

KELLY'S FORD BRIDGE  
(Bridge No. 6908)  
Spanning the Rappahannock River at Virginia Route 620  
Kelly's Ford Vicinity  
Culpeper County  
Virginia

HAER No. VA-96

HAER  
VA  
84-KELFO  
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD  
National Park Service  
Northeast Region  
U.S. Custom House  
200 Chestnut Street  
Philadelphia, PA 19106

HAER  
VA  
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HISTORIC AMERICAN ENGINEERING RECORD  
KELLY'S FORD BRIDGE  
(BRIDGE NO. 6908)

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- LOCATION:** State Route 620 over Rappahannock River, 0.3 mile east of Route 674, Kelly's Ford vicinity, connecting Fauquier and Culpeper counties, Virginia.  
USGS Germanna Bridge, VA Quadrangle, Universal Transverse Mercator Coordinates: 18.257440.4262240
- DATE OF CONSTRUCTION:** 1898
- BUILDER:** Horseheads Bridge Company, Horseheads, New York
- PRESENT OWNER:** Virginia Department of Transportation
- SIGNIFICANCE:** The Kelly's Ford Bridge is a representative example of a pin-connected steel Pratt pony truss typical of late nineteenth century factory-manufactured bridges.
- PROJECT INFORMATION:** The Kelly's Ford Bridge was recorded in 1993-1994 by the Cultural Resource Group of Louis Berger & Associates, Inc., Richmond, Virginia, for the Virginia Department of Transportation (VDOT). The recordation was undertaken pursuant to provisions of a Programmatic Memorandum of Agreement (Draft) among the Federal Highway Administration, VDOT, the Virginia SHPO, and the Advisory Council on Historic Preservation concerning management of historic metal truss bridges in Virginia. Project personnel included Richard M. Casella, Architectural Historian, and Rob Tucher, Photographer.

## DESCRIPTION

The Kelly's Ford Bridge (VDOT Bridge No. 6908) consists of five pin-connected steel pony truss spans and one steel beam deck span with an overall length of 433' (Figure 1). The bridge carries Virginia State Route 620 in an east-west direction over the Rappahannock River, 2.5 miles west of the junction of State Routes 620 and 651 (Figure 2). The bridge connects the counties of Culpeper and Fauquier, Virginia. The river is approximately 230' wide where the bridge spans it at a height of 31'. The immediate area around the bridge is wooded, surrounded by open rolling farmland dotted with widely spaced farm complexes and dwellings.

The trusses of the Kelly's Ford Bridge are of the low Pratt full slope type, also called a pony truss. The type is defined by parallel chords with inclined endposts, posts in compression, diagonals in tension, and by the absence of portals and a top lateral system. All members of the bridge are steel, joined with pinned, riveted, or threaded connections. The five trusses are identical in construction and dimension and will be discussed in the singular.

The truss is 8' 8" high, 14' wide, and 81' long overall, with five panels each 16' 2-3/8" wide (Figure 3). Top chords and inclined end posts are riveted box sections measuring 12" x 6-1/2" overall. They are constructed of 12" x 1/4" top plate, 6" x 2" side channels with flanges turned out, and bottom stay plates spaced 30" on center. The channels are stamped "Pencoyd U.S.A." Bottom chords consist of two loop-welded eye-bars, 2" x 7/8". The bottom chords of the second truss in from the west end have been reinforced with the addition of steel cables.

The riveted C-section bar-lattice posts are 12" x 3-1/2" overall, consisting of two 2" x 3-1/2" angles connected with 1-1/2" x 13" bar-lattice. Diagonals are located in the second panel in from each end and consist of paired loop-welded eye-bars, 1-1/2" x 3/4". Two opposing adjustable counters are located in the center panel. Each counter consists of a 1-1/8" diameter loop-welded rod with upset threads and a sleeve nut. All pins are 2-1/4" in diameter.

The floor beams are 12" x 5" rolled I-beams. A total of seven floor stringers consisting of 8" x 4" I-beams are spaced approximately 23" on center. Bottom lateral bracing consists of two 1" diameter rods with threaded ends attached to the beams with skewback plates.

The steel beam deck span is 18' long, with seven stringers spaced approximately 23" on center. The two outer stringers are 9" x 2" channel; the five inside stringers are 9" x 4" I-beams.

The bridge decking consists of 4" x 10" pressure-treated wood planks, coated with asphalt and attached to the stringers with carriage bolts and deck clips. The roadway is 10' 4" wide and edged with 4" x 6" wood curbing raised 4" off the decking with wood blocks spaced approximately 4' on center. The bridge railings consist of two horizontal rows of 2" channel

bolted to the posts. Some sections of the channel railing have been replaced with steel cable attached with U-bolts.

The bridge rests on one stone abutment, one concrete abutment, and five piers of combined stone and concrete construction. The east abutment is concrete with beveled wings; the west abutment is of the U-type, constructed of rubble masonry. All of the piers consist of rubble stone bases of varying height, topped with pyramidal concrete shafts. The concrete work was a later addition and appears to have raised the original bridge elevation by approximately 4'. For descriptive purposes, the piers will be referred to by numbers 1 through 5, counting from east to west. Pier 1 consists of its original stone base, approximately 5' high, and a 4' concrete addition. Piers 2 and 5, situated on the floodplains on each side of the river, appear to be completely original, the top course of stone slightly overhung to form a coping. Concrete pedestals, approximately 4' and 2' high, respectively, rest atop these piers. Piers 3 and 4 are located in the river channel. The stone portions of these piers are approximately 10' in height, with concrete shafts 18' to 20' high atop them. The three channel spans of the bridge were washed out in 1942, and it is likely that the original stone piers were damaged or loosened by the flood and subsequently cut down to a point of soundness before the addition of the new concrete elements.

## HISTORICAL INFORMATION

### Background

As the interior of Virginia became more thickly settled, villages grew up along the Rappahannock River at points which offered fords or falls. Kelly's Ford, also known as Kellysville, is named for the Kelly family; the family's ownership of land near the site of the ford on the Rappahannock goes back to 1823, when John P. Kelly bought nine acres and a sawmill from James Stigler for \$375. The river is wide and shallow at this point, with low banks offering a natural fording place just below where the bridge now stands. The falling elevation along this stretch of the river provided waterpower for several mills in addition to Kelly's, including Garland Wheatley's mill one mile to the north (Virginia Book Co. 1978:468)

As early as 1794, the merchants of Fredericksburg recognized the potential benefits of opening navigation on the Rappahannock River. A canal that utilized the river would connect the markets at Fredericksburg to the farms and forests of four counties: Fauquier, Culpeper, Loudoun, and Rappahannock. An attempt in that year to capitalize a canal company failed, as would repeated attempts made every few years until 1829, when canal construction finally began. Four locks were constructed by 1831, opening a short section of the lower Rappahannock just above Fredericksburg, but floods and financing problems repeatedly stalled the project (Callahan 1967:17).

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In 1827 Kelly built a gristmill, and in 1832 a millrace one-half mile long to power a woolen mill. Brick kilns were built to provide the bricks for the woolen mill and a large store. Clay excavated from the millrace was used to make the bricks. In 1836 he built a large dwelling which was still standing as of 1937 (Virginia Book Co. 1978:469; Works Progress Administration [WPA] 1936:n.p., 1937:6).

Over the years, Kelly and others along the Rappahannock River continued to expand their operations, and in 1848 the Virginia legislature, convinced of the value of the project, granted \$100,000 to complete the canal. Work immediately progressed to Wheatley's Mill just north of Kelly's Ford; however, due to floods, the final section of the canal to Waterloo was not completed until the following year. Upon its completion in 1849, the canal route stretched fifty-eight miles from Waterloo to Fredericksburg and consisted of fourteen miles of dug canal, forty-four locks, and twenty dams. Canal barges transported flour, timber, and farm products down the canal and brought lump plaster back to be ground for fertilizer (Callahan 1967:34; Fauquier County Bicentennial Committee 1959:110; Scheel 1982:148; Virginia Book Co. 1978:302).

Kelly's flour mill, at 100 barrels per day, had the greatest output of any mill in the area. Two canal boats, carrying fifty barrels of flour each, left Kellysville for Fredericksburg daily. The mill was closed only between midnight Saturday and noon Sunday (WPA 1936:n.p.).

The Orange and Alexandria Railway and the Manassas Gap Railway began operation in the region in 1852 and had put the Rappahannock canal out of business by the following year. The canal, which had cost \$372,000, was sold in 1868 for \$1,500, never having returned a profit to its investors (Fauquier County Bicentennial Committee 1959:112).

By 1860, Kellysville was the largest manufacturer in Culpeper County, employing 100 men in the flour mill alone. Kelly also kept "at least 130 slaves," but it is not clear whether these were the "employees" described elsewhere (WPA 1937:2). Granville Kelly, John's son, operated the cloth mill and a general store. The village included a school, church, blacksmith shop, cooper shop, wheelwright's shop, several barns, a bean house, two ice houses, and numerous dwellings for the employees. In addition, there was an up-and-down sawmill and a shoe shop where shoes were made from hides tanned in Fredericksburg (WPA 1937:2).

During the Civil War, Kelly's Ford was of strategic importance because it remained passable even during high water when other fords downstream were impassable. This importance increased as bridges over the Rappahannock were destroyed during the course of the war. In 1862, to avert destruction of the mill by the approaching Federals, Granville Kelly dismantled the looms and machinery and shipped it to Lynchburg (Scheel 1982:195, 347; WPA 1937:2).

The Battle of Kelly's Ford took place on March 16, 1863, between 2,100 Union forces led by General William Averell and 800 Confederate forces led by Brigadier General Fitzhugh Lee.

The battle lasted twelve hours, resulting in seventy-eight Union casualties and 133 Confederate casualties. The engagement was initiated by Union forces in retaliation for a raid by Fitzhugh Lee's calvary in February, 1863, into Union-occupied territory on the east side of the Rappahannock. Although pursued by Union forces, Lee escaped back across the river to his camp at the Culpeper Courthouse with prisoners and captured supplies. Three weeks later, Averell was ordered to take 3,000 men and six artillery guns and destroy Fitzhugh Lee's command at the courthouse (Welcher 1993:764). In the early morning of March 16, 1863, Averell marched with 2,100 men toward Kelly's Ford. An advance guard of 100 men was ordered to move forward at dawn, capture the enemy pickets on the south bank, and secure the ford for crossing. The men were initially held back by Confederate sharpshooters who had obstructed the crossing on both sides of the river with abatis and had taken advantageous defensive positions on the southern bank. Averell arrived at 6:00 a.m. with the main body of troops and a final charge of the 1st Rhode Island Calvary pushed through the defenses. Fitzhugh Lee moved 800 men forward from the Culpeper Courthouse to eounter the advance. The battle raged throughout the day around Kelly's Ford north to Wheatley's Mill. Both commands withdrew at nightfall, Averell unsuccessful in his mission (Boatner 1959:451; Livermore 1898:119).

At some point during the war the brick houses in Kellysville were torn down by the Union Army to build chimneys for their shacks, and most of the remaining houses, mill buildings, and other structures were burned (WPA 1936:n.p.). The post office closed July 9, 1866, apparently in retaliation against Kelly for his Confederate sympathies. Granville Kelly rebuilt the mill on a smaller scale, but the village never reached the prosperity it had earlier achieved with the help of the slave labor. In 1879, a "Kellysville" Post Office reopened, only to close a year later. In 1887 a "Kellys Ford" Post Office opened and operated in "Jennings' Store" until 1924. The store continued operation until the flood of 1936 destroyed the building (Scheel 1982:347).

#### History of Kelly's Ford Bridge

In the fall of 1836, John P. Kelly and 300 others petitioned the General Assembly to build a toll bridge at his mill. Garland Wheatley, Kelly's neighbor one mile upriver and competing mill owner, opposed the plan and a long-standing feud developed. Wheatley argued that his mill dam had a wagon bridge over the top of it and with the ford at Kelly's mill no further means of passage was needed. Despite the arguments, in February 1837 the Assembly authorized Kelly to build a toll bridge. This first bridge was apparently built and lasted until sometime prior to 1848. A historical account of the building of the Rappahannock canal stated that the canal was complete up to "John Kelly's new bridge." This bridge lasted until about 1860, when Culpeper County denied Granville Kelly the right to build a new bridge. A bridge was not present at Kelly's Ford during the Civil War (Scheel 1982:136, 137, 148, 346; WPA 1937:4, 5).

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The first iron bridge at Kelly's Ford was built in 1884. Fauquier County paid two thirds of the cost and Culpeper County, one third. This bridge was destroyed in the flood of May 1889, caused by the same storm system responsible for widespread flooding across the eastern United States, including the calamitous Johnstown, Pennsylvania, flood. Some months later, D.W. Kelly, grandson of John Kelly, was paid \$8 by Culpeper County for "hauling out the Kelly's Ford bridge" (Culpeper County 1884:191, 1890:295; Fauquier County 1889:364).

In 1898, Fauquier and Culpeper counties entered into an agreement to build a new "iron" bridge (actually steel) at Kelly's Ford to be erected by Horseheads Bridge Company of Horseheads, New York. This is the bridge which remains standing today. Fauquier County agreed to pay three fifths of the cost, and contracted directly with Horseheads Bridge Company for the total amount of the bridge, \$3,025.20, to be paid in three installments over two years. Each county was responsible for building the masonry on their side of the river. The bridge was completed by October 17, 1898 (Culpeper County 1898:42, 67, 70; Fauquier County 1898:146).

According to Culpeper County records, the bridge was painted in 1904 at a cost of \$34.72, including \$14.44 for paint and \$1.21 for materials. It was not mentioned whether this was the first painting or a repainting. The records also show that unspecified repairs were made to the bridge in 1905 by J.F. Billingsley and S.G. Roberts, who were paid \$10.17 for their work. More substantial repairs, but again unspecified, were made in 1908, when R.L. Willis was paid \$81.15 for repair work (Culpeper County 1904:231, 1905:265, 1908:365).

In 1910, M.P. Pullman, the Culpeper County Road Commissioner, inspected the bridge and found the floor and sleepers in poor condition. It was not until 1914, however, that the repairs were made. Culpeper County initially ordered that wood be used for the repairs, probably to keep costs low, but later agreed with the Fauquier County bridge commissioners to use steel joists. A contract was awarded to Roanoke Bridge Company, Roanoke, Virginia, in 1914 to supply steel joists and effect repairs to the bridge. The contract was for \$1,119, with the condition that the two counties supply the wood decking (Culpeper County 1910:13, 1914:215, 216).

In 1925, the decking was replaced and the bridge painted by W.B. Edwards. Edwards was paid \$340.91 for labor and materials, J.T. Smith was paid \$538.95 for lumber, and the Cambria Paint Company was paid \$138.40 for paint (Fauquier County 1925:221). In 1937, two spans of the bridge were washed out and were apparently repaired in the same year (Deibler 1974).

In October 1942, a flood washed out three spans of the bridge. These were recovered by the Virginia Department of Highways and the usable parts salvaged. New members were fabricated to replace those damaged beyond repair, and included new top and bottom chord members, posts, pins, and joists (VDOT Plan #68-5, n.d.)

At some point, cable reinforcement was added to the bottom chords of the second truss, counting from the west end of the bridge.

### Thomas Pratt and the Pratt Truss

Thomas Pratt was born in Boston in 1812, entered Rensselaer Polytechnic Institute at age 14, became an engineer with the United States Army Engineers at 18, and began a professional engineering career with Boston & Maine Railroad at age 21. At the beginning of his career, which lasted until his death in 1875, Pratt was probably the best educated bridge engineer in America. Pratt worked his entire life in the employ of various New England railroad companies (American Society of Civil Engineers [ASCE] 1876:332-333; Condit 1960:108).

Pratt is best remembered for a bridge truss that he designed in 1842 that consisted of two parallel chords connected by vertical wood posts in compression and double wrought iron diagonals in tension. The design, while similar in appearance to the truss recently patented by William Howe, functioned structurally opposite to the Howe truss, Howe having put the verticals in tension and the diagonals in compression. The Pratt design is considered to be the first scientifically designed truss (Condit 1960:109). Pratt had recognized and applied a basic principle of structural engineering to truss design: reducing the length of the member in compression reduces the bending moment, allowing members of smaller cross section to be used without sacrificing overall strength. The basic design premise of a truss is to provide equal strength with less weight and material than a solid beam, and Pratt's innovation applied that principle to the design of the components of the truss itself.

In 1844, Pratt was granted a patent for two truss designs, one with parallel chords and one with a polygonal top cord. The polygonal version reflected Pratt's understanding of the application of mathematical principles in calculating the forces involved and the precise strength of material required to counter those forces. Pratt's patent was renewed in 1858. The use of the Pratt truss for the deck of John Roebling's Niagara River Suspension Bridge in 1855 drew worldwide attention to the design and undoubtedly contributed to its increased use. By 1889, the truss in its iron form ranked first in usage. Thousands of bridges, both highway and railroad, have been built following the Pratt design or some variation (ASCE 1876:334-335; Condit 1960:111, 112, 302; Cooper 1889:11; Johnson 1929:179).

### Horseheads Bridge Company, Horseheads, New York

Horseheads Bridge Company was formed in 1890 in Horseheads, New York, by Edward A. Perkins and James S. Perkins. The two men claimed ten years of experience building bridges, having previously operated a bridge company in Williamsport, Pennsylvania, under the name

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E.A. Perkins & Company (*Chemung Valley Reporter* 1894:1; Chemung County Historical Society n.d.:n.p.; Elmira Advertiser Association 1894:n.p.).

By 1894, the company had manufactured and erected several hundred bridges in New York, Pennsylvania, Maryland, New Jersey, Virginia, and Ohio. Among these were two notable structures, the 960' long bridge over the Susquehanna River at Muncie, Pennsylvania, and the Buffalo Street Bridge in Niagara Falls. In 1894, the company added machinery and buildings to the plant which doubled its manufacturing capabilities. A "night force of workmen" was also added to keep up with the orders (*Chemung Valley Reporter* 1894:1; Elmira Advertiser Association 1894:n.p.).

The factory was located on the Old Corning Road, now Chemung Street, and consisted of several large fabricating and assembly buildings. The plant was adjacent to the Delaware, Lackawanna and Western Railroad, near the junction of the Northern Central Railroad. Overhead cranes on tracks moved bridge components through the fabricating shop, and over one-half mile of tracks wound through the buildings and around the yards. The company claimed to have the most modern machinery, and invited "any officials who contemplate the purchase of bridges to visit their works and will pay all expenses whether they purchase bridges from them or not" (*Chemung Valley Reporter* 1894:1).

In 1901, the Horseheads Bridge Company was purchased by the newly formed American Bridge Company. At that time, the Horseheads plant had a manufacturing capacity of 1,800 tons of steel per year, making it the smallest of the twenty-eight companies purchased and consolidated by American Bridge. Three other nearby bridge companies—Elmira Bridge Company, Elmira, New York; Groton Bridge Company, Groton, New York; and Union Bridge Company, Athens, Pennsylvania—were also purchased by American Bridge in 1901. The Elmira plant was the largest of the group and was chosen in 1906 to be the site of a new, larger plant. The Horseheads, Groton, and Athens plants were permanently closed, and it is presumed that any useful machinery from those facilities was moved to Elmira. As of 1975, the Elmira plant of the American Bridge Division of United States Steel Corporation was still in operation (Hilbert 1977; United States Steel Corporation 1975:14, 16, 18).

According to *A Survey and Photographic Inventory of Metal Truss Bridges in Virginia, 1865-1932*, a study conducted by the VDOT Research Council in 1973, the Kelly's Ford Bridge is the only bridge built in Virginia by Horseheads Bridge Company (Deibler 1973).

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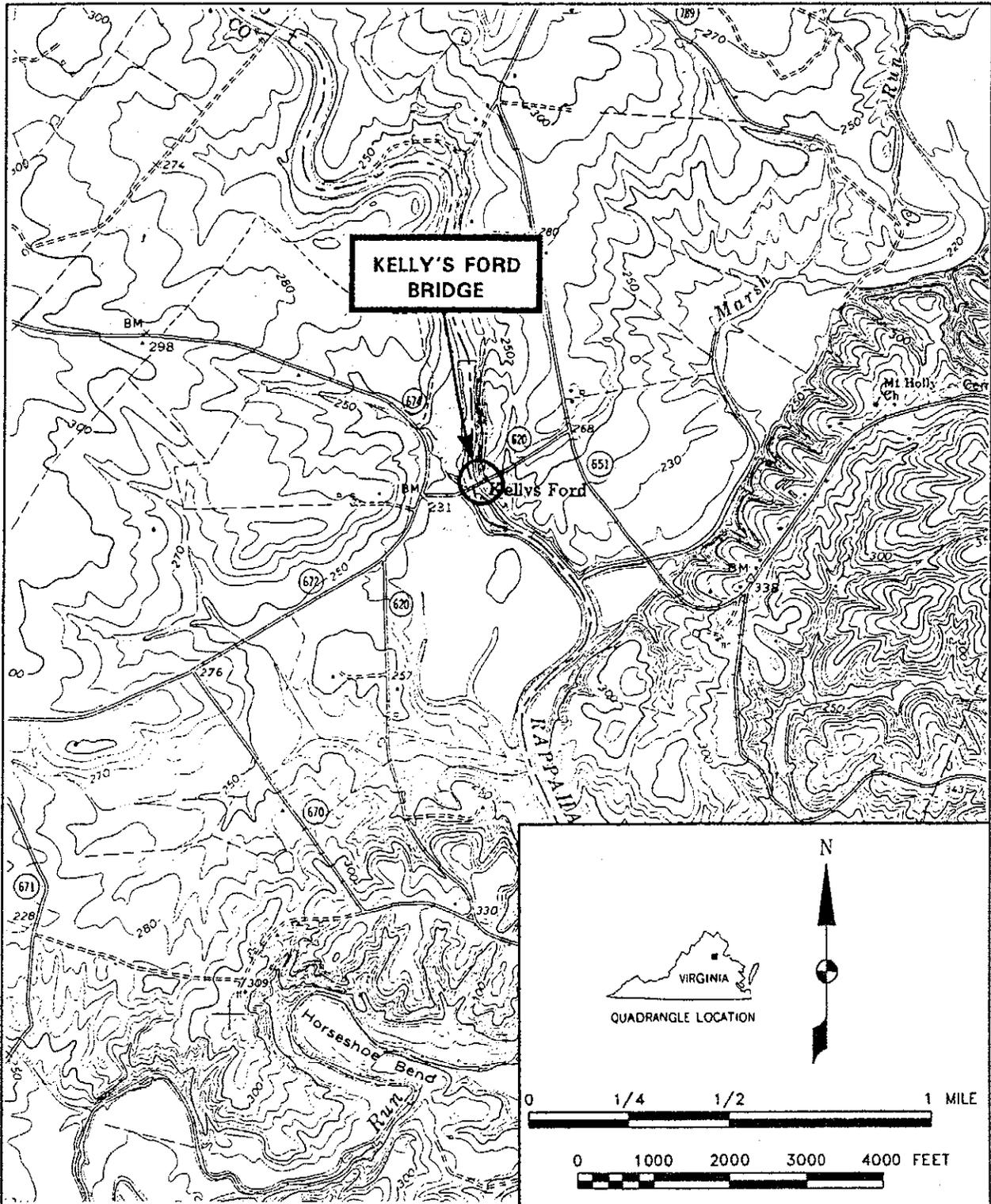


FIGURE 1: Location Map

SOURCE: USGS 7.5 Minute Quadrangle, Germanna Bridge, VA, 1968  
(Photorevised 1985, Photoinspected 1981)

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SOURCE: Virginia Department of Transportation 1971

FIGURE 2: Original Bridge Report, Bridge No. 6908, January 6-7, 1970

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