

NOTES ON THE GEOLOGIC STRUCTURE AND TRATIGRAPHY OF THE PIEDMONT ROCKS IN THE UNION BRIDGE QUADRANGLE In the Union Bridge quadrangle, the lithologies of the Westminster terrane MAPPING RATIONALE can be grouped into an assemblage of greenschist-facies metamorphic rocks, (1993a, 1993b, 1994, and 1996), identified the series of subparallel faults, which

relatively minor revisions to Edwards' original contacts. and Stose, 1938; Stose and Stose 1946), which they closely resemble. In the shales, siltstone, sandstone, and a basal conglomerate. current version of the map, additional phyllites, located between the Avondale Creek Formation.

For that reason also, the Sams Creek Formation is here elevated unofficially to group status, owing to the combining of various lithologies under the banner of Sams Creek. The Sams Creek is recognized here as a mixture of sheared metabasalt, various phyllites, carbonates, and quartzites. The Sams Creek has been thoroughly deformed by cleavage and small-scale folds. A few persistent layers of quartzite occur in the phyllites in the southern part of the quadrangle. They are symbolized on the map as subunits of the enclosing lithologies. metabasalt bears a strong resemblance to similar lithologies in the Catoctin and Southworth, 1996, 1998, 1999; Southworth and others, 2002.) Swift Run Formations of Late Precambrian age that are present in the South

GEOLOGIC SETTING

on the west or northwest by the Martic Fault (e.g., in the Woodsboro events during the Paleozoic. zone (e.g., in the Westminster quadrangle). ties to Laurentia (Horton and others, 1989). The Westminster terrane is thought these as reverse faults, steeply dipping to the southeast.

low-grade greenschist facies conditions (Mulvey and others, 2004).

others, 2002; and Kunk and others, 2004) used more of a lithologic approach to metamorphism of associated shale, siltstone, and graywacke, or lithic arenite. mapping than a stratigraphic approach. A similar lithologic approach was taken

The ages of these rock sequences have not been determined, but estimates in a reinterpretation of the geology of the adjacent New Windsor quadrangle range from as old as Late Proterozoic and Cambrian to as young as Early (Reger and others, 2004). Stratigraphic relationships are uncertain, and a Ordovician. Southworth and others (2002) depict all metamorphic rocks of the lithologic basis for grouping rock units, as is applied in both the New Windsor Westminster terrane to have been deposited during the Late Proterozoic to Early and the Union Bridge quadrangle maps, offers a reasonable alternative to a Cambrian. These deposits were subsequently subjected to several phases of As a result of this reinterpretation, some lithologic units that Edwards The Westminster terrane lies in unconformable contact with the Late Triassic or chronologic order. Stratigraphic interpretation and correlation of rock units considered to be different formations are now considered part of the Sams Creek New Oxford Formation. Triassic sedimentary rocks of the Gettysburg Basin are hampered by poor exposure and structural complexity, as well as by the lack Formation. Edwards (1986) included some phyllites in the Sams Creek occupy roughly the northern or northwestern third of the Union Bridge 7.5- of fossils and absolute dates. Most primary sedimentary and volcanic structures

deformation and metamorphism during the Paleozoic. Formation that had been formerly included in the Ijamsville Formation (Jonas minute quadrangle. The predominant lithologies in the Gettysburg Basin are in the rock units have been obscured or obliterated by folding, foliation, and Surficial deposits include naturally formed Quaternary terrace deposits and been destroyed or modified by later episodes of tectonism. Examining the Fault in the New Windsor quadrangle to the east and the Martic Fault in the alluvium and manmade artificial fill. Terrace deposits are a discontinuous series interpretations of Fisher (1978), Edwards (1993b), and Southworth and others Woodsboro quadrangle to the west, and which Edwards (1986) included in the of small fluvial deposits that lie adjacent to and above the flood plains of the two (2002) underscores the diversity of interpretations, but offers no solution. Ijamsville, Marburg and Gillis Formations, are now also included in the Sams major streams. Terrace deposits record episodes of river deposition and valley cutting older than the alluvium found along modern streams. STRUCTURE

Bedrock units of the Westminster terrane have a complex and dynamic structural and metamorphic history, characterized by polydeformed and of the Sams Creek has long been problematic. Edwards (1986) considered the In the Sams Creek "group," the association of phyllite and marble with polymetamorphosed rocks in a system of imbricate thrust sheets (e.g., Wakefield to be within the Sams Creek and near its base, but Fisher (1978) Triassic rocks of the New Oxford Formation, in the northwest corner of the considered it as older than the Sams Creek. Therefore, with the limited evidence Mountain Anticlinorium in northern Virginia (Nickelsen, 1956). Therefore, map, represent part of the Gettysburg Basin. It is widely accepted that early available, it is impossible to assign it to a set stratigraphic position with any Edwards (1986) considered the Sams Creek to be correlative with the Catoctin Mesozoic continental rifting formed the Gettysburg Basin. This basin was certainty. For the sake of consistency, the Wakefield Marble is herein shown as originally connected to a second basin, the Culpeper Basin, and together they a unit separate from the Sams Creek, in accordance with its depiction on the formed a large down-faulted basin that filled with sediments eroding from Blue adjacent New Windsor quadrangle geologic map (Fisher, 1986; Reger and Ridge and Piedmont highlands (Southworth and others, 2002).

the Mesozoic Gettysburg Basin in the northern part of the quadrangle and the quadrangle. Those offsetting the Triassic rocks are presumably normal faults. Creek marble, rather than Wakefield Marble. Early Paleozoic to Late Proterozoic(?) Westminster terrane in the southern part. associated with continental rifting that formed the Gettysburg Basin during the The Westminster terrane is one of the least understood tectonostratigraphic Mesozoic. Two much earlier sets of faults are shown in the Westminster associated phyllite and slate are here included in the Sams Creek Formation. units in the Maryland Piedmont. Dominated by phyllites, this terrane is bounded terrane; these were the result of compressional forces associated with orogenic Fisher (1978) included it in the Ijamsville Phyllite, which is not recognized in quadrangle) and on the east or southeast by the Pleasant Grove Fault, or shear Edwards (1986) had originally conceptualized most of the Paleozoic faults in Marburg Formation. As currently mapped, the Silver Run Limestone occurs at the Union Bridge quadrangle to be overthrust and overturned overthrust faults, or near the top of the Sams Creek Formation. Fisher (1978) interpreted the The rocks within the Westminster terrane have been interpreted as being part but direct evidence is sparse. Based on subsequent regional mapping and related alternating graded clastic carbonate beds and argillaceous material of the Silver of a post-rift, slope-rise deep-water prism that was deposited in the Iapetus revisions to the structural-tectonic framework (e.g., Edwards, written Run as representing the periodic influx of carbonate debris (possibly turbidites ocean off the Laurentian margin (Mulvey, 2004), but with no direct stratigraphic communication, 1997; Southworth and others, 2002), the current map shows or a polymictic slide mass) derived from a Cambrian and Ordovician carbonate to have been thrust over the unmetamorphosed, Cambrian-Ordovician Frederick

The two generations of Paleozoic faults can be distinguished as follows: (1) represents the distal edge of an off-shelf carbonate wedge and associated slide Valley limestones along the Martic Fault onto the Laurentian margin during the those that, because of their circuitous fault traces, indicate significant post-fault masses represented by parts of the Frederick Formation, west of the Union Ordovician Taconic orogeny, and its phyllites have been metamorphosed under folding, and correspond to the "early faults" of Fisher (1978) and (2) a series of Bridge quadrangle (Brezinski, 2004). subparallel faults that are not strongly affected by folding.

Edwards, in his mapping of the quadrangles surrounding Union Bridge This map represents a revised interpretation of the geology of the Union consisting mainly of metavolcanic rocks (metabasalt) and metasedimentary he collectively called the Cranberry fault system. He suggested that these later Bridge quadrangle, since the geologic map of the quadrangle was first published rocks (phyllites, marble, quartzites, and limestone). This metavolcanic and faults likely represent a final phase of Paleozoic deformation, presumably the (Edwards, 1986). While the current map retains most of Edwards' (1986) metasedimentary assemblage includes the Ijamsville phyllite, the Wakefield Alleghanian orogeny. Although he initially interpreted these as west-dipping, highgeologic contacts and structural measurements, it revises the structural and Marble, and the Sams Creek "group," which is combination of metabasalt, angle reverse faults, he subsequently considered them to be east-dipping, high-angle stratigraphic relationships (including formation names) to offer an interpretation phyllites, limestone, marble, and quartzites. The metabasalts represent ocean reverse faults (Edwards, written communication, 1997). In the Union Bridge consistent with the more recent regional interpretations. Field reconnaissance of floor deposits and possibly the remains of volcanic islands or seamounts built on quadrangle, the only named fault in the Cranberry fault system is the Hyattstown selected areas during the preparation of this current map resulted in a few oceanic crust (Smith and Barnes, 1994; Southworth, 1996). The associated Fault, which trends northeast into the New Windsor quadrangle and south into marble appears to represent shallow-water carbonates that formed in proximity the Libertytown quadrangle and beyond. Recent work by Southworth and others Recent mapping in the region (e.g., Southworth, 1999; Southworth and to volcanic islands or seamounts. Phyllites developed from the low-grade (in press) concludes the 50-km long Hyattstown Fault is a thrust fault with a cooling age that assigns it to the Taconic orogeny (Early Silurian at the latest).

STRATIGRAPHY AND CORRELATION

Stratigraphic relationships of the various lithologies in the map area remain

problematic. The order of unit descriptions is not meant to imply a stratigraphic recrystallization. To a large extent, early-formed structures and foliation have In the Union Bridge quadrangle, most of the metamorphic lithologies are interpreted as belonging to the Sams Creek Formation (or "group") as mapped in the adjacent New Windsor quadrangle (Reger and others, 2004) west of the Avondale Fault. In addition, the Ijamsville (?) phyllite is encountered in the western and central parts of the quadrangle. The reassignment of what Edwards (1986) had mapped as Urbana Formation to Ijamsville phyllite and part of his Ijamsville Formation to a tuffaceous phyllite is consistent with recent mapping of the adjacent Woodsboro quadrangle by Brezinski (2004). The stratigraphic position of the Wakefield Marble relative to the metabasalts placed it as a separate unit above the Sams Creek, and Jonas and Stose (1938) others, 2004). In a geographic sense in the Union Bridge quadrangle, the Wakefield Marble is restricted to the area of the Priestland Valley, where it is associated with the metabasalt lithologies. Narrow, linear, and somewhat discontinuous belts and sporadic lenses of marble, mainly within the Sams The Union Bridge quadrangle falls within two geologic terranes. These are

At least three generations of steeply dipping faults occur in the Union Bridge

Creek phyllite in the south-central part of the quadrangle are mapped as Sams Another unresolved placement is the Silver Run Limestone. It and its this part of the current map, and Edwards (1986) included it as a member of the shelf to the northwest into a shale basin. If so, the Silver Run probably

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CORRELATION OF MAP UNITS Late Triassic Early Paleozoic Late Proterozoic? Ijamsville (?) Wakefield Sams Creek group Phyllite

Union Bridge Quadrangle, Geologic Map

DESCRIPTION OF MAP UNITS



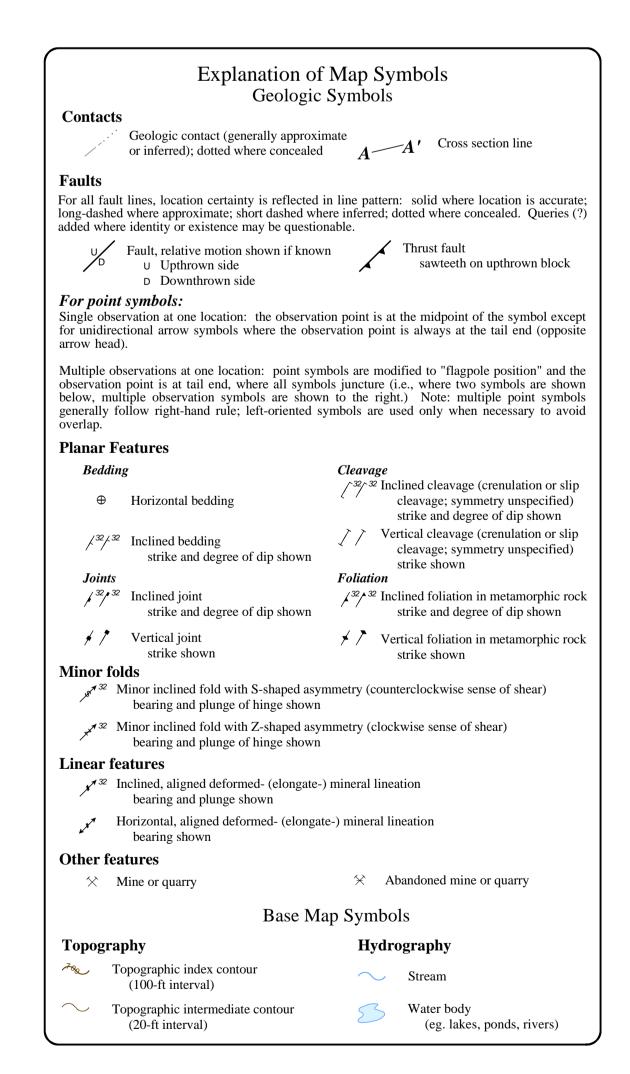
REFERENCES CITED

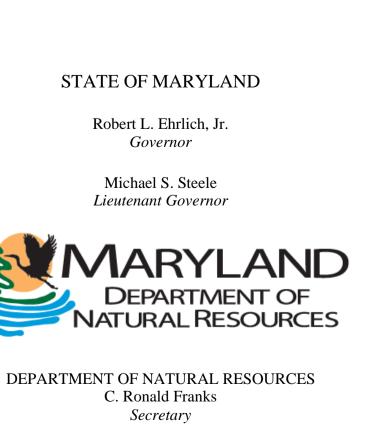
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