# HISTORIC AMERICAN ENGINEERING RECORD
# SOUTH CASCADE DRIVE/MILLER ROAD (FORMER US 219) BRIDGE OVER CATTARAUGUS CREEK
(BIN 1041590)
USN 02910.000088

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| Location: | The South Cascade Drive/Miller Road Bridge spans Cattaraugus Creek. The project lies in the Town of Ashford in Cattaraugus County and the Town of Concord in Erie County, New York.<br>UTM: Zone 17 E 689259 N 4704824<br>Quad: 1964 *Ashford Hollow, N. Y.* 1:24,000 |
| Date of Construction: | Initially constructed between 1954 and 1956 and enlarged in 1969[1] |
| Bridge Type: | Steel Spandrel Braced Arch Deck Truss Bridge |
| Engineer/Builder: | V. P. Maun (Engineer, ca. 1954); Conn Construction Company (ca. 1969) |
| Present Owner: | New York State Department of Transportation |
| Present Use: | Vehicular Bridge (BIN 1041590) |
| Significance: | BIN 1041590 was surveyed for PIN 5101.82.101 and determined to meet National Register Eligibility Criterion C. The bridge is a steel spandrel braced arch deck truss bridge. Steel arch construction was never standardized and this bridge type is therefore a rare resource.[2] |
| Project Information: | The New York State Department of Transportation has classified the South Cascade Drive/Miller Road (Former US 219) over Cattaraugus Creek Bridge as functionally obsolete. Analysis by the NYSDOT Region determined there is no prudent and feasible alternative that would meet the project objectives and retain the National Register Eligible bridge. The Department of Transportation has requested this Level II Historic American Engineering Record documentation to mitigate the adverse effect to the bridge resulting from removal of the bridge. |


Kerry Traynor
Nathan Montague
Archaeological Survey, Department of Anthropology
University at Buffalo
380 MFAC- Ellicott Complex
Buffalo, NY 14261


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[1] The construction documents are dated April 23, 1954. The documents were “Prepared pursuant to the Highway Law and recommended by the Engineer for District No. 5 on May 25, 1954.” The note bears the engineer’s signature. The Chief Engineer of the New York State Department of Public Works Division of Construction approved the construction documents on June 4, 1954. “As-built” record plans noted field changes and quantities used. The date for these drawings is not recorded on the plans. The bridge was finished in 1956 and enlarged in 1969 (Miller et al. 2014).

[2] The bridge was not included in the lists of pre-1961 bridges documented in the Mead & Hunt *Historic Bridge Inventory: Historic & Non-historic Bridges Guidelines for Evaluating Historic Bridges,* 2002 because it is located in the Scobey Power Plant and Dam National Register Historic (96NR00942) and 2002 inventory excludes bridges that are a component of a historic district. The bridge was not 50-years old when the historic district was listed in 1996, and is not listed as a contributing structure in either the narrative description or statement of significance.

## SETTING

BIN 1041590 runs northeast-southwest carrying US Route 219 over Cattaraugus Creek and the Zoar Valley Gorge between the Town of Concord in Chautauqua County and Town of Ashford in Erie County, New York. The project area lies in a rural, gorge setting. Landscape features include steep rock outcroppings on forested hillsides, bushes, ditches, and roads. The bridge is located within the boundaries of the Scobey Power Plant and Dam National Register Historic District (96NR00942). The district's dates of significance are 1899, 1924, and 1925. The bridge is located at the southernmost point of the boundary and is not included in either the verbal boundary description or boundary justification on the National Register form, and is not listed as a contributing structure in either the narrative description or statement of significance. There was no bridge connecting the east and west ridges at this location prior to the 1956 construction of BIN 1041590. A bridge was therefore never part of the historic context of the Scobey Power Plant and Dam. The construction date of BIN 1041590 is outside of the dates of significance of the district, and the bridge is therefore non-contributing. When the National Register District was listed in 1996, the bridge was not 50-years old and therefore not considered a historic resource at the time.

## BRIDGE DESCRIPTION

BIN 1041590 is a two lane, three span continuous spandrel braced steel arch deck truss system supported by two steel pier bents and high concrete abutments designed by V. P. Maun in 1954.[3] The bridge runs northeast-southwest with span lengths of 175'; 300' and 175'. The truss is symmetrical. The construction and "as-built" record drawings note the truss members, beginning at the south end of the bridge, as U0-L0 (upper and lower chords) through U13-L13 at the center, and continuing with U12'-L12' ending at U0'-L0' to the north. Spandrel braced bridges are constructed using trusses, beams, or girders. "A spandrel-braced arch bridge is a structure in which the dead-load thrusts and the full live-load thrusts are carried directly by the bottom chords of the arches; the top chords and the web members serving only to brace the bottom chords under unsymmetrical or partial loading."[4] BIN 1041590 relies on diagonal braces in the open spandrel to transfer loads to the arch. A Warren truss is used for bracing at BIN 1041590. A truss uses diagonals and vertical members to support the deck loads. The diagonals and verticals are joined with plates and fasteners to form several rigid triangular shapes, allowing for relatively light structures without compromising strength. The geometry of triangulation determines truss classification. For example, the Pratt truss, originally designed by Thomas and Caleb Pratt in 1844, has diagonal web members, which slope toward the center forming a V-shape. The center section commonly has crossing diagonal members.[5] The Warren truss was patented by James Warren and Willoughby Monzoni of Great Britain in 1848, and can be identified by the presence of many equilateral or isosceles triangles formed by the web members, which connect the top and bottom chords to form a "W". These triangles may also be further subdivided, as they are in the bridge crossing Cattaraugus Creek, with the addition of verticals for support. The trusses in a Warren Truss are indeterminate structures. In an indeterminate structure, the members act in both compression and tension. In "deck" configuration, as presented by BIN 1041590, the traffic travels on top of the superstructure.

The steel truss was introduced in the late 1860s and allowed for increased spans. Prior to this time arches would have been constructed using masonry, or wrought iron ribs. "The steel arch resulted from advancements in the development of steel, the use of welding, the invention of the high-strength bolts to replace the hot-driven rivet, and the erection methods that eliminated the need for falsework."[6] The steel arched ribs are built up of individual members, which are tied together with plates and angles, girders, or riveted trusses. The steel used at BIN 1041590 was carbon and silicon steel. One to three hinge systems are often used at steel arch bridges. In a one-hinged arch

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[3] Maun is noted as the designer on the Construction and "As-Built" Drawings.

[4] J. A. L. Waddell. "Economics of Steel Arch Bridges" in *Proceedings of the American Society of Civil Engineers, Volume 44*, 1918, p. 435.

[5] Information on bridges was obtained from the following sources: *Contextual Study of New York States Pre-1961 Bridges*, November 1999 Prepared for Department of Transportation by Mead & Hunt [www.DOT.STATE.NY.US\EAB\Bridge\BridgesContextualStudy-99.PDF]; *Historic Bridge Inventory: Historic & Non-Historic Bridges, Guidelines for Evaluating Historic Bridges*, 2002.

[6] Mead & Hunt *Historic Bridge Inventory: Historic & Non-historic Bridges Guidelines for Evaluating Historic Bridges,* p. 32.

the hinge is at the top of the arch; in a two-hinged arch the hinges are located at the base of the arch, limiting rotational effects between the structure and supports (abutments or piers), and the three-hinged arch has hinges at the base and at the top of the arch. The hinge allows for flexibility, compensating for the stress of expansion and contraction. At a hingeless or "fixed" arch, the abutments and span are assumed to remain fixed. At BIN 1041590 the expansion shoes at Pier 2 and at both abutments are rocker bearing, which act as a hinge. The shoe at Pier 1 is fixed. The bearings transmit forces from the superstructure to the abutments and piers.

Maun likely used a continuous spandrel braced steel arch deck truss system in response to the topographical conditions at the Zoar Valley Gorge. The steel arch deck truss system eliminated the need for false work, which would have been impractical to place due to the depth of the gorge. The deck truss allowed for the use of lower towers, as opposed to an overhead truss, which would have required higher towers, necessitating a larger base cut into the river banks and more materials overall. Although it would have been easier to build a box truss, since steel arch construction was never standardized, Maun's choice of the arched truss was likely for aesthetic reasons. Only seven steel arch bridges were identified in Mead & Hunt's *Historic Bridge Inventory*; all were determined to be National Register Eligible. None of the bridges identified are in Erie or Cattaraugus County.[7]

Abutments & Steel Pier Bents

The bridge superstructure is supported by reinforced concrete abutments, each with concrete bank protection wing walls, and two steel pier bents at U7-L7 and U7'-L7'. The wing walls and abutments are cut into the north and south stone embankment. The wing walls step back in plan and elevation from the facing plane of each abutment. The abutment and wing walls bear on shale, "excavation in the shale shall be to the meet line on the rear surface of the abutment walls and wings." ("As-Built" Record Plans, Sheet 20).

Two steel bent piers provide intermediate supports for the three-span superstructure. Both piers have four steel columns with struts and diagonals together to form a steel frame. The steel frame sits on top of concrete footings. Pier 1 is located to the south, at U7-L7 and Pier 2 to the north at U7'-L7'. Each footing is made up of two identical rectangular halves, with their long side running north/south and "founded in good firm shale – rock." ("As-Built" Record Plans, Sheet 24). The footing at Pier 1 is located away from Cattaraugus Creek, however Pier 2 is located at the water edge and a cofferdam isolated the construction. The footing of Pier 1, to the south, is 59'-0" tall and measures 25'-0" x 15'-0" at the base, while the footing at Pier 2 is 40'-0" tall and measures 22'-6" x 12'-6" at the base. Both footings taper to 20'-0" x 10'-0" at the top of the pedestal, where base plates and anchor bolts are located. At Pier 1 each pedestal has two plates measuring 24"x3"x5'-0". At each plate are two 3" diameter anchor bolts that are 22'-7" long. Pier 2 has a similar arrangement except that each plate measures 18"x3"x5'-0" and there are four 2 ½" diameter anchor bolts, 12'-4" long at each plate.

Attached to the anchor bolts at each pedestal is a steel pier bent, referred to as "Tower – Pier 1" and "Tower – Pier 2" on the construction and "as-built" drawings. At Pier 1 the tower rises 65'-10 ½" and at Pier 2 the tower rises 102'-1 5/8". Each tower is composed of four columns with longitudinal and transverse bracing. The columns at Pier 1 are a W36x245 section with two 6"x6"x1" angles. There are four C12x20.7 transverse struts at Pier 1. The transverse diagonals are made up of four 6"x4"x1/2" angles, with the top panel transverse diagonal made up of four 6"x6"x5/8" angles. There are six longitudinal struts made up of 6"x6"x3/8" angles at Pier 1. The longitudinal diagonals are made up of 6"x6"x1/2" angles at the top of the column; 6"x6"x7/16" angles in the middle and 6"x6"x1/2" diagonals at the bottom. Horizontal sway frames are located at the bottom and top panels of Pier 1. The bottom panel sway frame measures 34'-0 ¼" by 14'-0" with four equal panels made up of C12x20.7 sections with W12x31 diagonals. The top panel sway frame measures 24'-2" by 4'-2 inches with four equal panels made up of C12x20.7 sections.

The columns at Pier 2 are a W36x245 section. There are five C12x20.7 transverse struts at Pier 2. The transverse diagonals are made up of four 6"x4"x1/2" angles, with the top panel transverse diagonal made up of four 6"x6"x5/8" angles. There are eight longitudinal struts made up of 4"x4"x3/8" angles. The longitudinal diagonals are made up of 6"x6"x1/2" angles. There are three horizontal sway frames: one at the top panel; one in

[7] One bridge was identified in Putnam, Ulster, Schuyler, Westchester, and Sullivan County. Two bridges were identified in Tompkins County.

the middle and one at the bottom of Pier 2. The top panel sway frame measures 24’-2”x3’-1”, with four equal panels made up of C12x20.7 sections. The middle sway panel measures 31’-1 1/4”x7’-9”, with three equal panels, and the bottom panel sway frame measures 40’-0 ¼”x13’-8” with two equal panels. The middle and bottom sway panels are made up of C12x20.7 sections with W12x31 diagonals.

The Superstructure

The superstructure is a three-span continuous spandrel braced steel deck arch, supported at the concrete abutments and two steel bent piers located at U7-L7 and U7’-L7’. At Pier 2, and at both abutments the expansion shoes are rocker bearing, which act as a hinge. The shoe at Pier 1 is fixed. The bearings transmit forces from the superstructure to the abutments and piers. The three-span superstructure features 175’ span lengths north and south, and a 300’ intermediate span length, for a total length of 650’. Each span consists of a spandrel braced steel deck arch with Warren truss.

The steel arch in each span is formed by a Warren truss with vertical supports. This type of truss is more complicated to build since the web members vary in length from one panel to the next. Each 175’ span is made up of seven panels, each 25’-0” long, and the middle, 300’ span is made up of twelve panels, each 25’-0” long. The panels are made up of diagonal members, each forming an isosceles triangle. The diagonals are built up of two opposing channels and lace bars riveted together. The vertical members are also built up of two opposing channels and lace bars riveted together. Gusset plates connect the diagonal pairs and the vertical support where they intersect, and where each meets the top and bottom chords. The result is a structure that is light, with a minimal amount of material in the diagonal members.

The bottom chord members are built up of two opposing channels and lace bars riveted together to form a relatively light structural member. The bottom chords, which are of various length, are riveted together to span the distance between the apex of the triangles formed by the panels. The bottom chords are tied together by lateral (wind) bracing and lateral struts. Angles and lace bars, riveted together, span the distance between the two bottom chords to provide the lateral bracing and lateral struts.

The top chord members are also built up of two opposing channels and lace bars riveted together. The top chords are 25’ long, riveted together to span the distance between the apex of the triangles and the vertical supports. The top chords are tied together by lateral bracing and lateral struts in a similar manner as the bottom chord. Angles and lace bars, riveted together, span the distance between the two top chords to provide the lateral bracing and lateral struts.

Sway frames, which resist horizontal forces, are located at every other vertical beginning at U0-L0. The sway frames consist of diagonal members built up of angles riveted together and connected with a gusset plate. A sway frame is located at each Pier and at the vertical members immediately to the north and south. At these locations the sway frame consists of an intermediate strut, with diagonals above and below. The members are built up of angles, riveted together and connected by gusset plates.

The deck framing consists of a floor beam stinger system with a composite concrete deck. The Warren truss is divided by twenty-six panels, each 25’-0”, along the length of the bridge. Transverse floor beams, with a W33x130 section are located at every panel, and support eight longitudinal stringers, each W24x76. The stringers support a 7.25” thick concrete deck with a separate 2.5 inch concrete wearing surface. The structure runs in a north-south direction, with the roadway located approximately 128’ above the gorge. The bridge, as noted on the 1954 record drawings, was originally constructed with a 32’-0” clear roadway and 3’-6” sidewalk to the east and west. As constructed the sidewalks cantilevered 3’-0” beyond the center line of the outer stringer. Metal railings ran the length of the bridge and consisted of twenty-six, 25’-0” interior rail panels. Each section was made up of four horizontal rails and four vertical posts. The end railing panel at the abutments and adjacent to the wing walls was 11’-0” long, with four horizontal rails and two vertical posts.

In ca. 1971 the bridge was widened to 46’-0”, curb to curb, and the sidewalks were removed. At this time existing outer stringers were shifted over 9” and the floor beam was extended 4’-0” with a W35x130 section. A new W24x76 stringer was added at each end to support the new construction. A new steel bridge rail was constructed along the length of the road at each side of the bridge.

## HISTORICAL CONTEXT

The bridge runs northeast-southwest carrying South Cascade Drive/Miller Road (Former US 219) over Cattaraugus Creek between the Town of Concord in Erie County and the Town of Ashford in Cattaraugus County. The bridge is located about two miles (3.2 km) south of the village of Springville in the Town of Concord, Erie County. Cattaraugus Creek flows east-west, dividing the two counties north-south.

Settlement of the upper Cattaraugus Creek valley began in the early nineteenth century. The area soon became well populated and Concord was organized in 1821 and Ashford in 1824. The area has remained rural throughout the nineteenth and twentieth century. Growth was slower in this upland region due primarily to the availability of better farmlands elsewhere, limitations on the types of farming that could be practiced and the difficulties posed by underdeveloped transportation networks.

Outside the villages and hamlets, the earliest pioneers practiced subsistence agriculture with surpluses being traded in the local economy once their farms had become established. A variety of crops and animals were raised. The number of farms increased as logging, an integral part of the early economy, cleared forests opening the landscape and turning trees into both lumber and finished wood products. As the local lumber industry began to decline by the mid-nineteenth century, commercially inclined farmers shifted the focus of their production to more profitable agricultural ventures, including mixed husbandry, fruit, vegetables, hay, and dairy products.[8] In order to remain economically competitive, successful farmers bought additional land to increase the size of their farmsteads. In order to maintain larger farms, wage laborers were often hired to alleviate some of the burden placed upon the farm household by increased production. Prior to the development of large commercial farms in the late nineteenth century, individual farm households were often composed of a farmer’s immediate and extended family members, as well as non-related hired farm hands and servants.

Although the dairy industry, particularly cheese production, characterized late nineteenth century agriculture within the Towns of Concord and Ashford, hay production slowly increased over other crop types. The arrival of railroads hastened this process, encouraging growth by providing access to large urban centers such as Buffalo, as well as stimulating a brief resurgence in the lumber industry as the remaining forests were cleared.

By the onset of the twentieth century, family run subsistence and less-profitable surplus farms were consolidated into larger commercial farming operations. Furthermore, the mechanization of agricultural tools and equipment resulted in a decreased demand for farm laborers. Rural areas became increasingly depopulated as large urban centers, such as Buffalo, grew rapidly. Many former agricultural fields became reforested forming the basis of a small-scale lumbering industry that has survived until the present time. As continued mechanization and improved farming practices increased production on a large scale in other parts of the country, farms in southwestern New York became increasingly inefficient and many either stopped farming or reduced its scale. This process was accelerated by the Great Depression of the 1930s and World War II. Many former farmsteads became used principally as residences and the network of outbuildings and other forms of infrastructure deteriorated through a lack of use and maintenance. However, those farms that did survive after the war grew in size as economies of scale became an important aspect of their continued survival.

Historic maps and aerial photos were examined for evidence of previous development in and near the project area, including early road alignments and other indications of historic activity (Figures 2-8). The first recorded

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[8] Sally McMurray, *Families and Farmhouses in Nineteenth-Century America* (University of Tennessee Press, 1997); Sean Rafferty, “A Farmhouse View: The Porter Site” in *Nineteenth-and Early Twentieth-Century Domestic Site Archaeology in New York State*. John Hart and Charles Fisher, Eds. (New York State Museum Bulletin No. 495, 2000); Truman White, *Our Country and Its People: A Descriptive Work on Erie County, N. Y.* (Boston: Boston History Company Publishers, 1898).

development within the project limits occurred in 1956 on the existing alignment of Old US Route 219 and the bridge over Cattaraugus Creek (BIN 1041590). The 1951 aerial photo (Figure 8) depicts the project area prior to its construction. The 1964 USGS quadrangle (Photorevised 1979, Figure 2) depicts the road and bridge after they were built.

## BRIDGE HISTORY

BIN 1041590 was constructed in ca. 1954 as part of Federal Aid Project Number S-365 (2) that included road and culvert construction, and the construction of three bridges. BIN 1041590 was Bridge No. 3 in the project. The project was constructed under commission of the State of New York Department of Public Works, Division of Construction. The design was "prepared pursuant to the Highway Law and recommended by Engineer District No. 5" on May 25, 1954.[9] G. L. Nickerson, the Chief Engineer and E.W. Wendell the Deputy Chief Engineer for The New York State Department of Public Works Division of Construction approved the construction documents on June 4, 1954. V.P. Maun is noted on the construction documents as the bridge designer. Bethlehem Steel Co., Blasdell, New York produced the bar reinforcing for the concrete, and the structural steel was produced by the American Bridge Company in Elmira, New York.

The bridge was rehabilitated and widened under contract number RC 69-123, which was awarded to the Conn Construction Company on November 14, 1969. The work was completed at a cost of $537,063.26 on May 18, 1971. The widening of the bridge resulted in the removal of sidewalks on both sides of the road.

[9] Construction and "As-Built" Drawings note the approvals and recommendation for the bridge design. Note the signatures are not legible.

## SOURCES OF INFORMATION

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1954 *Plans for Constructing, with Federal Aid, the Ellicottville – Springville, Parts 2 & 3*. State of New York Department of Public Works, Division of Construction.

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1965 *Ashford Hollow, NY* 7.5 Minute Series Quadrangle, photo-revised in 1979.

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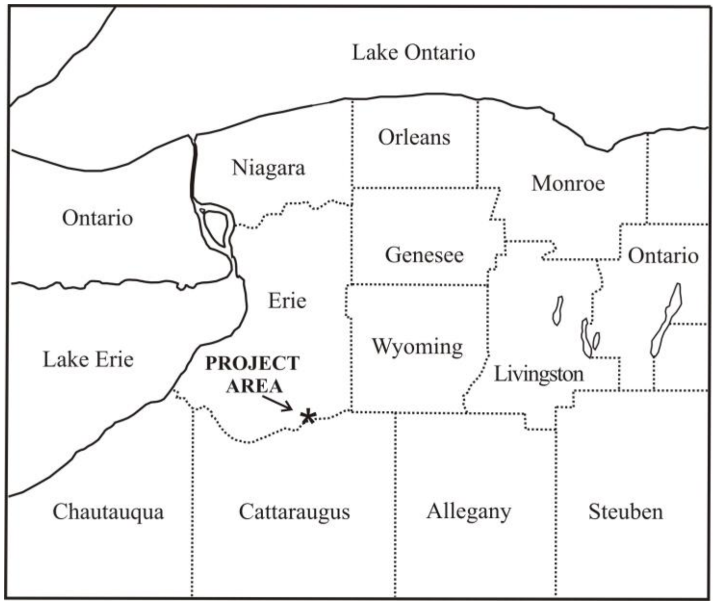


**Figure 1.** General location of the project area in western New York State.

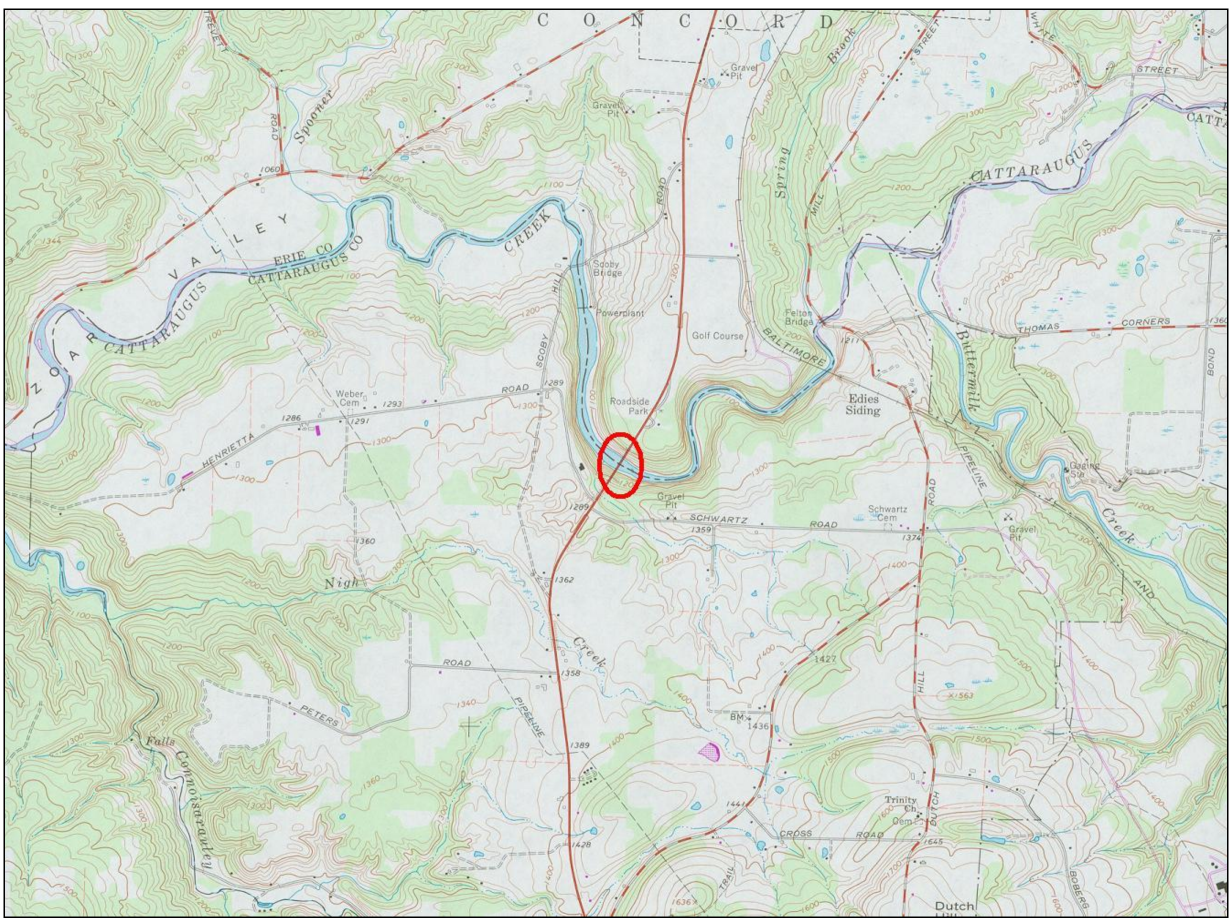

**Figure 2.** The location of the PIN 5101.82.101 project area is shown in red on the 1979 photo-revised edition of the 1964 *Ashford Hollow, N. Y.* USGS 7.5 Minute Series Quadrangle.

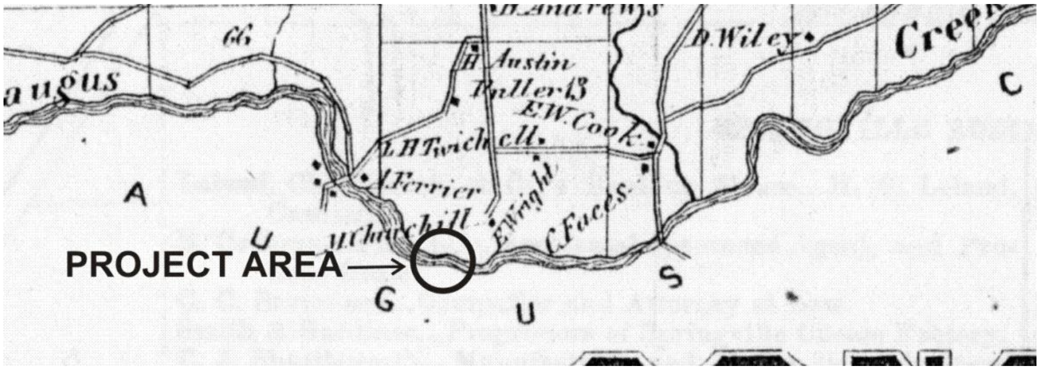


**Figure 3.** Location of project area on 1866 Stone and Stewart Atlas map of the Town of Concord.

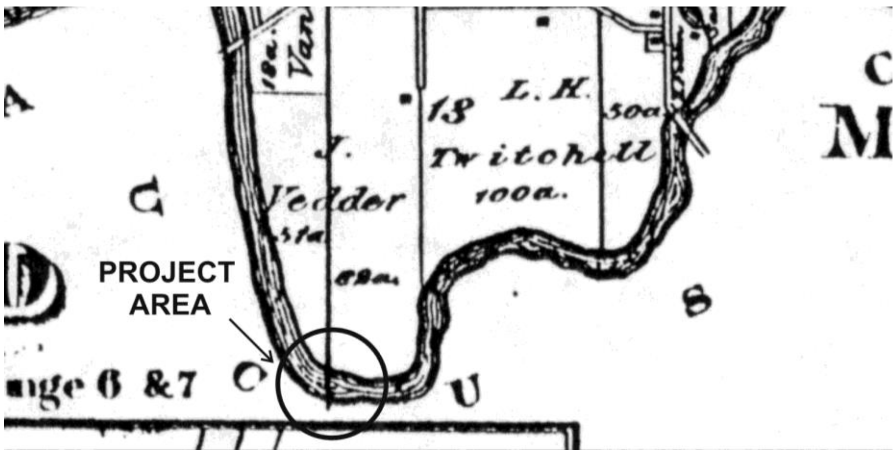


**Figure 4.** Location of project area on 1880 Beers Atlas map of the Town of Concord.

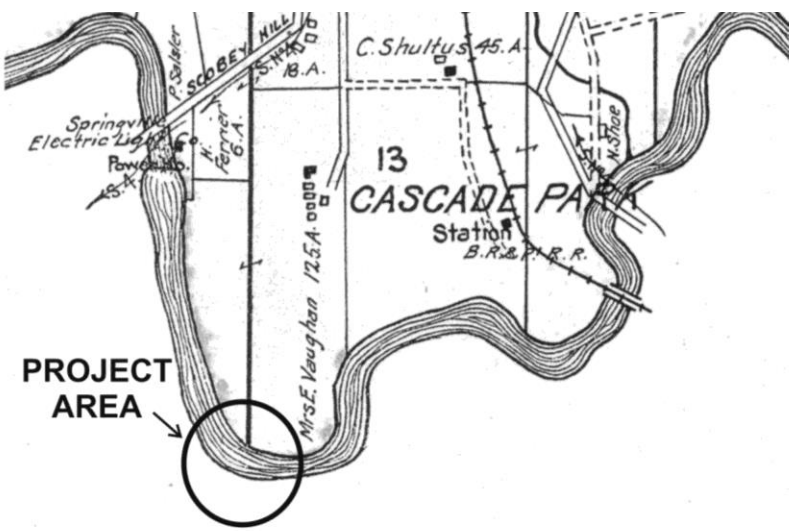


**Figure 5.** Location of project area on 1909 New Century Atlas map of the Town of Concord.

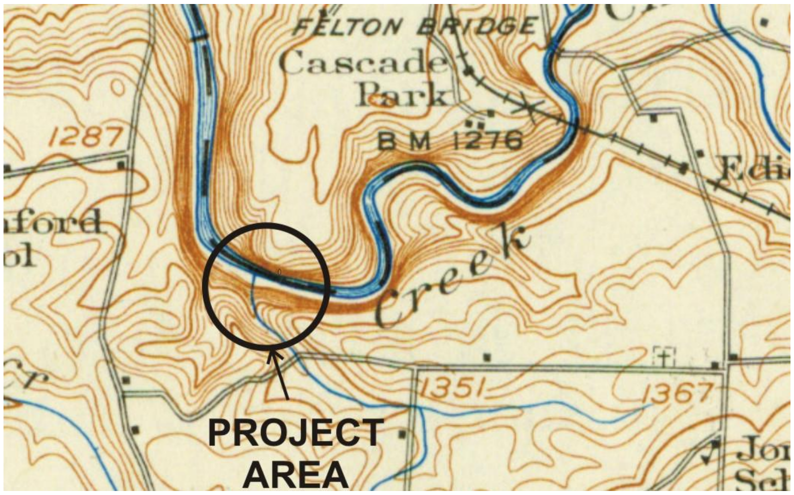


**Figure 6.** Location of project area on 1924 *Ellicottville, NY* 15 Minute Series Quadrangle.

**Figure 7.** Location of project area on 1929 Erie County Highway Department aerial photo.

**Figure 8.** Location of project area on 1951 Erie County Highway Department aerial photo.

**Figure 9.** Aerial view of BIN 1041590, facing south. The new US 219 bridges are to the left.

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Town of Ashford
Cattaraugus County
Town of Concord
Erie County
New York.

Photographer: Nathan Montague, Archaeological Survey January, 2015

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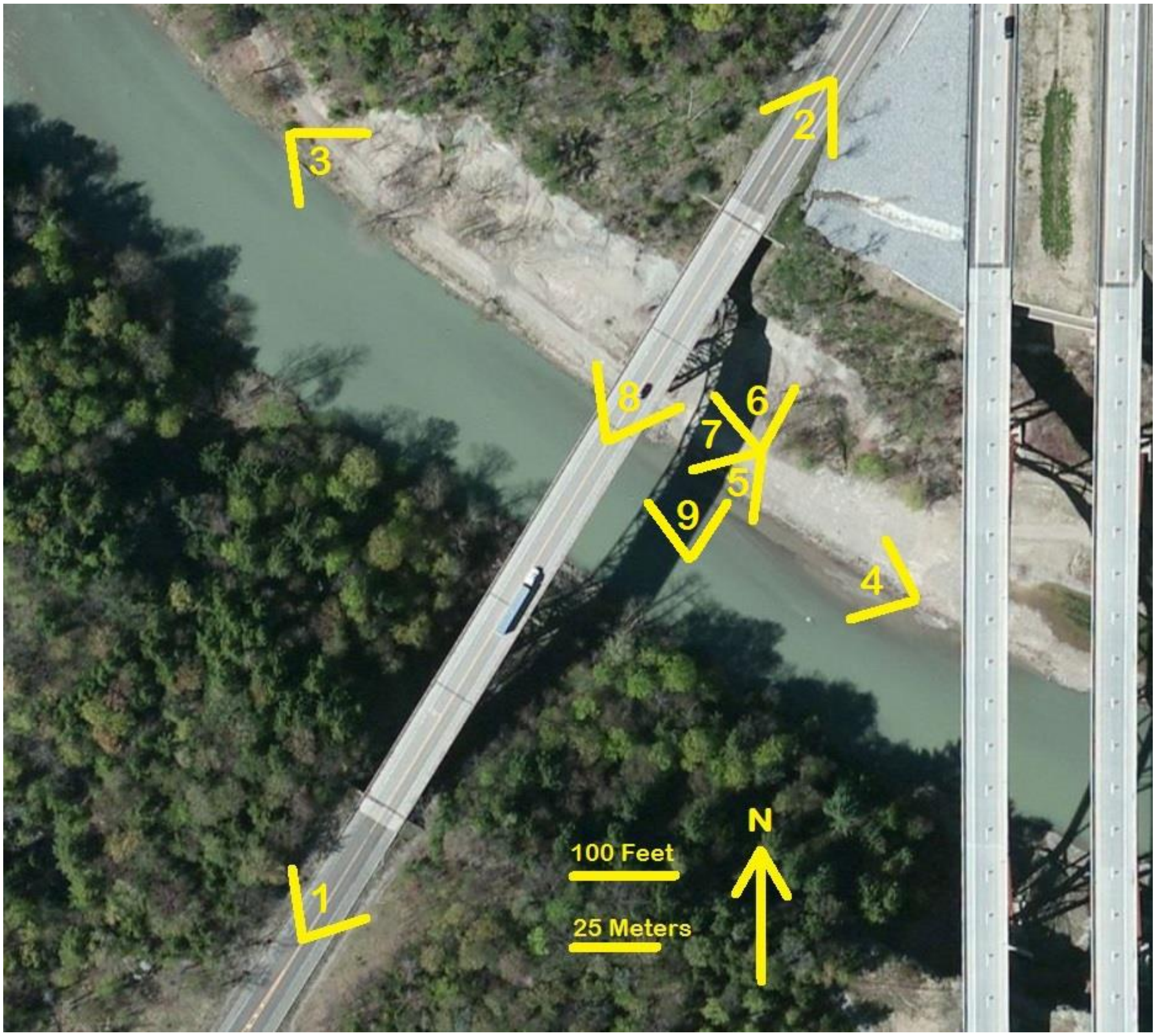

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USN 02910.000088-7. LOOKING WEST, SHOWING SPAN BETWEEN THE PIERS.

USN 02910.000088-8. LOOKING NORTH, SHOWING PIER 2.

USN 02910.000088-9. LOOKING NORTHWEST, SHOWING BASE OF PIER 2.

Appendix A:
Engineering Drawings