dl — **DISTURBED LAND:** Land disturbed by mining activity.

ul — **URBAN LAND:** Land disturbed by urban areas, including houses, streets, and parking lots.

Alluvium

Qadu — **ALLUVIUM/DIAMICTON UNDIVIDED:** Includes both poorly to moderately well-stratified fluvial sand, silt, and gravel and poorly stratified, poorly sorted diamicton in the valley bottom toeslope positions along most streams and in natural and man-made drainageways on the interfluves. Deposits in the interfluve regions are dominated by fine-grained sands and silts concentrated in the drainageways and behind hedgerows. The deposits are typically 1 meter thick in or near perennial streams but may be as much as 3 meters thick in the upland interfluve setting.

Qf — **ALLUVIAL FAN:** Gray, moderately well-stratified and rounded fluvial gravel and sand, overlain by a massive to well-stratified, fine sandy brown loam. Large subangular boulders 0.5 - 2 meters in diameter within and on deposit surface are common. Soil development is poor and similar to that found on terrace Qt2. The deposit is approximately 1 to 5 meters thick and found primarily at the foot of large gaps along the southeast base of Slate Ridge. Alluvial fans are also very common at the confluence of streams, but are unmappable at a 1:24,000 scale. They are mapped as alluvium/diamicton undivided in this landscape position.

Qt3 — **ALLUVIUM:** Gray, moderately well-stratified, subangular to rounded fluvial gravel and sand found as bars and constructional features on the modern floodplain. Composition of clasts reflects local Piedmont sources dominated by vein quartz, quartzite, metagreywacke, and schist with minor slate, ultramafic, and felsic-intrusive lithologies. Deposit thickness is approximately 1 meter.

Qt2 — **ALLUVIUM:** Gray, moderately well-stratified, subangular to rounded fluvial gravel and sand, fining upward to a massive to well-stratified, brown fine sand and silt loam. The base of the alluvial deposit is composed of one or two sandy gravel units approximately 0.2 to 0.5 meter thick that is conformably overlain by a micaceous, cross-bedded, yellow, green, gray, or brown sand approximately 0.5 meter thick, which is in turn unconformably overlain by a massive brown silty loam 0.5 meter thick. The contact between the basal gravels and overlying sand is commonly stained black and is thought to represent the mean annual ground-water table. Total deposit thickness is typically 1 to 2 meters. Composition of clasts reflects local Piedmont sources dominated by vein quartz, quartzite, metagreywacke, and schist with minor slate, ultramafic, and felsic-intrusive lithologies. Terrace Qt2 is found beneath a terrace surface 1 to 2 meters above the modern stream and exhibits poor soil development characterized by a loamy A horizon and silt loam Bw/Bt horizon <0.5 meter thick. This deposit appears to be strongly influenced by recent anthropogenic aggradational and incisional events.

Qt1 — **ALLUVIUM:** Gray, moderately well-stratified, subangular to rounded fluvial gravel and sand, fining upward to a massive to well-stratified, brown, fine sand and silt loam. The base of the alluvial deposit is composed of one or two sandy gravel units approximately 0.5 to 1.5 meters thick, which is conformably overlain by a micaceous, cross-bedded, yellow, green, gray, or brown sand approximately 0.5 meter thick, which is in turn unconformably overlain by a massive red silty loam 0.5 to 1 meter thick. Total deposit thickness is typically 2 to 4 meters. Composition of clasts reflects local Piedmont sources dominated by vein quartz, quartzite, metagreywacke, and schist with minor slate, ultramafic, and felsic-intrusive lithologies. This deposit is found beneath a distinct terrace surface about 3 to 4 meters above the modern streambed and displays a well-developed soil with a 0.5- to 1-meter thick red (2.5YR) argillic horizon exhibiting many thick clay films and well-developed angular blocky structure.

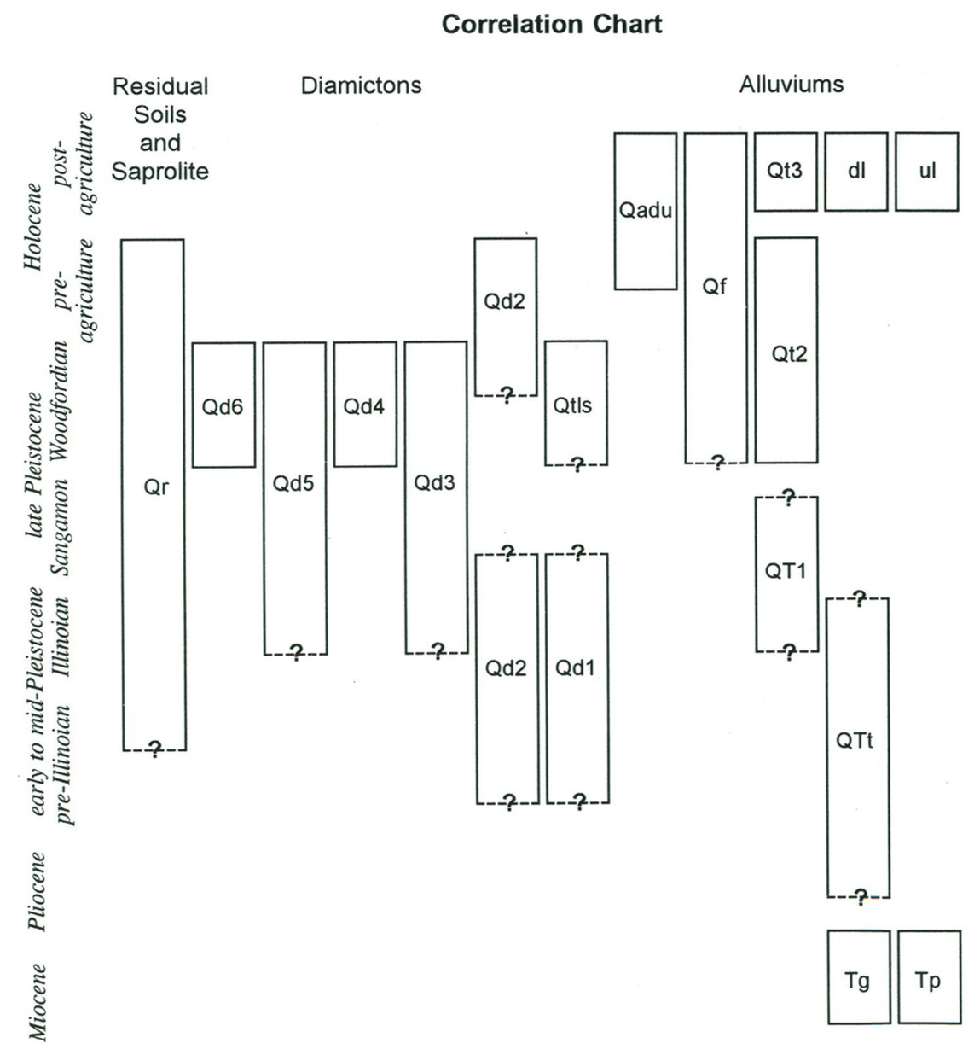
UPLAND GRAVELS: Thin (<1 meter thick) gravel lags to widely scattered lag pebbles typically found on flat interfluves and on flats adjacent to major streams. Pebbles range in size from 2 to 20 cm, average 4 to 10 cm in diameter and are subangular to very well-rounded. Clast composition generally reflects local Piedmont sources and is dominated by quartzite, vein quartz, metagreywacke, and schist. The gravels are further subdivided into the following three groups distinguished by their elevation, geographical, compositional, and textural characteristics:

QTt — Subangular to subrounded gravels of diverse lithologic composition dominated by vein quartz, quartzite, and schist on flats adjacent to larger streams at elevations less than 400 feet.

Tp — Subangular to subrounded gravels of diverse lithologic composition dominated by meta-conglomerate, slate, schist, and quartzite on flats interpreted to be dissected and colluviated pediments along the southeast flank of Slate Ridge.

Tg — Very well-rounded quartz pebble upland gravels along Broad Creek, Deer Creek, and the Susquehanna River at or above 400 feet in elevation.

Correlation Chart



Diamictons derived from mafic and meta-igneous rocks

Qd6u — **DIAMICTON 6:** Tan, yellow, and brown, clast-supported diamicton of dense, foliated ultramafic rocks and of Deer Creek Complex metasediment clasts. The diamicton has little to no matrix material, is poorly to moderately well-stratified and has a strong slope-parallel fabric. This deposit exhibits a very poorly developed light-colored loamy soil characterized only by a cambic B horizon. Diamicton thickness is typically no more than 1 meter.

Qd6s — **DIAMICTON 6:** Tan, yellow, and brown, clast-supported diamicton composed of dense, foliated, fresh and weathered serpentinite clasts that may have a thick (≈2 cm) goethite weathering rind. The diamicton is typically less than 0.5 meter thick and overlies fresh to slightly weathered serpentinite bedrock. The lack of any appreciable soil results in the support of only a barrens-type vegetation.

Qd4u — **DIAMICTON 4:** Tan, yellow, and brown, poorly stratified, poorly to moderately well-sorted, generally non-micaceous, matrix-supported deposit with many fresh angular clasts 5 to 30 cm in diameter. The silty sand matrix supports dense clasts of foliated ultramafic rock with a thick (≈2 cm) goethite weathering rind and clasts of Deer Creek Complex metasediment. The deposit exhibits a poorly developed light-colored (10YR-7.5YR) soil with a Bw/Bt horizon characterized by thin clay films and moderate subangular blocky structure. A buried soil exhibiting dark, brownish-red (5YR) colors with thick clay films and well-developed structure occurs in some areas. The diamicton ranges from 1 to 2 meters in thickness and typically overlies a silty saprolite of variable thickness developed in foliated ultramafic bedrock.

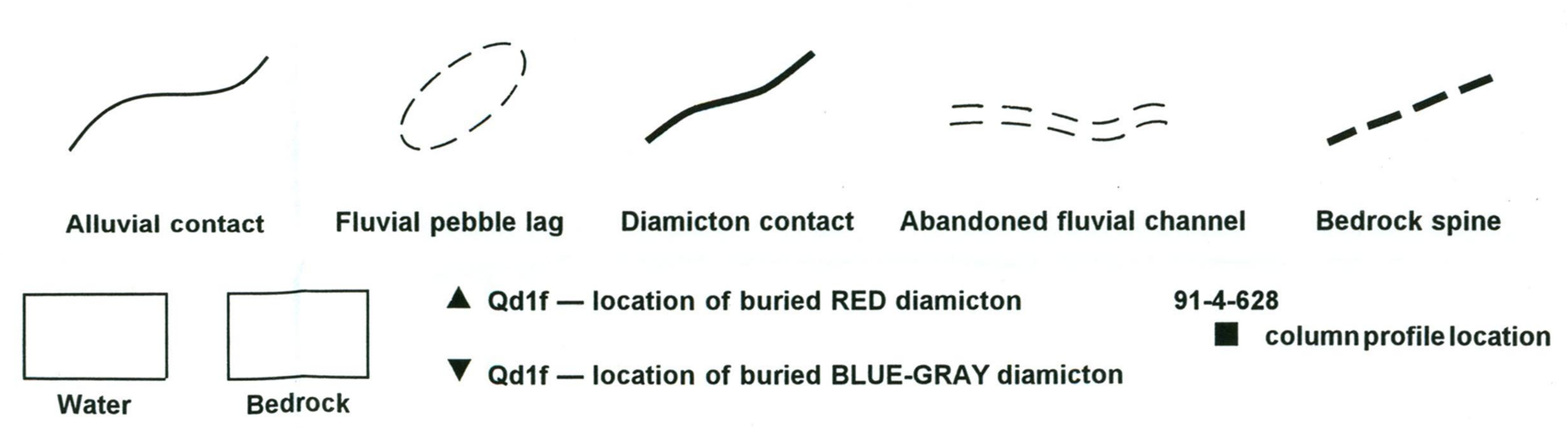
Qd4m — **DIAMICTON 4:** Dark red, poorly stratified, poorly to moderately well-sorted, dominantly matrix-supported roundstone diamicton with both fresh and weathered subangular to well-rounded clasts 0.1 - 2 meters in diameter. Matrix is sandy silt. Clasts consist of dense, massive ultramafic rocks and metagabbro with a thick (≈2 cm) goethite weathering rind that are commonly concentrated near or at the surface of the deposit forming surficial roundstone lags. The diamicton exhibits a moderately to well-developed red soil characterized by a 0.3- to 1-meter thick red (2.5YR-10R) argillic horizon with many thin to thick clay films and moderate to well-developed structure. The unit is 0.5 to 3 meters thick and typically overlies a thin (<1 to 2 meters) sandy, structured saprolite, and/or weathered bedrock.

Qd2u — **DIAMICTON 2:** Tan, yellow, and brown, very clast-poor, massive sandy silt deposit that is the near-surface expression of reworked residuum derived from foliated ultramafic rocks. The deposit exhibits a very poorly developed soil characterized by a thin cambic B horizon that is gradational to underlying residual materials such as saprolite and/or weathered bedrock. This diamicton is easily distinguished from true saprolite and residual soil, because it displays a textural fabric sub-parallel to slope, as well as a thin (0.5 m) discontinuous, non-foliated "massive" residual material separating remobilized saprolite from the overlying soil. The deposit is typically about a meter thick, whereas the underlying residual material is highly variable, ranging from 1 to >10 meters.

Qd2g — **DIAMICTON 2:** Tan and white, very clast-poor, massive sandy silt deposit that is the near-surface expression of reworked residuum derived from structured saprolite of granitic gneiss. The deposit exhibits a very poorly developed soil characterized by a thin yellow cambic B horizon that is gradational to underlying residual materials, such as saprolite and/or weathered bedrock. This diamicton is easily distinguished from true saprolite and residual soil because it displays a textural fabric sub-parallel to slope as well as a thin, discontinuous, non-foliated (≈0.5 m) "massive" saprolite zone separating the remobilized saprolite from the overlying soil. Deposit thickness is less than 1 meter while the thickness of saprolite is highly variable, ranging from 1 to >10 meters.

Qrm — **RESIDUAL SOIL and SAPROLITE:** Dark red and brownish-yellow, sandy silt residual soil with few fresh and weathered subangular to well-rounded clasts 0.1 to 2 meters in diameter, composed of massive, dense, ultramafic rocks and metagabbro with a thick (≈2 cm) goethite weathering rind. The deposit exhibits a well-developed red soil (2.5YR - 10R) characterized by a 0.5- to 0.8-meter thick argillic horizon with many thick clay films and well-developed angular blocky to prismatic structure that grades downward to a well-developed reddish-brown sandy saprolite. The soil commonly has a roundstone lag on the surface and is penetrated by numerous wedge-like "tongues" of brownish-yellow (10YR) silt, approximately 1 meter deep and 0.5 meter wide at the top. The residual soil is generally 1 to 2 meters thick, while the underlying sandy structured saprolite ranges in thickness from 1 to >10 meters.

Qrg — **RESIDUAL SOIL and SAPROLITE:** Tan and white dominantly sandy silt residual soil approximately 1 meter thick with few weathered subangular to well-rounded clasts 0.1 to 0.5 meter in diameter, composed of massive, light-colored granitic gneiss. The soil is poorly developed and characterized by a reddish-brown (10YR - 7.5YR) Bw/Bt 0.1 to 0.5 meter thick, transitional downward to a well-developed, sandy, very micaceous white saprolite. The saprolite has locally lost its structured characteristic and appears as a massive saprolite. Saprolite thickness ranges from 1 to >10 meters.



Diamictons derived from felsic and metasedimentary rocks

Qd6f — **DIAMICTON 6:** Brown, clast-supported diamicton with little or no matrix material. It is poorly to moderately well-stratified and contains only fresh, angular clasts 0.1 to 0.5 meter, rarely >1 meter in diameter. This unit exhibits a very poorly developed soil characterized by <0.5-meter thick A and Bw horizons. The deposit is typically about 1 meter thick and overlies weathered and unweathered bedrock.

Qtls — **TALUS:** Poorly to moderately well-sorted, generally coarsening-up blockfields composed of angular and subangular clasts 0.2 to 2 meters in diameter with virtually no interstitial matrix material. The deposits are typically less than 2 meters thick and compose the surficial cover of only small areas underlain by the Rocks Park and Cardiff metaconglomerates.

Qd5f — **DIAMICTON 5:** Brown, brownish-red, and red poorly sorted and stratified slate-clast deposit with 1- to 10-cm flat slate clasts imbedded in a uniform, massive silt matrix. This deposit is actually at least two separate diamictons consisting of an upper brown unit characterized by a moderately well-developed brownish-red soil (7.5YR) that overlies a diamicton with a well-developed, but truncated, red (5YR) paleosol. Total thickness of slate diamicton is 1 to 1.5 meters. This unit is associated only with slate bedrock of the Peach Bottom Formation.

Qd4f — **DIAMICTON 4:** Orange and brown, poorly stratified, clast-rich diamicton that is dominantly matrix-supported but which also exhibits a clast-supported texture in approximately 10 percent of its areal extent. The non-micaceous silty-sand matrix supports mostly fresh, angular clasts 5 to 30 cm in diameter with a strong slope-parallel fabric except where disturbed by cryoturbation features. The deposit exhibits a poorly developed soil characterized by a brown (10YR) cambic B horizon 0.1 to 0.3 meter thick followed by a brown (10YR) and reddish-brown (7.5YR) argillic horizon approximately 0.5 meter thick with few thin clay films and poorly developed subangular blocky structure. This upper argillic horizon may be followed by a thin, truncated, buried brownish-red (5YR) argillic horizon. Diamicton 4 often exhibits cryoturbation features characterized by roll structures 0.2 to 1 meter across and 0.5 meter deep and wedges 0.5 meter across and 0.5 meter deep. The unit is typically 1 to 2 meters thick and usually overlies weathered and unweathered bedrock, but may also overlie structured saprolite and reworked saprolitic materials.

Qd3f — **DIAMICTON 3:** Orange, brown, yellow, tan, and gray, poorly stratified and sorted, always matrix-supported diamicton. The matrix is a slightly micaceous silty sand that supports fresh and weathered bedrock clasts and "clasts" of structured saprolite. The clast to matrix ratio is 50:50 or less, and clasts generally exhibit a slope-parallel fabric. The deposit typically exhibits a moderately well-developed reddish-brown (7.5YR) and brownish-red (5YR) soil characterized by a 0.5-meter argillic horizon with common thin clay films and moderate subangular blocky structure often followed by a thin, truncated, buried, red (2.5YR), well-developed argillic horizon. Approximately 20 percent of the deposit is also characterized by a more poorly developed soil with a morphology consistent with the soil found with diamicton 4. Diamicton 3 often exhibits cryoturbation features characterized by roll structures 0.2 to 1 meter across and 0.5 meter deep and wedges 0.5 meter across and 0.5 meter deep. This 1- to 2-meters thick unit usually overlies residual materials such as structured saprolite, reworked saprolite, and weathered bedrock. This diamicton rarely overlies fresh bedrock.

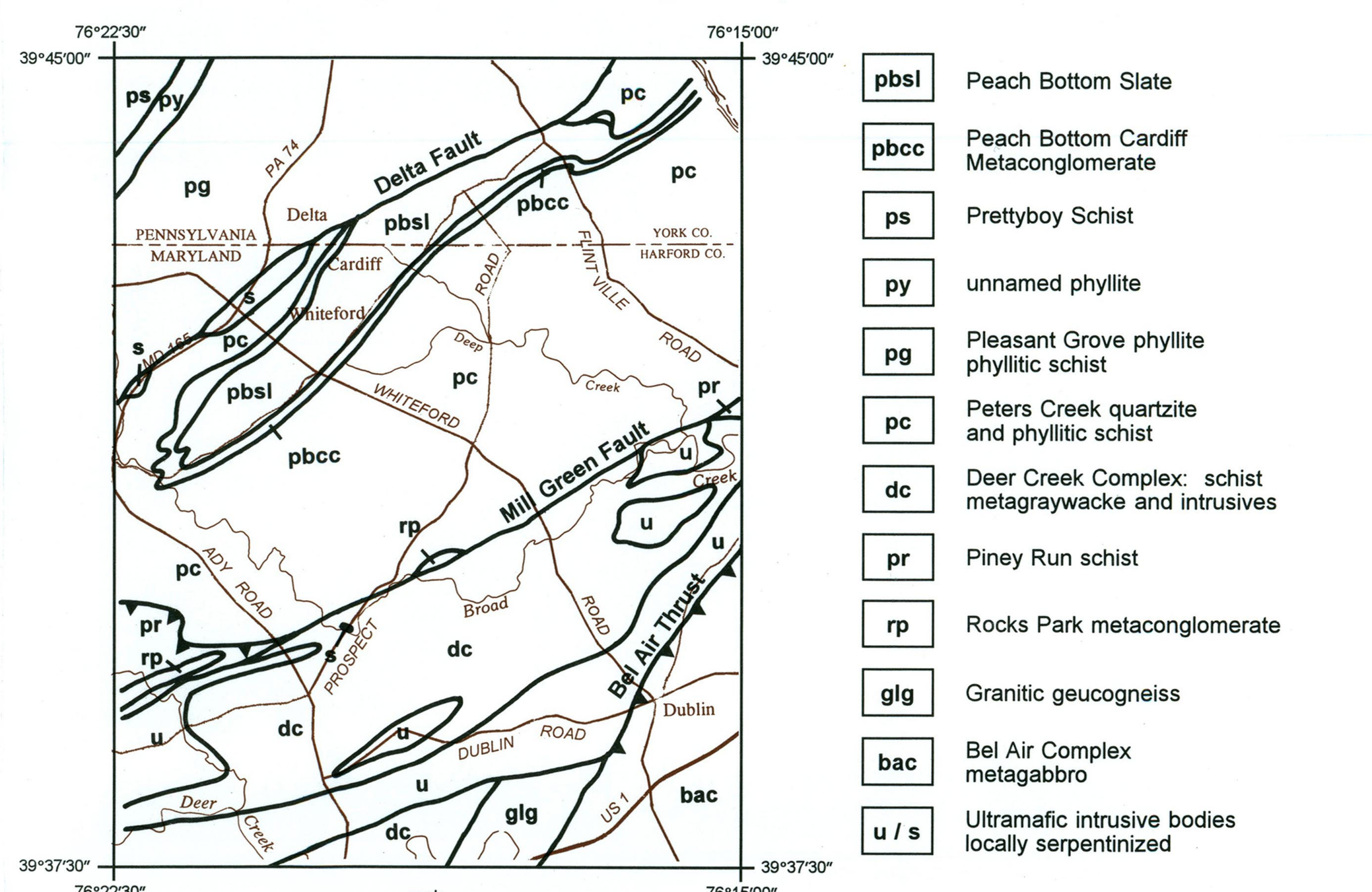
Qd2f — **DIAMICTON 2:** Brown, brownish-red, gray, green, and olive, often micaceous, very clast-poor diamicton that is either a near-surface or buried deposit of reworked residuum derived from structured saprolite and weathered bedrock. This diamicton is easily distinguished from underlying saprolite because it typically exhibits a slope-parallel, sub-horizontal foliation which differs markedly from the nearly vertical foliation of non-deformed structured saprolite and bedrock. Where exposed at the surface, the deposit exhibits a very poorly developed soil characterized by a brown (10YR) Bw/Bt horizon approximately 0.3 meter thick. Diamicton 2 is typically less than 1 meter thick, while thickness of the underlying residual material from which it is derived is highly variable, having been observed to range from 1 to >10 meters.

Qd1f — **DIAMICTON 1:** Red, matrix- and clast-supported, poorly to well-stratified, buried diamicton that distinctly coarsens upward. The base of this unit is often characterized by a red, brown, olive, or green sandy, micaceous, often cross-stratified deposit 0.2 to 1 meter thick. It is interpreted to be fluvially reworked material derived from saprolite (diamicton 2). Diamicton 1 is easily recognized by a well-developed paleosol with mostly weathered, but some fresh, angular clasts 5 to 30 cm in diameter that exhibit a strong slope-parallel fabric except where disturbed by cryoturbation features. The argillic horizon exhibits deep red colors (2.5YR), has well-developed angular blocky structure, many thick clay films, and may be 2 to 3 meters thick in some of the thicker deposits. This diamicton is indurated in poorly drained positions where it has been observed to exhibit a bluish-gray color. Thickness ranges from <1 to 5 meters.

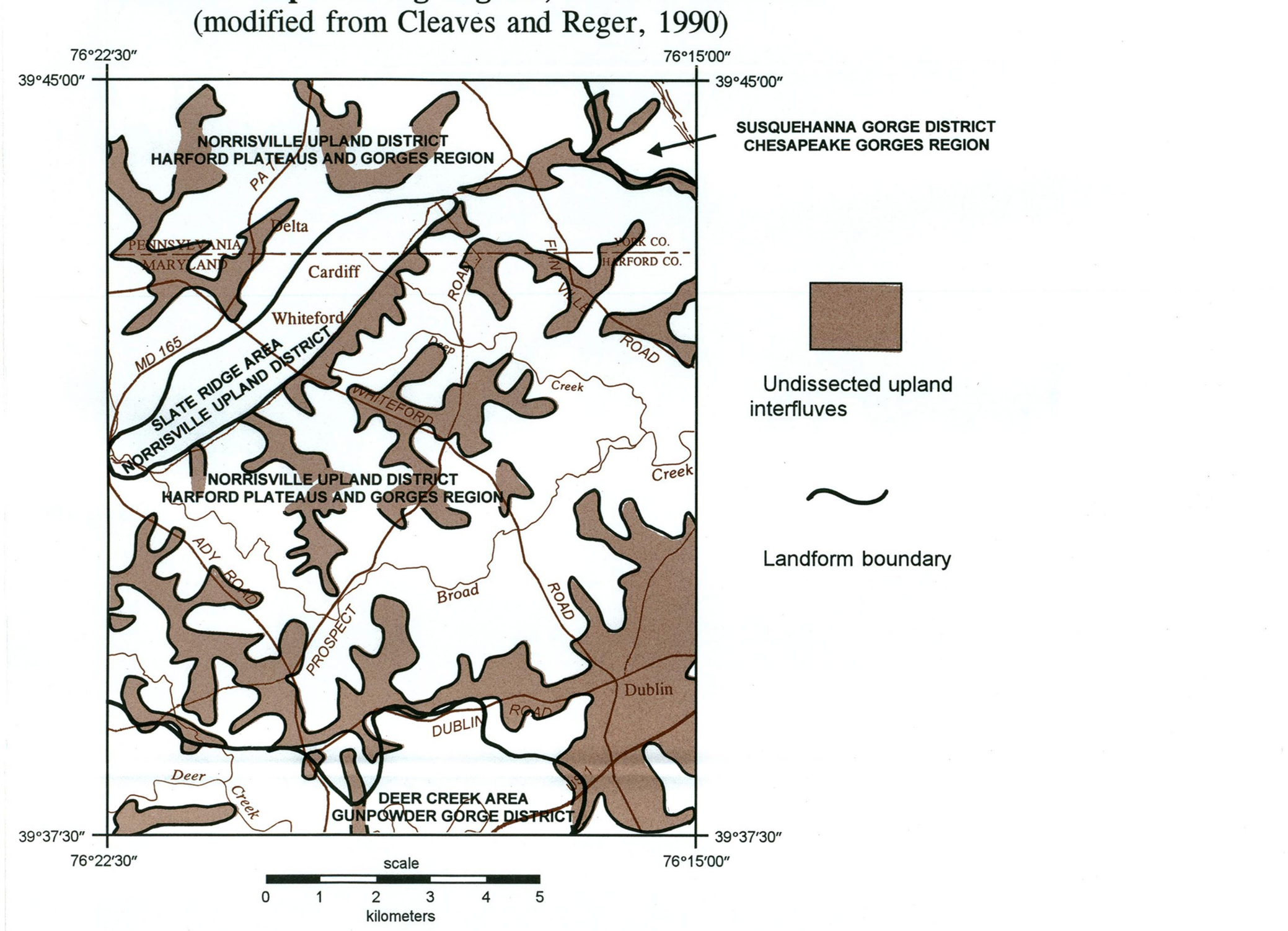
Qrf — **RESIDUAL SOIL and SAPROLITE:** Clast-poor surficial deposit derived entirely from *in situ* chemical weathering and pedogenic processes. The slightly micaceous soil has easily distinguishable horizons and a clearly visible transitional Cox-horizon into underlying structured saprolite or weathered bedrock. The argillic horizon is approximately 0.4 to 0.8 meter thick, reddish-brown (7.5YR) to red (2.5YR) with moderately well-developed subangular blocky structure and common thin clay films. The residual soil is 1 to 1.5 meters thick, whereas underlying saprolite ranges from 1 to 10 meters. Micaceous content of the saprolite differs with bedrock type. Generally saprolite derived from phyllite and schist contains more mica than that derived from quartzite and metagreywacke.


A
A'
76°22'30"
39°45'
20'
17'30"
76°15'
42'30"
40'
39°37'30"
Whiteford
Mt Vernon
Pylesville
Dublin
Poplar
SCALE 1:24 000
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST
ROAD CLASSIFICATION
Heavy-duty
Light-duty
Medium-duty
Unimproved dirt
U. S. Route
State Route
QUADRANGLE LOCATION
UTM GRID AND 1974 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
DELTA, MD.—PA.
N3937.5—W7615/7.5
1956
PHOTOREVISED 1974
AMS 5763 III NE—SERIES V833

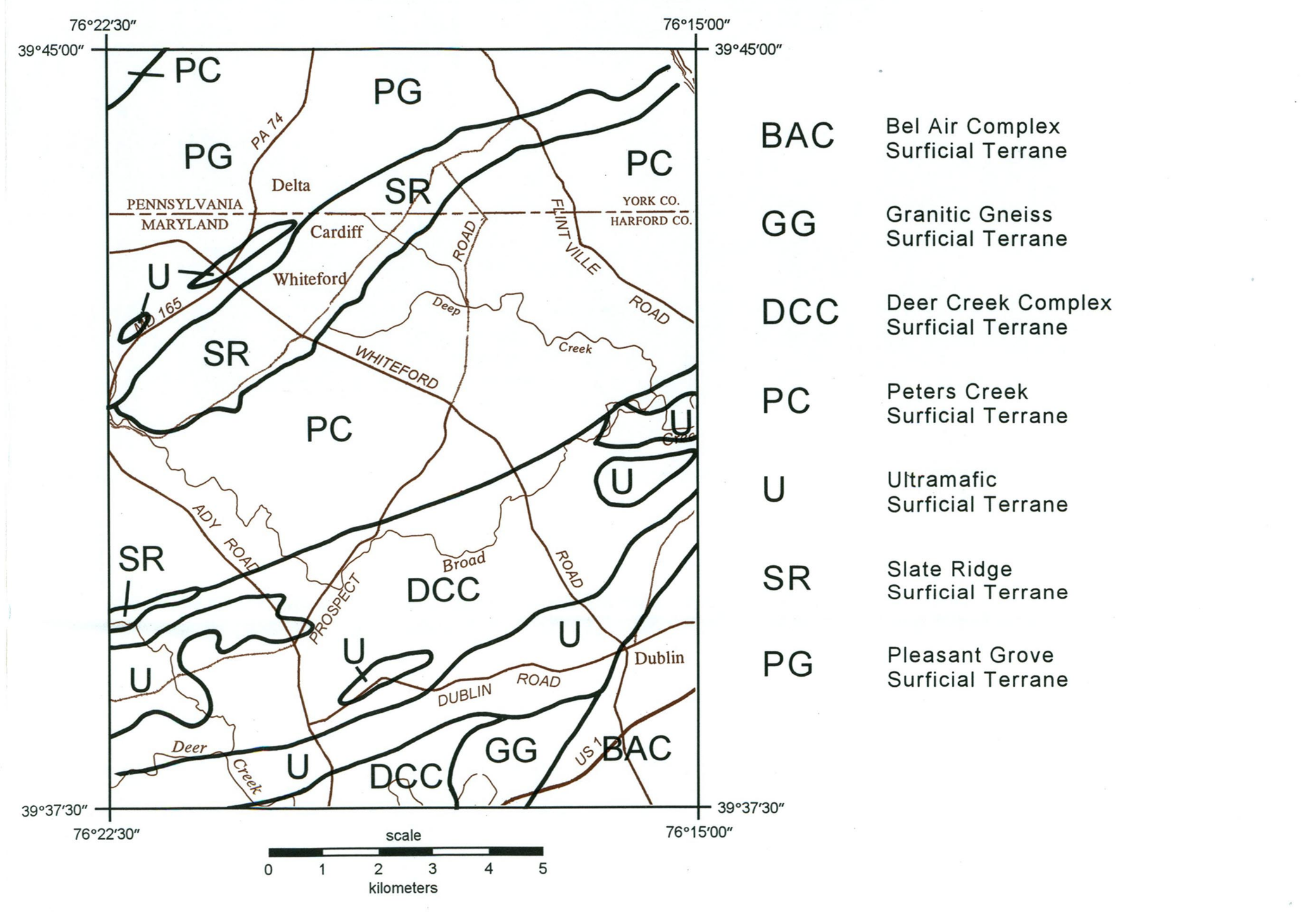
Bedrock Geology of Delta Quadrangle (adapted from Muller, 1990)


76°22'30"
76°15'00"
39°45'00"
39°37'30"
Delta Fault
Mill Green Fault
Bel Air Thrust
PENNSYLVANIA
MARYLAND
Delta
Cardiff
Whiteford
Dublin
pbsl Peach Bottom Slate
pbcc Peach Bottom Cardiff Metaconglomerate
ps Prettyboy Schist
py unnamed phyllite
pg Pleasant Grove phyllite phyllitic schist
pc Peters Creek quartzite and phyllitic schist
dc Deer Creek Complex: schist metagraywacke and intrusives
pr Piney Run schist
rp Rocks Park metaconglomerate
glg Granitic geucogneiss
bac Bel Air Complex metagabbro
u/s Ultramafic intrusive bodies locally serpentinized
scale
kilometers

Landform Map Showing Regions, Districts and Areas
(modified from Cleaves and Reger, 1990)


SUSQUEHANNA GORGE DISTRICT
CHESAPEAKE GORGES REGION
NORRISVILLE UPLAND DISTRICT
HARFORD PLATEAUS AND GORGES REGION
SLATE RIDGE AREA
DEER CREEK AREA
GUNPOWDER GORGE DISTRICT
Undissected upland interfluves
Landform boundary
scale
kilometers

Surficial Terranes in the Delta Quadrangle


PC
PG
SR
U
DCC
GG
BAC
BAC Bel Air Complex Surficial Terrane
GG Granitic Gneiss Surficial Terrane
DCC Deer Creek Complex Surficial Terrane
PC Peters Creek Surficial Terrane
U Ultramafic Surficial Terrane
SR Slate Ridge Surficial Terrane
PG Pleasant Grove Surficial Terrane
scale
kilometers