CLARKTON BRIDGE
(Bridge No. 6902)
Spanning the Staunton River at Virginia Route 620
Clarkton Vicinity
Charlotte County
Virginia

HAER No. VA-108

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

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HISTORIC AMERICAN ENGINEERING RECORD
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LOCATION: Virginia Route 620 over the Staunton River, Clarkton vicinity, Charlotte and Halifax counties, Virginia. USGS Nathalie, VA Quadrangle, Universal Transverse Mercator Coordinates: 17.687120.4094280

DATE OF CONSTRUCTION: 1902

BUILDER: Virginia Bridge & Iron Co., Roanoke, Virginia

PRESENT OWNER: Virginia Department of Transportation

SIGNIFICANCE: The Clarkton Bridge is a representative example of a pin-connected steel Camelback truss, supported by steel cylinder piers. The truss and piers are typical of late nineteenth and early twentieth century factory-manufactured bridges.

PROJECT INFORMATION: The Clarkton 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; Ingrid Wuebber, Historian; and Bruce Harms, Photographer.

DESCRIPTION

The Clarkton Bridge (VDOT Bridge No. 6902) consists of two Camelback, pin-connected steel through truss channel spans and twelve steel deck beam approach spans. The bridge carries Virginia State Route 620 in a north-south direction over the Staunton River, connecting the counties of Charlotte and Halifax, Virginia. It is 0.1 miles north of the junction of Route 620 and Route 626, approximately 0.5 miles east of the settlement of Clarkton (Figure 1). The overall dimensions of the bridge approach and truss spans are as follows: north approach, 370' with twelve deck spans; north truss, 150'; south truss, 150'. The total length of the bridge is 692'.

At the point of the bridge, the riverbed is approximately 250' wide, with the two trusses an average of 53' above the riverbed. The north approach spans the floodplain at a grade of 5%. The depth of the river fluctuates with discharges from Smith Mountain Dam, varying in depth from a low of about 4' to a high of 8'. The bridge is situated in a valley surrounded by forested mountains.

The trusses of the Clarkton Bridge are of the Camelback type, a variation of a Parker truss defined by a top chord with five slopes. The Parker truss is a Pratt truss with polygonal top chords. All members of the bridge are steel, joined with pinned, riveted, or threaded connections. The two trusses are identical in construction and will be discussed in the singular. The truss is 16' wide; it has a maximum height of 25' and an overall length of 150', with eight panels, each 18'-9" wide.

Top chords and inclined end posts are riveted H-sections consisting of side channels with flanges turned out, top plates, and bottom stay plates. The top chords measure 12" x 7-1/4" overall, built with 1/4" x 12" top plate, 7" x 2" channels and 4" x 12" x 1/4" bottom stay plates spaced 36" on center. The truss rests on plate and roller type bearings and fixed bed-plate bearings, which measure 12" x 20". Bottom chords consist of paired loop-welded eye-bars of three sizes: chords at panels one and two are 2-1/2" x 5/8"; chords at the third panel are 3" x 13/16"; chords at panel four are 3" x 7/8".

The riveted box-section bar-lattice posts are 9-1/4" x 5" overall, consisting of two 5" x 1-3/4" channels with flanges turned out, spaced 7" apart, and connected with single bar-lattice top and bottom.

Main diagonal panel braces consist of doubled bars with loop-welded eyes, measuring 2" x 5/8" in panel two, and 7/8" square in panels three and four. Single diagonal counters of 3/4"-diameter rod with loop-welded eyes, upset threads, and turnbuckles are located in panels three

and four. Hip-verticals consist of a single 3/4" square rod with loop-welded eyes, and two angles, measuring 3" x 2-1/2", connected with tie plates to form a built-up channel. All pins are 2-5/8" in diameter.

Portal struts consist of a double intersecting Warren truss girder, 6' high by 4-1/4" wide. Top and bottom flanges are riveted T-sections, 4-1/4" x 3" overall. Web members are 2-1/2" x 1-1/2" angles. Portal braces are riveted T-sections bent on a radius (Figure 2). Upper lateral struts and sway struts are 6" x 3" inverted riveted T-sections. Upper lateral bracing rods are 3/4" in diameter with threaded ends. Sway bracing consists of two sets of intersecting 2-1/2" x 2" angles. The end sway frames are 7' high and the intermediate sway frames are 9'-10" high. The truss has a vertical clearance of 14'-7" at the portal and 15'-2" at the sway frames.

Both trusses have identical floor systems which were repaired and reinforced in 1940. The floor beams are 12" x 5" rolled I-beams, hung from the bottom chord pins with 3/4" U-bolt beam hangers. The 1940 repairs converted the floor beams into inverted king post trusses. This work consisted of the addition of doubled 5" x 1/4" bars, bolted to the end of the beam and to a king post 2' long bolted to the center of the beam. A total of eight floor stringers consisting of 8" x 4" rolled I-beams are spaced 19" on center. Bottom lateral bracing rods are of four sizes, 3/4", 1", 1-1/4", and 1-1/2", with one end loop-welded and one end threaded. The laterals connect to the floor beam with angle brackets which accept both the eye and the threaded ends.

The two trusses are carried by two piers, each consisting of two riveted steel cylinders. The north pier is 41' high, with cylinders 4' in diameter, and is founded on the bank. The south pier is located in the center of the river and is 53' high, with cylinders 5' in diameter. The cylinders are rolled from 1/4" plate, 54" wide, with overlapped riveted joints (Figure 3). They are spaced 15' apart on center and interconnected with bracing consisting of struts and diagonal tie-rods. The struts consist of two channels, 7" x 2", spaced 3" apart, with flanges turned out, connected with tie-plates top and bottom. The diagonals are 1-5/8" rod with loop-welded eyes, upset threads, and turnbuckles. The diagonals and the struts attach with pins and riveted plate and angle brackets directly to the steel cylinder.

The twelve deck approach spans vary in length: seven spans are 26' 3-1/2"; one span is 26' 7", and four spans are 40'. Each span consists of nine I-beam stringers, measuring 9" x 4" and spaced 18" on center. The stringers rest on I-beams either 15" x 5-1/2" or 12" x 5" in length. The piers are constructed of two 8" x 4" I-section posts, cross-braced with 2-1/2" angles. The posts rest on square concrete footings, which vary in size depending on the height of the posts.

The north abutment is straight, constructed of concrete, and 16' wide and 5' high. The south abutment is straight and rests directly on the exposed bedrock cliff. It consists of rubble masonry encased in concrete, and is approximately 18' wide and 2' high.

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 13'-wide roadway is 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 steel angles, 3" x 2-1/2", running horizontally 18" and 36" off the deck, supported by angle posts.

HISTORICAL INFORMATION

Background

The Clarkton Bridge derives its name from the Clark family, their plantation, and the village of the same name. There do not appear to have been any earlier bridges, ferries, or fords at this exact location. John Clark was a wealthy landowner who lived near Randolph in Halifax County. On his death in 1827, he left an estate of half a million dollars and a provision in his will to purchase plantations for his children. His son, Charles Adophus Clark (1821-1859), bought the "Rosebank" plantation on the Staunton River in Halifax County from the Yuille family; it was the only river plantation available at the time. Just before he married Eliza Ann Spraggins (1821-1897) in 1846, Charles Clark built "Hovelock" on the crest of a ridge about a mile and a quarter from the river (on present County Road 632) (Edmund [undated]:119-120).

After Charles Clark died in 1858, his widow, Eliza, managed the estate until it was inherited by their son, Thomas (1851-1919). Thomas added nearly 400 acres of land on both the Charlotte and Halifax sides of the Staunton River to the 5,600 acres he had inherited, making the plantation one of the largest bright tobacco farms in Halifax County. Corn and cattle were also raised on the farm. Thomas Clark conveyed the Lynchburg and Durham Railroad (present Norfolk and Western Railway) a right-of-way through his plantation in 1889 in exchange for the construction of a station and express office. At his request, the station was named Clarkton and he also changed the name of his house to Clarkton. Prior to the railroad, the Danville to Richmond stagecoach had passed through Clarkton on its way to the Staunton River crossing at Coles Ferry (Carrington 1975:147-148; Ginther 1968:54-56).

In the decades before the Great Depression, the village of Clarkton was a place of considerable activity. The Guthrie brothers ran a large general store, and a post office as well as the railroad depot were also located in the village. Following Thomas Clark's death in 1919, his widow, Grace, endowed St. Thomas Episcopal Church and a community center in Clarkton. In 1938, thirty-one tenant families were still living on the Clarkton plantation (Reynolds [undated]:59; Edmund [undated]:121-122, 127). The Clarkton Depot went out of service in the late 1950s, and the post office moved, but a general store still remains (Koontz [undated]:30).

F.G. Baldwin, J. Edward Baldwin, and L.D. Martin were commissioned in Halifax County Court's April term, 1900, and George R. Hannah, G.W. Berkley, and S.C. Daniel were commissioned in Charlotte County Court's June term, 1900, to determine whether a new bridge should be built across the Staunton River near Clarkton. The site selected for the bridge, known as "Rock Bluff," was located about one-half mile below Coles Ferry. It was felt that the bridge would benefit the area by inducing more people to locate to these sections of the counties, thereby increasing land values (Charlotte County Board of Supervisors Volume No. 3:23; Charlotte County Report of Bridge Commissioners, January 7, 1901; *The Charlotte Gazette*, January 17, 1901:2).

On January 8, 1901, the County Court followed the bridge commissioners' recommendations and authorized construction of the bridge. Charlotte County, Halifax County, and the Norfolk and Western Railway Company would each contribute $2,000 toward construction costs, with an additional $1,940 to be raised by private subscription. The Norfolk and Western Railway agreed to assist further in the bridge's construction by shipping all bridge material to the work site free of charge (Charlotte County, Letter from the Norfolk & Railway Company, March 26, 1901). The Virginia Bridge & Iron Company, of Roanoke, Virginia, was awarded the contract for the bridge. The bridge was to consist of two spans, each one hundred fifty feet in length, and two steel tubular piers set on solid rock with a horizontal surface. The Virginia Bridge & Iron Company also proposed to construct a crib protection below the low water mark for the river piers. Work was to be completed within six months of approval of the contract (Charlotte County, Contract with Virginia Bridge & Iron Company, March 27, 1901).

By a legislative act approved on February 1, 1901, the Charlotte County Board of Supervisors was authorized to borrow money to pay for construction of the bridge by issuing bonds. In December of 1901, the Charlotte County Treasurer escrowed funds for bridge construction, indicating that the work could begin. One hundred dollars was paid to have a road constructed to the bridge on the Charlotte County side of the bridge. S.P. Daniel, an engineer/architect, was commissioned to superintend construction of the iron bridge (Charlotte County Board of Supervisors Volume No. 3:26, 57, 75).

Bridge construction began on October 1, 1901, and the bridge was completed and ready for inspection on December 25, 1901. However, before the bridge was formally accepted by the county, a major flood occurred. The flood undermined the concrete in the center pier and washed away the approaches (Charlotte County, Letter from Virginia Bridge & Iron Company, April 11, 1902).

In February 1902, Daniel reported that the damage resulting from the flood had revealed defects in the bridge's construction. The bridge pier nearest the Charlotte County side of the river was a hollow iron caisson, seven feet in diameter, into which was inserted a five-foot iron pier surrounded by cement. Daniel described the cement as being "of very poor quality." The pier

had sunk, causing the bridge to twist upstream approximately three feet, breaking one tie-rod and possibly weakening others. Daniel believed that the central pier had failed because it had not been sunk to solid rock and was also incorrectly designed. He contended that the fifteen-foot spacing between the two sets of piers was not sufficient to prevent the bridge's collapse during a period of high water and wind. Daniel suggested that the piers be placed twenty-five feet apart instead of fifteen feet, and further suggested that the county conduct a thorough load-bearing test before accepting the bridge (Charlotte County, Report of S.P. Daniel, May 5, 1902; *The Charlotte Gazette*, February 13, 1902:2).

The Virginia Bridge & Iron Company had already begun repairing the flood-damaged bridge by the middle of January 1902, using a work force of between three and twelve men. Commissioner Daniel reported that the work proceeded slowly because of continuing floods and also due to the company's general mismanagement of the project (Charlotte County, Report of S.P. Daniel, May 5, 1902). On June 12, 1902, it was reported that the repairs to the foundations and piers were nearly completed, but that the approaches to the bridge remained unfinished. The rebuilt bridge was completed and ready for service on June 20, 1902. As per Daniel's recommendation, a load-bearing test was carried out prior to the bridge's acceptance. A load of 120,000 pounds per span was applied and the bridge passed inspection (Charlotte County, Report of S.P. Daniel, July 7, 1902; *The Charlotte Gazette*, November 13, 1902:2).

By 1906 it was noted that the Clarkton Bridge was much in need of having the accumulated rust scraped off, being painted, and being "screwed up." C.E. Walker was hired to do the job for $125, the cost to be shared by Charlotte and Halifax counties. The bridge was subsequently painted by the counties at least three more times (1912, 1922, and 1927) (Charlotte County Board of Supervisors Volume No. 3:189; 5:138; 7:15).

In 1907 the Clarkton Bridge was condemned as too dangerous to cross. A.B. Rice, G.W. Berkley, and W.D. Clark were commissioned to find the "best and cheapest way" to repair the bridge approaches. No action on the approaches was taken for several years, until a new public road from Coles Ferry to the Clarkton Bridge was laid out in 1911. The contract to construct a new steel approach on the Halifax side, with a new floor and steel handrails, was awarded to Austin Brothers Bridge Company. No location for this company was given in the court records; however, a firm called the Austin Bridge Company was located in Chicago at one time (Smithsonian Institution [undated]). The job called for the replacement of steel stringers and hand rails on the main bridge and repainting of the trusses and piers. The total cost of $3,149 was to be borne proportionately by Charlotte and Halifax counties according to their respective 1910 population census figures. A.B. Rice was given the commission of inspecting the concrete work during construction and making a bridge inspection upon completion of the project (Charlotte County Board of Supervisors Volume No. 3:238, 241, 326, 332, 400, 406).

Bridge repairs were underway in the early part of 1912. When the necessity to replace the approach on the Charlotte County side became evident, A.B. Rice was commissioned to have a "wooden approach of three spans on concrete pillows" constructed. In June 1912, Rice reported that Austin Brothers had failed to put in foundations according to the contract. The State Highway Commissioner was requested to send a State Bridge Engineer to inspect the approach and its foundation. Further unspecified repairs to the bridge were undertaken by the counties in 1919 and 1923 (Charlotte County Board of Supervisors Volume No. 3:427, 432; 4:435; 5:312).

In 1940, repairs were made to the floor systems of the two truss spans. The floor beams were reinforced with steel braces, which structurally converted the beams into king post trusses. New floor stringers and decking were also installed (Virginia Department of Highways 1940:Plan No. LXXXIII-23).

In 1974 the weight posting for the bridge was lowered from ten tons to five tons due to deteriorated structural members. Inspections of the bridge in 1984 revealed continued corrosion and sectional loss of the structural members, as well as evidence of overloading, prompting a reduction of the weight posting to three tons. A 1988 inspection found the bridge to be in poor condition overall, with further sectional loss evident throughout the structural steel members, bowed end posts, sagging deck sections, and a leaning main span pier (Sellars 1990).

The Parker Truss

The Parker truss was introduced by C.H. Parker in the 1870s. Parker utilized a quadrilateral truss of the Pratt type with posts in compression and diagonals in tension, but varied the length of the posts based on the strains exerted on them at a given location. The center panels, where the strains were the greatest, required the tallest panels, with the posts becoming successively shorter toward the ends of the bridge. The primary advantage of the design was a reduction in the weight of the bridge, or dead load, permitting longer spans without increasing the sectional area of the bridge's structural members. A savings in material cost was a direct result; however, this advantage was largely offset by the cost of having to fabricate a greater variety of members. The most economical compromise was struck with a modification of the design that limited the number of variations in the slope of the top chord to three, for a total of five polygonal segments. This variation of the Parker truss is called a Camelback truss. In general, the Parker or Camelback truss becomes economical for bridges over 160' long (Comp and Jackson 1977:5; DuBois 1900:58-59; Kunz 1915:170; Waddell 1916:24).

Steel Cylinder Piers

According to John Waddell, a preeminent authority on bridges in the early twentieth century, concrete-filled steel cylinder piers "used to be the most common kind of pier in America" (Waddell 1916:1025). Riveted cylinder piers were the predecessor of modern pipe piers, which remain in frequent use. The cylinders were originally constructed of cast and wrought iron; steel was used after about 1890. Iron or steel sheets, from 3/8" to 5/8" thick and between 4' and 8' wide, were rolled into cylindrical sections varying in diameter from 4' to 15'. The cylinder ends were overlapped several inches and joined with rivets. The cylinders were joined end to end to achieve the desired pier height. The seams were riveted and usually overlapped, although butt seams with an internal riveted band were used when higher compressive strength was required. When the piers rested on rock, they were anchored by drilling the rock and grouting-in steel rods to project up into the concrete in the cylinder. When piers were to be placed on soft bottoms, several wood pilings were driven in a tight cluster to project up into the cylinder. Tall piers, or piers carrying extreme loads, often rested on footings constructed of concrete-filled cylinders two or three times the diameter of the pier (Mitchell 1937:339-341; Waddell 1916:1025).

The Virginia Bridge and Iron Company

The Virginia Bridge and Iron Company was founded in Roanoke in 1889 as the American Bridge Company, by C.L. Wentworth, J.B. Hunter, and C.L. Michael. In 1895 the company was incorporated as the Virginia Bridge & Iron Company (VBI) and capitalized with $50,000 (Stevens 1930:66; *Roanoke Times* 1966).

By 1904, VBI was the largest steel fabricating company in the south, with a capacity of 12,000 tons annually. The company's product line consisted of bridges, turntables, warehouse factory buildings, and general structural iron and steel work. The company employed 175 men in the shops and 150 men in the erecting department. The plant covered 10.5 acres and included a bridge shop 300' by 80', a large girder shop, and several smaller buildings. The plant was located on the lines of the Norfolk and Western Railroad and the Southern Railroad. The principals of VBI at the time were W.E. Robertson, President; C.E. Michael, Secretary; T.T. Fishburn, Treasurer; and C.E. Hamlin, Contracting Engineer (*Roanoke, the Magic City of Virginia* 1904:36-37; Charlotte County 1899-1902).

Growth of the company continued through the early twentieth century, and plants were built in Memphis in 1908 and in Birmingham in 1922 (*Roanoke Times* 1936). By 1934, VBI had 800 employees and an annual production output valued at 5.4 million dollars. Company offices were located in Birmingham, Memphis, Atlanta, New York, New Orleans, Los Angeles, Charlotte (North Carolina), Dallas, and El Paso (*Roanoke Times* 1934; Stevens 1930:66). In 1936 VBI

became a wholly owned subsidiary of the Tennessee Coal, Iron and Railroad Company, the largest producer of steel in the south (*Roanoke Times* 1936).

In 1952, VBI was merged into the American Bridge Company, a subsidiary of U.S. Steel Corporation and the largest bridge company in the United States. VBI's facility in Roanoke served as the headquarters for the Southern Division of the American Bridge Company until 1965, when the plant was closed (United States Steel Corporation 1975:18, 32).

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 Virginia Bridge & Iron Company built a total of sixty-five truss bridges in Virginia during the period researched. The company built five other truss bridges in addition to the Clarkton Bridge within the Lynchburg VDOT Construction District (Deibler 1973). One other VBI bridge, Waterloo Bridge (VDOT Bridge No. 6906), in Culpeper County, is included among the seventeen historic metal truss bridges recorded by VDOT in 1993-1994, of which this report is a part.

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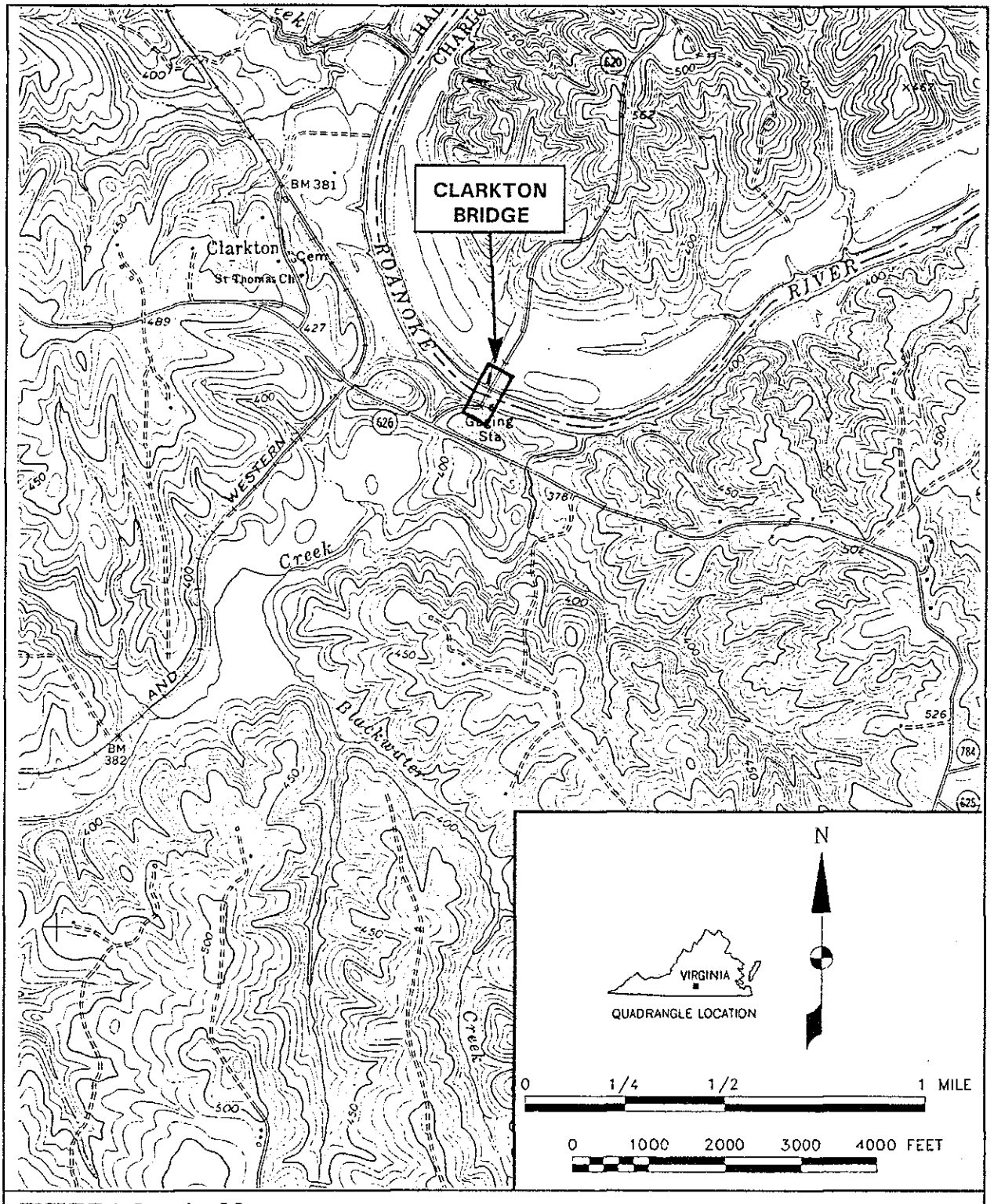

FIGURE 1: Location Map

SOURCE: USGS Nathalie, VA, 7.5 Minute Quadrangle, 1968

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FIGURE 2: Original Bridge Report, Bridge No. 6902, May 1974 *SOURCE: Virginia Department of Transportation 1974*

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SOURCE: Virginia Department of Transportation 1974

FIGURE 3: Original Bridge Report, Bridge No. 6902, May 1974