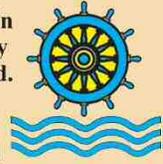




HydroQuest

email: hydroquest@yahoo.com
web site: hydroquest.com

Paul A. Rubin
414 E. Kerley
Corners Rd.
Tivoli, New
York, 12583
845-657-8111



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Preliminary Cultural/Archaeologic Resource Investigation: Hemlock Quarry

Location: Bluestone Wild Forest, Town of Kingston, New York State. See NYS location map below and Figure 1. This general area is referred to as Stony Hollow.

Cultural Heritage Protection Status: North-northeast section: Partially protected by New York State ownership
South-southwest section: Private ownership by 850 Route 28 LLC



Large bedrock block (left) fallen from cliff face.

Cultural/Archaeologic Investigation Status: Preliminary Field Reconnaissance only on NYS land and via analysis of high resolution orthoimagery and LiDAR-derived elevational data.

Cultural Resource Investigation Purpose: To establish systematic, high-quality methods for the identification, evaluation, interpretation, and preservation of culturally significant resources.



Cultural Significance: “Hemlock Quarry” is the largest relict bluestone quarry within the Bluestone Wild Forest and the only one where progressive bedrock cliff removal occurred over a long distance, probably with the aid of horse drawn derricks. The large scale of the operation here was favorable because competent, well-bedded, sandstone (aka bluestone) beds are underlain by a thick sequence of weak shale beds - making bluestone extraction economically viable (i.e., by dropping or swinging massive sandstone blocks onto staged work areas for shaping and transport). The quarry’s continuous

cliff length of about 1100 feet provides an exceptional cultural resource and opportunity to reconstruct and interpret historic stone quarrying methods (some of which cannot be gleaned from historic sources); moreover, this long cliff is adjacent to workshop areas, an historic quarry road, and building structures formerly part of the quarry’s working operation some 170 years ago. This quarry has great value as an archaeologic resource and, importantly, for educational, historic, and ecotourism venues.



“In recent years, cultural resources also have been incorporated into heritage tourism projects throughout the United States. ... These sites and the artifacts and features contained within them are valuable parts of our regional and national heritage. ... When interpreted for the general public, prehistoric and historic sites are valuable educational tools for schools, and a vehicle for enhancing economic development through tourism.” (NYAC, 2000)

Regulatory Framework: New York State’s Professional Standards for Cultural Resource Investigations (NYAC, 2000) involve a process of identification, evaluation, and protection of significant cultural resources mandated by a variety of state, federal, and local laws (e.g., State Environmental Quality Review Act [SEQRA]; New York State Historic Preservation Act [NYSHPA]). The NYS review process includes consideration of the potential impact of projects on cultural resources and features, including historic standing structures greater than 50 years old. *“Preventing the destruction of these resources ensures the continued use and enjoyment of them by present and future generations. ... Cultural resources are non-renewable parts of our environment. Once a site is destroyed, it is lost forever. The importance of cultural resources to preserving our national heritage has been recognized by all levels of government in the United States and around the world. ... Cultural resources warrant informed preservation so that they will be available for future study and analysis of the past as well as the future* (NYAC, 2000).” The Hemlock Quarry site embodies distinctive characteristics of mineral/bluestone extraction used prior to technological advancements that led to changes in quarrying methods around 1860, followed by industry collapse after 1880 with the discovery of Portland cement. Figure 1 shows that proposed construction of the 850 Route 28 Site will impact the integrity of the historic Hemlock Quarry. **This quarry, associated rubble piles, stone works, and foundations comprise a significant cultural resource/archaeological site that has not been previously recognized.**



Worked Hemlock Quarry cliff faces looking north-northeast (left photograph) and south-southwest (right photograph). Note raised quarry rubble pile on left side of right photograph.

Bluestone Quarries in the Bluestone Wild Forest

Bluestone Wild Forest is riddled with evidence of historic bluestone (i.e., sandstone) quarrying. Quarry workers exploited sandstone cliffs exposed along glacial meltwater channels, low cliff faces, bedrock mounds, and even massive boulders within and on top of knolls. For example, small historical quarry works are present along both the east and west side of Pickerel Pond, with two quarries, Historic Quarry Area A and Historic Hemlock Quarry, extending directly into the 850 Rt 28 project site (Figure 1).

Historic Quarry Area A is an example of a small quarry. This quarry is largely comprised of low excavated cliff faces and massive quantities of quarry rubble that drape steeply downslope into Pickerel Pond. In one location, a low laid stone wall helps prop up quarry rubble. This quarry area is typical of many of the small bluestone quarry workings along the east and west flanks of Pickerel Pond, as well as elsewhere within the Bluestone Wild Forest.

Enormous rubble piles associated with many of these quarry workings provide evidence that it was difficult to extract quality stone of desired thickness and extent, even with vertical fractures and horizontal bedding planes to guide extraction. Poor geologic conditions led many quarry works to ruin (Evers, 1972). Contrary to geologic conditions that resulted in failed operations, Hemlock Quarry had sufficiently favorable geologic features to continue operations over a considerable period of time. Rubin (2020) provides additional information on bluestone quarries and geology.

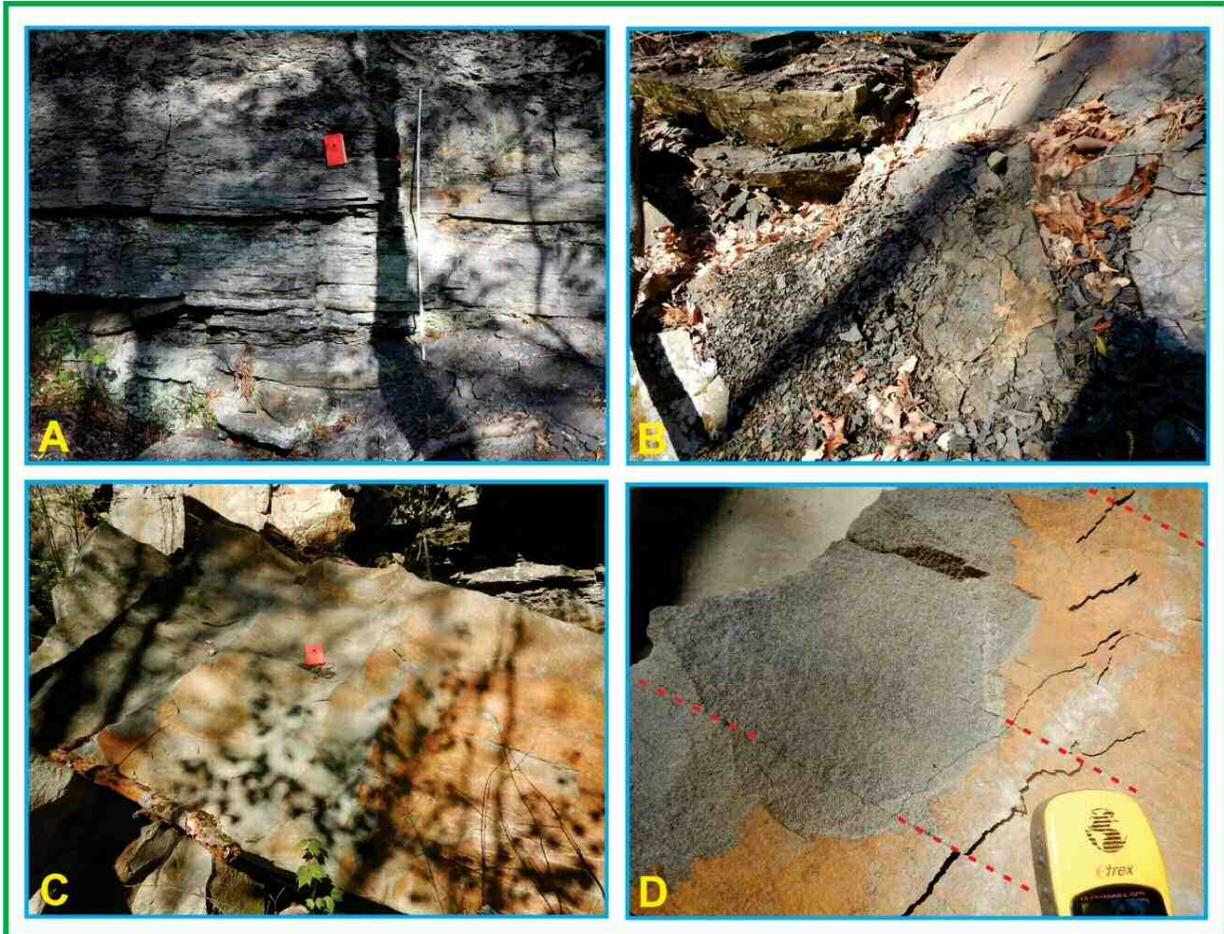
Hemlock Quarry Geology

Figure 1 shows the location of Hemlock Quarry, a premier historic quarry. Portions of this quarry are present on New York State preserved lands and portions of it are in private ownership (approximately 600 feet). The physical extent of the quarry is discerned here based on field reconnaissance on preserved lands, detailed assessment of LiDAR-derived 2-foot elevational contours, review of a number of years of high resolution orthoimagery, and geologic assessment. Field evaluation of that portion of the quarry on private land is recommended. The undisturbed nature of this quarry and working area provide an outstanding opportunity for geologists and cultural archaeologists to study and interpret historic quarrying methods and the historic quarry's functioning infrastructure. In essence, Hemlock Quarry reflects a time capsule of pre-Civil War industrial quarrying methods.



The exposed basal portion of the Hemlock Quarry cliff face on New York State lands is comprised of 19 feet of interbedded shale and sandstone (Photograph A below). Weak, friable, shale (Photograph B below) made extraction of some thin sandstone layers relatively easy work. A thick sandstone caprock overlies the underlying weaker shale-rich geologic beds (approximately 11 feet thick). The massive competent nature of these upper sandstone beds made them well-suited for flagstone sidewalks, doorway sills, and building construction. A 7.6-foot thick

sandstone block that was formerly directly above the underlying weak shale beds is shown on the top of page 1 and in photographs C and D below. Note the dashed red lines that accent thin bedding plane partings that the quarry workers exploited.



Hemlock Quarry interbedded shale and sandstone beds (A), weak, friable, shale (B), and massive fine-grained sandstone caprock with thin bedding plane partings (C & D).

The areal extent of the quarried Hemlock Quarry cliff face is well-approximated on 2013 imagery and on a 2-foot elevational map (Figure 1). Together, they show a linear north-northeast to south-southwest oriented vertical cliff face extending continuously for a distance of approximately 1,100 feet. Photographs on page 2 above show a portion of this worked cliff face. The height of exposed bedrock below the massive sandstone caprock shows that quarry workers sought both the upper massive sandstone layers and lower thin sandstone beds where they were present. Removal of the weak shale beds at the base of the quarried cliff provided a staging area where the overlying bluestone caprock could be either dropped or swung after blasting. This provided a means to safely exploit the bluestone along bedding plane partings and vertical fractures.

A few scattered relict workshop areas in the Bluestone Wild Forest reveal evidence of methods used to cut sandstone blocks to desired specifications (e.g., nail holes and round drill holes used in the shaping process). Detailed cultural assessment of these exposed features, along with workshop

areas, and possibly other as yet undiscovered quarry artifacts, along with their locations is warranted as there is much to be learned relative to quarrying methods and the infrastructure present during quarrying operations. Importantly, only Hemlock Quarry has old foundation structures that may, after excavation, shed light on on-site quarrying operations.

Age of Hemlock Quarry

There are a very few built up or laid stone features scattered here and there throughout Bluestone Wild Forest that are associated with historic quarrying operations, vestiges from yesteryear. Near the northeastern end of the Hemlock Quarry there are two foundation-like features that have survived intact for about 170 years. The age of Hemlock Quarry has yet to be determined through the examination of historic records and/or dating of historic artifacts found during future archaeological investigation. However, a reasonable approximation can be based on research conducted by Alf Evers (1972). A quote from Evers' book "The Catskills - From Wilderness to Woodstock" allows a reasonable approximation of the working date of the quarry:

"Tons of bluestone were quarried in places like Quarryville (in the Town of Saugerties), Hurley Woods, Jockey Hill, the banks of the lower Sawkill and Moray Hill. The stone was loaded onto iron rimmed wagons pulled by teams of horses, often in convoys, and sent to the trading towns along the river. There, the stone dealers would cut and shape them into what would become steps, curbing and sidewalks for cities all over the country. By 1850, bluestone was being shipped by river sloop to Boston, Philadelphia, Baltimore, Charleston, San Francisco, Milwaukee, St. Louis and Havana, Cuba. The stone was prized because it was hard and long lasting, dried very quickly after a shower, and did not become slippery with wear.

As the demand grew, stone dealers took advantage of the newly constructed railroads, such as the Ulster and Delaware Railroad, and older quarries that were farther from the railroad were closed and replaced by quarries in places like Margaretville, Roxbury and Phoenicia. The quarries near the railroad and today's Route 28 corridor continued to flourish.

By the 1860's more and more machinery was being used, requiring fewer and fewer men. River sloops gave way to two masted schooners which needed fewer sailors. Quarrying work continued to be very dangerous, resulting in broken limbs, smashed hands, dust induced lung disease, and deaths caused by blasting powder.

Quarrying took its toll on the landscape, leaving scars on the earth and great piles of leftover rubble which can still be seen throughout the wild forest. In Kingston, courthouse proceedings on Wall Street would often stop as the convoys of bluestone wagons came down the street on the way to the stone yards at Wilbur (southwest Kingston).

The industry collapsed in 1880 with the discovery of Portland cement, bringing the 60-year era most responsible for shaping the Bluestone Wild Forest to a close.

Today, several surface mines on adjacent private lands continue to use the area to produce crushed stone construction aggregates."

Day (1891) describes bluestone quarrying in the area in 1891. Based on the Evers quoted section above and bracketed peak quarrying dates (1820 to 1880), it is reasonable to assume an operating date of about 1850 for the Hemlock Quarry (possibly as early as 1820) and the laid stone structures that are well within adjacent historic quarry debris mounds. Additionally, this quarry does not appear on the 1875 Beers map, possibly indicating that it was no longer operating by this late date.

Hemlock Quarry Working

Massive irregular blocks of sandstone quarry rubble extend outward to the southeast from the Hemlock Quarry cliff face that almost assuredly was worked forward in a northwesterly direction.



Pileated Spring issues from the base of a steeply sloping relict quarry rubble pile (green area) immediately north-northeast of Hemlock Quarry (see Fig. 1 location).



Alf Evers (1972) provides insight into the means by which the quarrying process used horse drawn derricks to leverage and swing blocks cut from quarry faces to the top of rubble piles where stonecutters shaped and sent them away for use. Drill and nail holes present in rubble blocks provide evidence of quarrying processes that date back some 200 years. This wooden derrick arrangement was probably used at the Hemlock Quarry, with derricks positioned atop the massive rubble piles located southeast of the working cliff face labeled on Figure 1. It is important to discern the difference between massive 1800's quarry rubble piles hidden amidst trees such as those outlined in yellow in the 1994 to 1998 digitally enhanced orthoimagery to the left provided from the New York State Department of State and relatively recent rock piles situated further to the

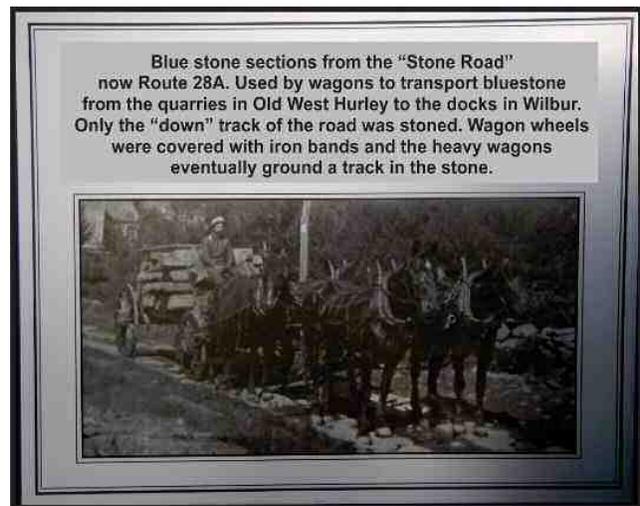
southeast (purple oval area) that were pushed together using modern heavy excavation machinery.

The photograph below shows the scraped bedrock floor and mounds of quarry debris pushed together by modern day heavy equipment - a very different physical appearance than that of historic quarry rubble piles.



While additional fieldwork is warranted to verify the physical boundary, working areas, and attributes of quarry rubble associated with the Hemlock Quarry, assessment of elevational contour data and initial field reconnaissance allowed the reasonable 9-acre approximation depicted on Figure 1. See, for example, the sharp change in gradient proximal to Pileated Spring that issues from the base of an arcuate and steeply sloped sandstone rubble pile (see photographs on top of page 6).

With the exception of tree growth amidst historic quarry rubble and mass wasting of massive cliff top blocks, one can imagine the sounds of workers drilling, blasting, sledge hammering, and chiseling the Hemlock Quarry cliff face, the neighing of working horses, and creaking of heavy stone on iron-rimmed wagons being loaded for transport as if it were only yesterday. Pileated Spring provided a nearby source of drinking water.



Historical marker in Hurley, New York.



Wagon ruts in the old wagon road.

Hemlock Quarry provides a superb example of a relict, undisturbed, large-scale bluestone quarry operation - a markedly different setting than observed elsewhere in smaller sandstone quarries within Bluestone Wild Forest. This cultural resource is of great historic value and, as such, warrants protection, preservation, and further study.

Hemlock Quarry Foundations and Wagon Pathways

At least two foundations, each with evidence of an adjacent historic wagon pathway, are present near the northern end of the Hemlock Quarry footprint. One, pictured immediately below, measures 12 feet by 12 feet, has a wall thickness of 2 feet and maximum remaining foundation height of 4.5 feet. It appears to have been intentionally built into a quarry rubble mound. A second nearby foundation has wall remnants measuring 28 feet long by 4 feet high with a 2-foot wall thickness. Additional investigation is needed to determine the length of another degraded wall that may be 30 feet long. A low laid stonewall between foundations appears to reflect a former wagon pathway used to dump quarry rubble northward down a rubble embankment (right photograph above on page 6). Archaeological investigation in this area may lend greater interpretive significance to the larger composite cultural quarry feature.



Twelve-foot by twelve-foot foundation wall of what may be a former quarry building. Perhaps this building was used for secure storage of explosives and equipment.



Inside and outside corners of the twelve-foot by twelve-foot foundation.



Second nearby and larger foundation remnant. Perhaps this was once a quarry headquarters building.



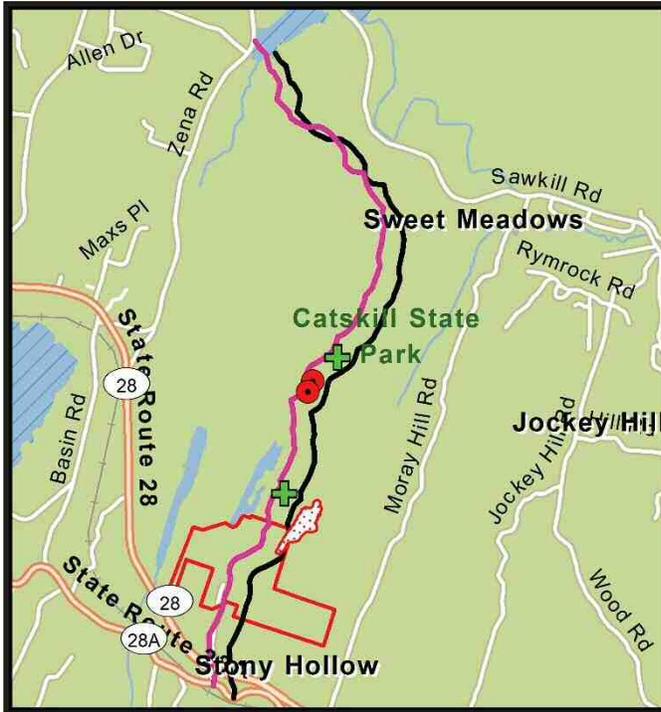
Yellow dashed lines define the boundary of a former wagon pathway between foundations.

The Old Wagon Road and Another Quarry

Hemlock Quarry was almost certainly the grandest of many working bluestone quarries operating within Bluestone Wild Forest roughly between 1820 and 1880. Many of these quarries were positioned along a wagon road believed to have formerly been used by the Lenape Indians (aka Waghkonk Trail). Now, the only paved portion of this road is named Waughkonk Road. The remaining portion of this wagon road is largely overgrown. However, within Bluestone Wild Forest, portions of it can be traced amidst trees and sometimes between short sections of



laid stone walls placed to keep quarry rubble from falling onto the road. At one location along this wagon road there is an old foundation (pictured above) that may have been a small home or an office (lower green + on the map below). A small dot on the 1875 Beers map depicts a building at this location and the name T. Beekman. The foundation is situated approximately 500 feet northwest of Hemlock Quarry, some 2,200 feet south of a quarry plotted on the 1875 Beers map, and directly along the old wagon road (see foundation photograph above on page 9). Historic research may reveal that Beekman was a quarry owner or foreman who oversaw operations in multiple nearby quarries.



A portion of this old wagon road was removed by modern quarrying operations on the 850 Route 28 LLC site sometime after 1972. This roadway no longer appears on modern maps, but does appear on the 1875 Beers map. Because determination of the location of the old wagon road is essential in reconstructing a comprehensive picture of the full bluestone industry in Bluestone Wild Forest, an effort was made to reasonably determine the road's pathway. To this end, ESRI software was used to georeference portions of the Beers map and align it spatially. This was accomplished using carefully selected tie in points to correlate the position of the old wagon road with modern fixed features, primarily the intersections of a railway bed and the Saw Kill with extant roads. Once

Map 1. Reconstructed Route of Waghkonk Trail and Wagon Road.

the old wagon road was spatially oriented, it was overlain with other known features including the 850 Route 28 site boundary, roads, and waterways. The black roadway line on the map above depicts the result of the georeferencing effort. Considering the extensive change in area road alignments over the last 145 years, this alignment is reasonably correct. However, it does not exactly match the current position of Waghkonk Road that may represent the original route of the Waghkonk Trail. The purple line on the above map represents a slightly shifted alignment of the original georeferenced black roadway position, moved 400 to 500 feet westward to match the trend of Waghkonk Road. The wagon road lies within, or very close to, the two bounding lines presented on the map above. This is, in part, confirmed by two locations within Bluestone Wild Forest where the old roadway is obvious. These two locations are depicted as green plus signs on the map above. The wagon road at the upper plus sign is positioned between hillslopes to either side. The lower wagon road location depicted by a plus sign on the map above is a short distance east of an old building shown on the 1875 Beers map associated with the name T. Beekman.

The 1875 Beers map also depicts a labeled quarry north of the Beekman building along the same old wagon road, further confirming the location of the historic wagon road. Workings associated with this quarry are found between 2,500 feet and



2,750 feet north of Hemlock Quarry (two red dots on page 10 map above). Two photographs above show the much smaller nature of this quarry area versus that of Hemlock Quarry.

Cultural Resource Investigation – Preliminary Conclusions

Hemlock Quarry was likely the largest bluestone quarrying operation within Bluestone Wild Forest, active about 170 years ago. Its' physical position along a now abandoned wagon road was, like other smaller quarries not far removed from this road, probably part of an interconnected and integrated network of stone workers. These woods were once alive with toiling stone workers, the roar of drilling and blasting, and clatter of iron rimmed horse drawn wagons carting shaped stone to market. While most artifacts from this period, including much of the quarry works, are protected from development due to their location within the Bluestone Wild Forest, a significant portion of Hemlock Quarry and Beekman foundations, along with substantial portions of a relict wagon road, are not protected. Cultural reconstruction of these quarry workings is best viewed in the context of a cohesive enterprise conducted during an important time period in our developing country. An important historic story waits to be unraveled here.

Construction of the 850 Route 28 manufacturing facility would irreparably compromise the integrity of Hemlock Quarry. Project plans show that blasting and site grading would occur through the southwestern end of Hemlock Quarry for construction of a large parking area and diversion and drainage swales (Figure 1). Detailed cultural resource investigation and preservation is warranted.

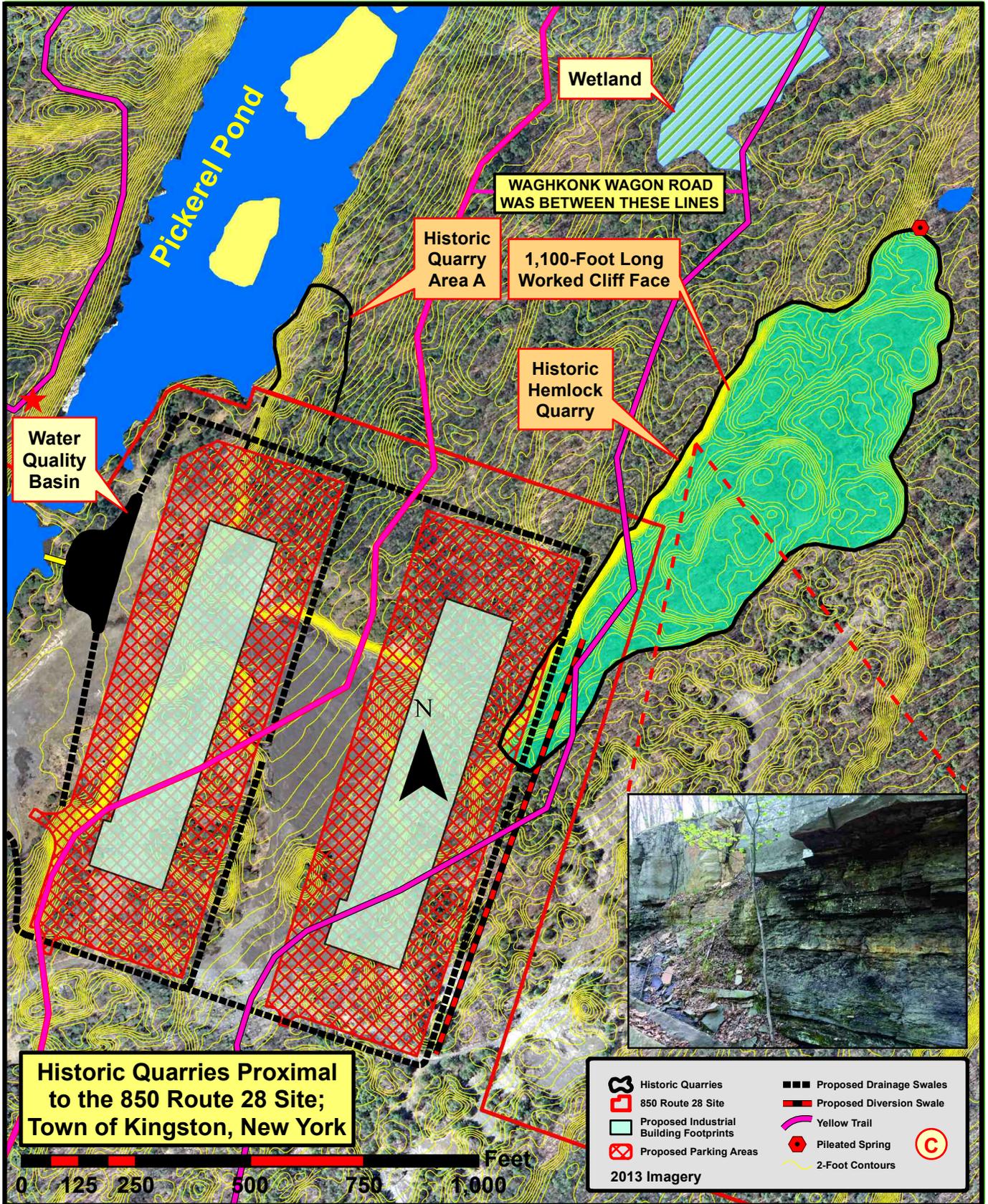
References:

Day, W.C., 1891, Production of Bluestone. *In* Census Bulletin, No. 71 (5-23-1891); Mines and Mining - Bluestone, 5 p.

Evers, A., 1972, *The Catskills - From Wilderness to Woodstock*.

NYAC, 2000, *Cultural Resources Standards Handbook: Guidance for Understanding and Applying the New York State Standards for Cultural Resource Investigations*. Prepared by The New York Archaeological Council Standards Committee (NYAC), 27 p.

Rubin, P.A., 2020, *Surface Hydrology, Hydrogeology, Bluestone Quarries, and Glacial Geology Proximal to Pickerel Pond and the Proposed 850 Route 28 Manufacturing Facility (May 5)*, 37 p.



Prepared by HydroQuest for Catskill Mountainkeeper and Woodstock Land Conservancy

Figure 1 Map Date: 5-26-20