

The Geological Framework of 1st Tectonic Cycle Quarries Developed Within Chert-Bearing Cambrian and Ordovician Strata of the Kittatinny Supergroup: NW New Jersey/ SE New York State

Philip LaPorta, Ph.D., The Center for the Investigation of Native and Ancient Quarries and Pace University, Department of Chemistry and Physical Science

Margaret Brewer-LaPorta, Ph.D., The Center for the Investigation of Native and Ancient Quarries and Pace University, Department of Chemistry and Physical Science

Scott Minchak, M.A., The Center for the Investigation of Native and Ancient Quarries and Pace University, Department of Chemistry

Approximately 800 bedrock chert quarries are documented in the Wallkill Valley of the Great Valley Sequence, near the Pennsylvania salient/New York embayment of the Appalachian orogen. The Wallkill Valley is the type section for prehistoric quarries developed in tectonic cycle 1 nodular cherts of Cambrian/ Ordovician age.

Chert-bearing carbonates in the Wallkill Valley have endured several episodes of tectonism (Taconic orogeny through Triassic-Jurassic rifting) and have been metamorphosed to greenschist facies. Tectonics and resulting large scale structures have given rise to the Great Valley physiography of the study area, which is bound to the east by Precambrian gneisses and to the west by Middle Ordovician Martinsburg slate.

The quarries are partitioned by regional structure into a province with associated trends, districts, slices, inliers and outliers. On the 7.5' quadrangle scale, quarries situated to the east are within normal fault bounded horsts and grabens; within structural flats in the center of the valley; and in thrust-fault ramps, truncated folds and back thrusts along the western side. Outcrop-scale structures within chert include pressure solution features, dissolution-reprecipitation halos, a variety of stylolites, boudinages, mylonites, cataclasites, novaculite structures, dilation breccias, recrystallization fabrics and metamorphic mineral phases.

The eastern normal faulted section is underlain by basal Cambrian upper supratidal Hardyston and overlying lower supratidal Leithsville formations. Structural flats contain Middle Cambrian peritidal Limeport Formation and associated stromatolites. The western flat is supported by shallow subtidal Upper Allentown and peritidal Stonehenge formations. Ramps are underlain by the lower supratidal/ peritidal Rickenbach Formation and its overlying reefal Crooked Swamp facies. Upper ramps contain the supratidal silcrete Lower Ordovician Epler Formation, while truncated folds and back thrusts reveal shallow subtidal to peritidal Beaver Run and Harmonyvale members of the Ontelaunee Formation. All of the Cambrian-Ordovician carbonates exhibit sedimentary facies which are partially or entirely preserved by chert.