

Tectonics Implications of Bedrock Studies at the World Trade Center Site (WTC), NYC
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During construction for the new World Trade Center site extensive excavation allowed for long-term study (2004-2008) of the principal bedrock features in context with my allied studies in surrounding regions of NYC. Steeply dipping rocks of the Walloomsac and Hartland formations traverse from NE to SW through the site where they are highly flattened, sheared and imbricated and then cut by steeply plunging late folds with NE-trending axial surfaces. Here the Hartland (Taconic Sequence) consists of dominantly gray-weathering, fine- to coarse-textured, well-layered muscovite-quartz-plagioclase-biotite-kyanite-staurolite-garnet schist, gneiss, and migmatite with cm- and m-scale layers of gray quartzose granofels, coticule, and greenish amphibolite±biotite±garnet. The schistose facies is lustrous and consists of fine- to coarse-textured muscovite that splits readily along the foliation.

By contrast the Walloomsac (Tippecanoe Sequence) consists of fissile brown- to rusty-weathering, fine- to medium-textured, biotite-muscovite-quartz-plagioclase-kyanite-garnet-pyrite-graphite schist and migmatite containing interlayers centimeters to meters thick of plagioclase-quartz-mica granofels, layers of diopside±tremolite±phlogopite calcite (“Balmville”) and dolomitic marble, and calc-silicate rock. Garnet occurs as porphyroblasts up to 1 cm in size but amphibolite is absent. Pleochroic reddish-brown biotite, graphite, and pyrite are diagnostic mineralogical features of the former pelitic portions of the formation.

Both rock formations contain garnet+staurolite+kyanite assemblages with relict sillimanite indicating amphibolite facies conditions at former depths of ~24 km. The presence of comingled Walloomsac and Hartland lithotypes at the WTC site suggests shearing of a former carbonaceous and sulfidic clay-rich continental margin sequence (Tippecanoe Sequence) against allochthonous eugeoclinal strata of the Hartland Terrane (Taconic Sequence). Sheared rocks of the WTC lie within a belt of isolated serpentinite and sheared schistose rocks that are folded into a broad antiform that extends below the southern tip of Manhattan Island into Staten Island. The belt of sheared rocks + serpentinite masses may outline the location of a formerly deep-seated Taconian suture.

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