

NASHVILLE TOLL BRIDGE (ABUTMENTS)
Trail of Tears National Historic Trail
West and east side of the Cumberland River, below the Victory
Memorial Bridge
Nashville
Davidson County
Tennessee

HAER TN-48
HAER TN-48

PHOTOGRAPHS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

ADDENDUM TO:
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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

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NASHVILLE TOLL BRIDGE (ABUTMENTS)
HAER No. TN-48

Location: West and east side of the Cumberland River, immediately upstream of and below the Victory Memorial Bridge. Nashville, Davidson County, Tennessee.

The Nashville Toll Bridge abutments site is located at latitude 36.168079 north, longitude -86.777083. The coordinates represent the northeast corner of the west abutment. It was obtained in 2015 by plotting its location in Google Earth. The location has no restriction on its release to the public.

Present

Owner: Tennessee Department of Transportation

Present Use: Historic artifact

Significance: The Nashville Toll Bridge abutments are significant for being the only surviving bridge crossing remains on the Trail of Tears, a National Historic Trail. The site represents the oldest bridge in the city of Nashville, and is associated with the early development of the city. The abutments are also rare surviving remains of a bridge designed by Lewis Wernwag, an early bridge pioneer, who built over thirty major river crossings from the 1810s-1830s.

Historian: Christopher H. Marston, 2015-2016

Project

Information: The National Covered Bridges Recording Project was undertaken by the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is administered by the Heritage Documentation Programs Division (Richard O'Connor, Chief), a division of the National Park Service, U.S. Department of the Interior. The Federal Highway Administration's National Historic Covered Bridge Preservation Program funded the project.

Several partners contributed to the documentation of the Nashville Toll Bridge abutments. The Tennessee Department of Transportation (Gerald Kline, Archaeology program manager, Laura van Opstal, TDOT historian) owns and maintains the site. Patrick Cummins, president, and Toye E. Heape of the Native History Association did research on the bridge and applied for a grant from the National Park Service in 2012-13. Aaron Mahr and Michael Romero Taylor of the NPS National Trails Intermountain Region were instrumental in getting HAER

involved in the project in 2013, and designated the site as a Certified Site on the Trail of Tears National Historic Trail in 2014. James Barker, J.A. Barker Engineering, Inc. (now VS Engineering) completed a preliminary engineering analysis of the abutments in 2013, which was funded by grants from NPS National Trails, Historic Nashville, Inc. (Robbie Jones, president), and the Native History Association. James Barker, Dario Gasparini, and Timothy Andrews offered several insights on Wernwag. Martin Stupich completed the large format and digital photography in 2015. Christopher H. Marston, HAER Architect, managed the project and wrote the historical report in 2015-2016.

Part I. Historical Information

A. Physical History

1. Dates of construction: 1819-1823

2. Engineer: Lewis Wernwag (1769-1843) was a pioneer in early bridge development in the United States. Born in Germany, Wernwag came to Philadelphia in 1788 and tried his hand in several ventures from nail works to canal and mill construction. He built his first bridge, a movable cantilever truss, over Neshaminy Creek in 1811. He achieved fame with the design and construction of the Lancaster-Schuylkill Bridge, a single span, 340'-long arched wooden truss with a decorative cover, over the Schuylkill River near the Fairmount Water Works in Philadelphia in 1812, which survived until 1838. Built of five parallel laminated arch ribs, the "Colossus" was the longest timber span built in the country at the time.¹ He then built the New Hope Bridge across the Delaware River between New Hope, Pennsylvania and Lambertville, New Jersey in 1814, which consisted of six spans of 175' each. Wernwag promoted these three different bridges with a broadside first printed in 1813, which accompanied his original patent application (see figure 2).² Some of the innovations in these designs included sawing through the heart of the timbers to 6" thickness, separating the timbers with cast-iron spacers to prevent dry rot, and using iron fittings to avoid the use of mortise and tenon (see figures 3-4). These designs also represent the first use of wrought-iron diagonal tension members, and by resting the arch on top of the lower chord (instead of against the abutment), Wernwag created the first tied-arch design.

¹ Lee H. Nelson, *The Colossus of 1812: An American Engineering Superlative* (New York: American Society of Civil Engineers, 1990), 1.

² E.G. Gridley, "Illustrations of Lewis Wernwag Bridges," 1813, 1829, available in Thomas Pinckney Papers Collection, South Carolina Historical Society, Charleston.

Having earned a reputation as a “premier bridge builder,” Wernwag built several more bridges on the New Hope model in Reading, Wilkes-Barre, and over both the Monongahela and Allegheny rivers in Pittsburgh from 1816-19.³ In his later years, Wernwag designed the bridges but hired craftsmen to erect them, including Joseph Johnson and Samuel Stackers, and as he got older, his sons William and Lewis, Jr., among others.⁴ Although there is no record of Wernwag coming to Nashville, the Nashville Bridge Company contract states the “Bridge shall be erected on the principles of Lewis Wernwag’s patent as displayed in the New Hope, Reading, and Pittsburgh Bridges.”⁵ Wernwag continued to design and build wooden truss bridges across major rivers in the mid-Atlantic and Ohio Valley for the rest of his life. Nearly all of his bridges were toll bridges built for turnpike companies, but Wernwag also built the first wooden railroad bridge in the country for the Baltimore & Ohio Railroad over the Monocacy River in 1831. Most of his later bridges were a variation of the patented Burr-arch truss, where Wernwag preferred to use flared posts.⁶

3. Builder/Contractor: Joseph Johnson first worked with Lewis Wernwag in building the “Colossus” in Philadelphia. Afterwards, Wernwag, Johnson, and Stackers teamed together to build the New Hope Bridge across the Delaware. Wernwag, Johnson, and Isaac Nathans used the New Hope plan to build the three-span Penn Street Bridge in Reading, Pennsylvania (1816). Wernwag and Johnson reunited with Stackers in Pittsburgh, using the same tied-arch truss design on both the Monongahela (1818) and Allegheny river bridges (1819). The eight-span, 1,500' long Monongahela Bridge, built for \$110,000, was celebrated as a major engineering achievement in Pittsburgh as the first bridge over one of the three rivers in the emerging industrial center.⁷

At Nashville, Wernwag appears to have been the designer/engineer, with Johnson the superintendent and Stackers the lead contractor. According to the *Nashville Whig*, “Stackers and his wife made the trip from their home in Pennsylvania to Nashville on horseback. With them came thirty mechanics to perform the skilled labor connected with the undertaking.” Stackers remained in Tennessee the rest of his life, working in the iron industry until his death in 1859.⁸

³ F.E. Griggs, Jr., “Colossus Bridge Designer: Lewis Wernwag,” *Structure Magazine* (October 2004), 34-36.

⁴ Richard Sanders Allen, *Covered Bridges of the Middle Atlantic States* (Brattleboro, Vermont: Stephen Greene Press, 1959), 16.

⁵ “Contract for bridge over the Cumberland with Joseph Johnston, 1819,” 1, in Nashville Bridge Company 1819-1953 Records, Folder 1, Tennessee State Library and Archives (Nashville) [hereafter cited as TSLA]. Joseph Johnson’s last name is referred to as Johnson, Johnston and even Thompson in contemporary records. Although the Nashville Bridge Company records call him Johnston, nearly all Wernwag historians (from John Wernwag to Lee Nelson) refer to him as Johnson, so that is how he will be referred to in this report.

⁶ Joseph D. Conwill, “Burr Versus Wernwag,” *Covered Bridge Topics* 55, no. 2 (Spring 1997): 4. See Appendix E for a detailed list of Wernwag’s bridges.

⁷ A local newspaper noted that “Mr. Johnson, the meritorious undertaker and Superintendent” presided at the dinner celebrating the Monongahela Bridge’s completion. See Herbert Du Puy, “A Brief History of the Monongahela Bridge, Pittsburgh, Pa.,” *The Pennsylvania Magazine of History and Biography* 30, no. 2 (1906): 194.

⁸ Samuel A. Weakley, “The First Bridge Across the Cumberland River,” 2, in Samuel Anderson Weakley Papers 1795-1971, Box 4, Folder 6, TSLA.

4. Owner: The Nashville Bridge Company was a privately held company of prominent local citizen shareholders that raised \$75,000 for the construction of the bridge, piers, approaches, and toll houses. The company signed an agreement with “Joseph Johnston of Philadelphia, Bridge Architect” on June 28, 1819, and first advertised for subscriptions on July 31, 1819, payable in installments of \$5 on each share. Thomas Talbot served as the first president, followed by Robert Weakley by 1823.⁹ By 1831, maintenance of the bridge cost the company over \$116,000, including additional costs for approaches, roadways, and a series of repairs.¹⁰ The Nashville Toll Bridge stood until it was taken down in 1851, leaving only the west and east abutments. The Tennessee Department of Transportation (TDOT) is the current owner of the surviving abutments.

5. Original plans and construction: No drawings of the original Nashville Toll Bridge are known to survive. The only contemporary rendering is found in a vignette in the corner of Matthew Rhea’s 1832 “A map of the state of Tennessee taken from survey” (see figure 1). It shows the bridge from the bluff of downtown Nashville sloping towards the sandy east (historically referred to as north) bank, crossing over steam packets plying the Cumberland River. As the first bridge over the Cumberland, the bridge would have been a major improvement to regional transportation, connecting Nashville’s public square with the Gallatin Pike, which led northeast. It also linked towns to the south, such as Murfreesboro and Franklin, with White’s Creek Pike due north towards Springfield, and with the Nashville-Clarksville post road to the northwest.¹¹ The 1819 Nashville Bridge Company contract specifies the use of Wernwag’s patented design for the New Hope Bridge (see appendices C & D). Thus, the patent drawing of the New Hope Bridge from Wernwag’s 1813 broadside can be viewed as a prototype for the Nashville bridge.¹² Details from the broadside are confirmed by examining the photograph of the original New Hope truss remains, seen in a rare photograph after the 1903 Delaware River Flood (see figure 5). By comparing the detailed patent drawing with the meticulous specifications found in the contract, one can envision what the Nashville Toll Bridge would have looked like, despite some of the differences listed below.

Feature	New Hope	Nashville
Abutment width	43'-8"	52'-0"
Abutment height	27' above foundation	75' above low water
Span length	6 @ 175' (24 panels)	3 @ 200'
Overall length bw abutments / overall	1050' / 1177' overall	600' / unknown

⁹ “Contract for bridge over the Cumberland with Joseph Johnston, 1819,” 1; Weakley, “First Bridge,” 2.

¹⁰ Andrew Hynes, Petition #194 (Petition from the Nashville Bridge Company protesting a second bridge across the Cumberland River at Nashville), Tennessee Legislative Petitions, TSLA, 1831.

¹¹ “A map of the state of Tennessee taken from survey,” (Columbia, Tennessee: Matthew Rhea, 1832). Library of Congress Geography and Map Division, Washington, D.C.

¹² “Illustrations of Lewis Wernwag Bridges.”

Width of bridge, end / center	33' / 32'	37' / 36'
Arch member size / overall (at ends)	6" x 15" / 13" x 31"	6" x 12" / 13" x 38"
Capacity	2 roadways, 2 walkways	2 roadways, 2 walkways
Arch height	13'	13'-6"
Cost of bridge and piers only	\$50,000 (1814)	\$75,000 (1823)
Overall cost	\$67,936.37	\$116,000

6. Description of Nashville Toll Bridge: To span the Cumberland River, Joseph Johnson was to employ Lewis Wernwag’s tied-arch design patented at New Hope to erect three spans at 200' each.¹³ As Wernwag had done on his previous bridges, the arch ribs were composed of multiple timbers, and “prevented from coming into contact by one inch iron bars placed between them.” The Nashville design called for each rib to be 6" x 12", “two in breadth & three in depth” for a total cross section of 13" x 38". As Wernwag had introduced on the “Colossus”, the arches were slightly inclined from the ends to the center, in an attempt to account for lateral wind bracing. The overall width of the bridge was to measure 37' at the ends and 36' at the center, and the height of the arch at the center was to be 13'-6". The ends of the arches were “set in cast iron head blocks, confined together with strong iron clamps and screw bolts.”¹⁴ The end casting can be seen in the New Hope Bridge drawing (figure 3); an interpretive drawing of this complex casting by James Barker is seen in figure 6. To accept the force transfer of the arches, Wernwag specified notching in the lower chord and bolting of the timbers together. This detail was the key element to producing the first-tied arch bridge design.¹⁵

The New Hope broadside shows diagonal iron rods connected to an eyebar mounted in the abutment, stabilizing the end of the bridge to help resist lateral movement. It also shows tension splices in the lower chord, drawn as if there were two lower chord timbers per truss and each was spliced every five panels (approximately every 36'). For a more detailed view of the tension splice detail, see figure 7. The broadside depicts wrought-iron tension rods which clamped diagonally between each post, as well as the square horizontal bracing laid across the upper chords (see figure 3.) The vertical wood post and diagonal iron tension rod truss arrangement is a predecessor to the Pratt truss, which was patented over thirty years later in 1844.¹⁶ The contract specified that the wood used in the superstructure was to be “pine, cedar or yellow poplar, using white oak in some particular places where the pressure is great.”¹⁷ Oak would be needed most at

¹³ The *Nashville Whig* reported the bridge as 560' long with spans of 187', so it's possible the contract estimated the bridge size, and the article reported the actual sizes after construction. The variation in size is about 6 percent, so still comparable to the original specifications. “The Nashville Bridge,” *Nashville Whig* (January 26, 1824), 8.

¹⁴ “Contract for bridge over the Cumberland with Joseph Johnston, 1819,” 5-6.

¹⁵ Correspondence from James Barker to Christopher Marston, May 2016.

¹⁶ David Guise, *Abstracts & Chronology of American Truss Bridge Patents, 1817-1900*, Society for Industrial Archeology, Occasional Electronic Publication No. 1 (2009): 77.

¹⁷ “Contract for bridge over the Cumberland with Joseph Johnston, 1819,” 5.

the ends of the arches for its superior strength in compression parallel to the grain, and at the ends of the lower chord for its superior shearing strength and resistance to decay.¹⁸

The bridge required two abutments and two piers that could accommodate the downward slope from the bluff on the Nashville side to the sandy lowlands on the east side, at which point a causeway for the approach from the Gallatin Pike would later be constructed.¹⁹ The total height was 75', from top of the abutment to "low water."²⁰ The contract called for masonry work to be composed of "large and sufficient stones... worked in mortar of good lime and quick sand, completely and sufficiently pointed... These walls to be finished on the top, pointed & the front wing walls, and side walls, as far as may be exposed to view shall be hammered, dressed work." The stone abutments were to measure 52' wide, with a depth of 16' at the base, have a batter of 1/12, with matching wing walls from the bank. The abutments were to be "filled in with stone, and as much clay as will be necessary to render the same compact... so as to form a firm and compact road, with a gentle, easy ascent, to the entrance upon the Bridge... The abutment on the Town side to be cut out of the Bluff of the River at least as wide as the Bridge with an easy ascent, extending at least fifty feet from the termination of the arch."²¹ The description of the masonry was very detailed in the contract, as the substructure represented the majority of the cost of the project.

The two piers in the river were also to be 52' wide, with a depth of 24' at the base, and 10' at the top, battered at 1/12, built on a base of timber cribbing. Typical of nineteenth-century practices, the upstream head of the pier was a pointed cutwater, and the downstream end semicircular, reinforced and clamped with iron straps.

The floor was specified to be two-ply, with the "first layer of three inch pine plank, laid deck fashion" and the weathering surface of 2" white oak, fastened with spikes. Unlike the New Hope drawing, the deck height was to "be one foot higher than the heads of the arches." As with other early urban bridges, the Nashville bridge was multimodal, with two roadways, and two raised pedestrian walkways, 4'-3" wide. The contract called for "strong white oak fenders [curbs], or ways to confine the wheels extending from one end of the Bridge to the other."²²

¹⁸ Correspondence with Timothy Andrews, May 2016.

¹⁹ The artist's vignette in the map shows the slope as approximately 4 percent. A newspaper report from 1826 says the height of "low timbers of the bridge to the water at the first pier on the Nashville side 16 feet; at the second pier... 13 feet 4 inches; at the north abutment 11 feet." If one divides these measurements by 200' span, the slope is 1.25-1.33 percent. Weakley, "First Bridge," 7.

²⁰ "The Nashville Bridge," 8.

²¹ "Contract for bridge over the Cumberland with Joseph Johnston, 1819," 3-4.

²² "Contract for bridge over the Cumberland with Joseph Johnston, 1819," 6.

Befitting its name, the Nashville Toll Bridge called for an impressive toll house. The contract specified “the ends of the bridge shall be finished with a strong frame building as wide as the Bridge.” It would project 16’ and stand 6’ higher than the roof, have arched openings, pilasters and “a neat frontispiece.”²³ A contemporary oil painting of Pittsburgh’s 1818 Monongahela Bridge shows the inspiration for the Nashville toll house (see figure 8).

The contract also specified for the exterior of the bridge to be weatherboarded, for eleven windows on each side, a cornice, and covered with a “workman like roof of joint pine or cedar shingles.” It even detailed the paint scheme: “The string board shall have two coats of black paint, the weatherboarding two coats of light yellow, and the shutters and cornice two coats of white lead.”²⁴

The contract concluded with an acknowledgement that the total price of \$75,000 to Johnson “includes the purchase or fees of the patent right of Lewis Wernwag.”²⁵

An interesting detail not found until inspected in the field was the discovery of seven wrought-iron anchor rods mounted in the top course of the west abutment, with pockets for wood bracing underneath (see figures 14-17). These may have been used to support falsework during construction (see figure 9).

Lewis Wernwag’s design for the Nashville Toll Bridge, based on the New Hope Bridge, had several innovations. By assembling the ribs with 6" timbers cut through heart and separated with iron, Wernwag was keen to avoid the possibility of dry rot. The end of the arch casting and arch and chord connection is the key detail in this design. The end casting had to gather the three sets of arch members and endure the heavy compressive thrust, as well as accept the lower chord in tension. Wernwag’s arch truss design was the first version of a tied arch and an early use of wrought iron in the primary tension members. This truss arrangement preceded Thomas and Caleb Pratt’s truss design by thirty years. Finally, regarding Wernwag’s practice of inclining arches from the ends to the center at New Hope and the “Colossus”, the 6" horizontal inclination of the outside arches probably directed any lateral motion of the outside arches to the third, middle arch.²⁶

²³ “Contract for bridge over the Cumberland with Joseph Johnston, 1819,” 7.

²⁴ “Contract for bridge over the Cumberland with Joseph Johnston, 1819,” 7.

²⁵ “Contract for bridge over the Cumberland with Joseph Johnston, 1819,” 8.

²⁶ James Barker, Dario Gasparini, and Timothy Andrews contributed to this summary of Wernwag’s legacy.

B. Historical Context

1. Nashville's Development and First Bridge: Capt. James Robertson led the first white settlement of Nashville in 1779, when the region was still part of North Carolina. Fort Nashborough was established on the bluff overlooking the Cumberland River in 1780, at the location of the present day public square. The town of Nashville was officially established as the Davidson County seat in 1784. After Tennessee achieved statehood in 1796, Nashville was eventually selected as the state capital in 1843. Overland routes developed along Native American trails into Middle Tennessee, and early keelboats and flatboats navigated down the Ohio River and up the Cumberland. Nashville developed as a port city on the Cumberland River and as a crossroads for numerous turnpikes, including the northern terminus of the Natchez Trace. Steamboats first arrived in Nashville in 1818. These early steam-powered packet boats greatly improved communications and brought supplies such as “cast and wrought iron, wire, nails, tools, glass, leather goods, white lead and paints, chemicals, flour” and coal from Pittsburgh, Baltimore and Philadelphia.²⁷

2. Pittsburgh Connections: The archives of the Nashville Bridge Company reveal several connections between the two inland cities of Pittsburgh and Nashville. As previously mentioned, the 1819 contract detailed a bridge based on the “the principles of Lewis Wernwag’s patent as displayed in the New Hope, Reading, and Pittsburgh Bridges.” Wernwag and Johnson’s Monongahela Bridge had recently been completed in 1818, and was the first major crossing of an inland river. It is conceivable that some of the Nashville merchants saw this bridge on their journeys through Pittsburgh, either by boat or stage, and decided to construct a bridge of their own with the same engineer and builder.

There is also a copy of a lawsuit in the Tennessee archives between Jacob Beltzhoover and Wernwag and Johnson, with entries from 1820-25. Beltzhoover was a large landowner and coal mine owner on the South Side of Pittsburgh, where the Monongahela Bridge’s south abutment sat. In the document, Beltzhoover accuses the bridge builders of trespassing, and they are ultimately ordered to pay a fine. This unpleasantness must have hung over Johnson as he was building the Nashville bridge, as it appears it was not resolved until after the Tennessee project was completed. It should be noted that lawsuits over early toll bridges and other improvements such as turnpikes, canals, and railroads were not uncommon during this period.²⁸

The Nashville Bridge Company’s account book has several items with Pittsburgh references. These include the entries for the Allegheny Bridge Company, which also used Wernwag and Johnson’s services for the 1819 Sixth Street Bridge. Pittsburgh resident names such as Jacob

²⁷ Stanley John Folmsbee, *Sectionalism and Internal Improvements in Tennessee 1796-1845* (Knoxville: East Tennessee Historical Society, 1939), 14.

²⁸ “Suit against Johnston by Jacob Beltzhoover, 1821,” Nashville Bridge Company 1819-1953 Records, TSLA, Folder 2.

Vandergrift and his sons Samuel and Benjamin are listed in the ledger.²⁹ The Vandergrifts have several entries, including reimbursements for “coming down river to Nashville” and “six days of work in Pittsburgh” and supplying “sticks of timber.” There are other entries for “a horse for Clingan to ride to Pittsburgh,” and “expenses for going to Pittsburgh.” There are even references to Jacob Beltzhoover, who, despite the pending lawsuit, provided some funding for supplies.³⁰

As previously noted, the fledgling steamboat trade was instrumental in supplying construction materials for the Nashville Toll Bridge. The first steamboat to make its way to Nashville in the spring of 1818, the *General Jackson*, was built at Pittsburgh for Gov. William Carroll.³¹ A native Pittsburgher, Carroll was instrumental in forming the Nashville Steamboat Company, which invested in developing the Nashville-New Orleans steamboat trade.³² Steamboats supplied many of the construction materials for the bridge, but later caused the obsolescence of the bridge as its low height restricted boat traffic.³³

3. Subsequent history of the Nashville Toll Bridge: Despite being noted as an “elegant piece of architecture,” complaints about the bridge’s height emerged not long after it officially opened in the summer of 1823. For example, an 1826 flood crested at 11 feet below the east (north) abutment.³⁴ The Nashville Bridge Company detailed some of the additional expenses associated with constructing the bridge in an 1831 petition to deny a charter for a second bridge. These items included: building approach roads on either side, adding a causeway on the north side, building a toll house, repairing a pier that had fallen during a thunderstorm, repairing the north (east) abutment in 1827, and general maintenance of the bridge and approaches. The extra expenses increased the overall cost from \$75,000 to over \$116,000. The company complained that it had only finished paying off debts and paying dividends to stockholders in 1829, seven years after starting to collect tolls. The petition was evidently successful as construction on the new suspension bridge did not start until 1850, and the old bridge was not removed until 1851.³⁵

²⁹These Vandergrifts were the forefathers of the more famous Capt. Jacob Jay Vandergrift, the industrialist for whom the western Pennsylvania township is named. See Dr. Thomas Cushing, editor, *History of Allegheny County Pennsylvania* (Chicago: A. Warner & Co., 1889), 300.

³⁰ Nashville Bridge Company, “Account book,” 1819-1823.

³¹ Josephus Conn Guild, *Old Times in Tennessee: With Historical, Personal, and Political Scraps and Sketches* (Nashville: Tavel, Eastman & Howell, 1878), 473.

³² Anita Shafer Goodstein, *Nashville 1780-1860: From Frontier to City* (Gainesville: University of Florida Press, 1989), 35.

³³ Two other steamboats are mentioned in the Account book as delivering coal and other goods: the *Rifleman* and the *General Greene*. The *Rifleman* was built and based in Louisville, and ran from 1819-24. The *General Greene* was huge for its day at 305 tons. She was built in Cincinnati, called New Orleans home, and ran from 1820-24 before being snagged in Harpeth Shoals, Tennessee. “Account book”: 21-29; William M. Lytle, Forrest R. Holdcamper, and C. Bradford Mitchell, *Merchant Steam Vessels of the United States, 1790-1868* (Staten Island, N.Y.: The Steamship Historical Society of America, reprint: 1975).

³⁴ Weakley, “First Bridge,” 7-8.

³⁵ Hynes, Petition #194.

With the new suspension bridge in place one block upstream at what is now Woodland Street, the campaign to replace the original reached a fever pitch in 1851, with the newspapers calling to remove “that miserable hen-coop, the old bridge.”³⁶ The Nashville Toll Bridge finally collapsed during the demolition process in November 1851. Built 110' above the lower water mark, the suspension bridge only lasted a decade, as it was destroyed by Confederate soldiers in 1862. The bridge was rebuilt in 1866 and replaced by the Woodland Street truss bridge in 1886 (see figure 10). This bridge was in service for eighty years, and was replaced by the present day Woodland Street Bridge in 1966.³⁷ A century after the demolition of Nashville’s first bridge, the Victory Memorial Bridge was built high above the long forgotten Nashville Toll Bridge abutments in 1956, and today carries the James Robertson Parkway.

4. Trail of Tears: In the late 1830s, the U.S. government forced the Cherokee from their homelands to Indian Territory in Oklahoma. Some were forcibly marched by U.S. Army and state militias, while others were allowed to march under the leadership of Cherokee chiefs. The majority of the detachments completed the marches in 1837-39. John Golden Ross led one of the last delegations (including his brother-in-law, Cherokee Chief John Ross), leaving Charleston in southeastern Tennessee and crossing through Nashville in December 1838.³⁸

The Cherokee took several routes, across turnpikes, wagon trails or river routes (see map, figure 11.) The route through Nashville was called the Northern Route. It started in northern Georgia/southeast Tennessee, crossed the Tennessee River at Chattanooga or Birchwood, and continued northwest through McMinnville and Murfreesboro, before crossing the Cumberland River at Nashville. The trail continued northwest into Kentucky, eventually crossing the Ohio River at Golconda, Illinois, the site of several winter encampments. From here the route crossed southern Missouri and northwestern Arkansas before reaching disbandment sites in Oklahoma.

There are a couple notable accounts of marches through Nashville. A Cherokee Treaty Party detachment leader, B.B. Cannon, wrote in his journal that his group “passed through two Turnpike gates, and crossed the Cumberland river on the Nashville toll bridge, at Nashville” on October 27, 1837.³⁹ A local newspaper reported in December 1838,

the last detachments of the Cherokee Indians passed through this place on Sunday. They were in number about eighteen hundred. It is apprehended that they will suffer intensely from the cold, ere they reach their new homes, particularly if

³⁶ *Nashville Daily American*, February 25, 1851, in Weakley, “First Bridge,” 10.

³⁷ Debie Cox, “Nashville’s Bridges Across the Cumberland River,” *Nashville History*, September 7, 2008. <http://nashvillehistory.blogspot.com/2008/09/nashville-bridges.html>, accessed August 10, 2016.

³⁸ Vicki Rozema, editor, *Voices from the Trail of Tears* (Winston-Salem: John. F. Blair, Publisher, 2003), 30.

³⁹ B.B. Cannon, “Journal of Occurrences with a Party of Cherokee Emigrants,” National Archives Record Group 75, Records of the Bureau of Indian Affairs, Letters Received, Cherokee Emigration, 1837, C-553, filed in Special Case 249. <http://ualrexhibits.org/trailoftears/eyewitness-accounts/journal-of-bb-cannon-cherokee-removal-1837/>, accessed June 17, 2015.

they prosecute their journey by land during the winter. It has been suggested that they will probably pitch their tents in the neighborhood of the Ohio River [at Golconda, Illinois] and wait for spring.⁴⁰

The remains of the Nashville Toll Bridge are noteworthy as a witness to this tragedy, but their relation to this sad history went undocumented until recently.

5. NPS commemoration: The U.S. Congress first authorized the National Park Service to commemorate the Trail of Tears in 1980, and by 1987 Congress officially designated the Trail of Tears National Historic Trail.⁴¹ The purpose of the commemorative trail was to preserve the history of the removal of the Cherokee Nation and other tribes, to preserve and protect historic resources, and to interpret the story of the Trail of Tears. The NPS and its partners have embarked on a comprehensive interpretive plan to raise awareness, provide matching funds to appropriate sites and projects, and develop a certification program for Trail of Tears-related historic sites.

Since 2010, multiple initiatives have been undertaken to research, document, and commemorate the Nashville Toll Bridge abutments. New South Associates completed a historic resource survey of the west and east banks of the Cumberland River for a Nashville Riverfront Park study for the Metropolitan Development and Housing Agency of Nashville. This 2010 report identified the remains of the west abutment as a significant cultural feature and stated “it is possible that it reflects an abutment for a former bridge here.”⁴² Beginning in 2012, Prof. Kevin Smith, Middle Tennessee State University, conducted preliminary archaeological research of the site, under permit to the Tennessee Division of Archaeology. Patrick Cummins and Toye Heape of the Native History Association assisted in researching the history of the bridge and its role in the Trail of Tears.⁴³ However, an expert was needed to do an engineering assessment to confirm that the ruins were bridge abutments of the period. HAER Architect Christopher Marston recommended engineer James Barker, a specialist in rehabilitating historic covered bridges. Cummins and Heape successfully applied for a grant from the NPS National Trails Intermountain Region (NTIR) for an engineering survey, with support from Historic Nashville Inc. and the Native History Association. James Barker of J.A. Barker Engineering completed a site inspection in November 2013 and produced a report by January 2014. Barker’s survey confirmed the authenticity of the abutments, and the partners proceeded to submit an application for official certification.⁴⁴

⁴⁰ “The Last of the Cherokees,” *The Republican Banner* [Nashville], December 4, 1838, 2.

⁴¹ National Park Service, “Trail of Tears National Historic Trail Interpretive Plan,” June 14, 2004, 2.

⁴² J.W. Joseph, David Price, R. Jeanine Windham, Brad Botwick, and Shawn Patch. “Nashville Riverfront Park: Cultural Resource Context, Research Design, and Survey Results” (Stone Mountain, Georgia: New South Associates, 2010), 90-94.

⁴³ Toye Heape and Patrick Cummins, “The Last Remaining Structure of the 1823 Nashville Toll Bridge,” 2013.

⁴⁴ James Barker, “Inspection & Appraisal of Stone Structures at Nashville, Tennessee Riverfront,” January 7, 2014.

In March 2014, the NTIR (Aaron Mahr, superintendent) and TDOT (John Schroer, commissioner) signed a Partnership Certification Agreement for the Nashville 1823 Toll Bridge Abutments.⁴⁵ In the agreement, the two parties agreed to work together on planning, interpretation and resource management and protection of the site. TDOT archaeologists Phillip Hodge and Ryan Robinson performed shovel and auger tests at the top of the west abutment and the approach. In 2016, TDOT historian Laura van Opstal, along with staff members from the TDOT Archaeology and Historic Preservation sections, completed a cultural resource management plan, and TDOT cleared brush around both abutments and planted native vegetation to control erosion. As of August 2016, TDOT has fabricated interpretative panels to be installed at a viewing area near the west abutment.⁴⁶

The abutments became the sixteenth site to be certified as an historic site on the Trail of Tears National Historic Trail in the State of Tennessee, which has the most certified sites of any of the nine states.⁴⁷ Funded by NPS grants, Amy Kostine of Middle Tennessee State University has undertaken a multiyear survey of historic structures of the Trail of Tears.⁴⁸ Most sites are houses, taverns, or churches that are listed as witness properties along the route. The significance of the Nashville Toll Bridge abutments is that they are among the few transportation structures, and only river crossing to survive.

Part II. Structural/Design Information

A. General Statement

1. Character: The Nashville Toll Bridge was the first bridge across the Cumberland River when it was built in this location in 1823. The bridge was lost in 1851 but the abutments have survived. The stone abutments are rare examples of early nineteenth century bridge masonry. The walls and iron remains show evidence of the level of craftsmanship of the period, and offer clues to the construction of a Lewis Wernwag-designed bridge.

⁴⁵ Trail of Tears National Historic Trail, “Partnership Certification Agreement,” Nashville 1823 Toll Bridge Abutments, March 20, 2014.

⁴⁶ Laura van Opstal, Gerald Kline, Tammy Sellers, Phillip Hodge and Holly Barnett, “Cultural Resource Management Plan for the 1823 Nashville Toll Bridge West Abutment” (Nashville: Tennessee Department of Transportation), 2016; Phillip Hodge, “Partners in Preservation: The Rediscovery of the First Bridge over the Cumberland River.” *Tennessee Council for Professional Archaeology*, September 10, 2015. <https://tennesseearchaeologycouncil.wordpress.com/2015/09/10/30-days-of-tennessee-archaeology-2015-day-10/>, accessed February 22, 2016.

⁴⁷ “Certified Sites on the Trail of Tears NHT,” *National Park Service*.

<http://www.nps.gov/trte/learn/management/certified-sites-on-the-trail-of-tears-nht.htm>, accessed June 17, 2015.

⁴⁸ Amy Kostine, “Reconnaissance, Documentation, and Assessments of Historic Buildings/Structures Associated with the Trail of Tears National Historic Trail” (Murfreesboro: Center for Historic Preservation, Middle Tennessee State University, 2015), 43-45.

2. Condition of Fabric: The west abutment is in reasonably good condition. The upper stone courses retain sharp edges to define the structure, and wrought-iron anchor rods survive. The former roadway is lost below grass and trees atop the abutment. TDOT has maintained the site since 2013, removing vines and weeds along the wall, and began a stabilization and interpretive plan.

The east abutment is a ruin. Some courses of original stonework survive at both the river's edge and rubble fill can be seen further up the bank. However, several courses of stone were robbed and displaced during the construction of the 1956 bridge. The site is strewn with trash, and appears to have been used as a homeless encampment.

B. Current Description: The west abutment measures 48' wide at the top course. The wall sits along the steep bank of the Cumberland River. It is exposed above the slope approximately 20' vertically on the south corner, and about 40' at the north corner. Using photogrammetry, it measured approximately 47' above the water line on March 27, 2015. The wall is battered on all three sides. It tapers 0.7 inch per vertical foot, as measured on the northern wingwall. The abutment extends 25' from the neighboring retaining wall to the north. There is an overgrown steep bank to the south. The stones are of reasonably good quality, dressed with square edges, forming horizontal courses.⁴⁹

The top course appears to form the bridge bearing seat, though some stones are missing at the corners (see figures 14-18). There are seven wrought-iron bars, anchored between the top two courses of the abutment. The bars are spaced 7'-6" apart, and each bar aligns directly above a notch seven courses below. The notches are three courses tall, measuring 24" x 3". The bars measure 4'-7" long, 1½" wide, overhanging the edge of the wall by approximately 16". There is an eyebar that fits into an 1 ¾" diameter iron post in the abutment, and three 1" diameter pins that stick out of the far end of the bar with ogee washers and nuts at each end, spaced 8" apart. Judging by their position at the top of the abutment and how they are spread evenly across, these were probably anchor bars to be used during construction, not as tie downs during flooding. The anchor bars would have tied into the floor beams to support the decking of the falsework system, and the notches directly below would have held bracing members (see Figure 9 for a speculative layout).⁵⁰

The remains of the east abutment measure only 38' wide and 8' in height from the shoreline (see figures 19-20). The rubble fill of the former roadbed can be seen about 40' behind the abutment when looking east from the river. The roadbed measures another 17' high, which suggests it was

⁴⁹ The measurements and current descriptions are from a combination of field work by James Barker in November 2013 and Christopher Marston and Martin Stupich in March 2015. See also James Barker, "Inspection & Appraisal of Stone Structures at Nashville, Tennessee Riverfront," January 7, 2014, unpublished.

⁵⁰ Barker, "Inspection," 7, 14. Correspondence from James Barker to Christopher Marston, May 2016..

part of the causeway. These remains sit directly below the Victory Memorial Bridge, where concrete deadman blocks lie in front of the 1823 stonework. While the stonework in the front wall is square and dressed, it is not of the same quality as the taller west abutment. Any evidence of a causeway extending further east is obscured by the modern bridge.

C. Site Information: The two abutments lie slightly diagonally across the Cumberland River from each other. The east abutment sits directly beneath the Victory Memorial Bridge. The west abutment stands alongside the steep banks of the Cumberland River, just south of the VMB, adjacent to other stone retaining walls from former neighboring buildings on the edge of historic downtown Nashville (see figures 12-13). Today it can be accessed from the Gay Street Connector, and is a short walk from the Davidson County Courthouse and the redeveloped Public Square. The east abutment is in an undeveloped flood zone area and lies directly below the modern bridge. The entire site is owned and maintained by the Tennessee Department of Transportation, and was designated as an historic site on the Trail of Tears National Historic Trail by the National Park Service in 2014.

Part III. Sources of Information

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“Day book, 1819-1853.” Nashville Bridge Company 1819-1953 Records, TSLA, Folder 4.

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Part IV. APPENDIX

Appendix A. Historical Images



Figure 1. View of Nashville, ca. 1832, with Nashville Toll Bridge sloping from downtown, across the Cumberland River, to the lowland across the river, where it connected with the Gallatin Pike. From “A map of the state of Tennessee taken from survey.” Columbia, Tenn.: Matthew Rhea, 1832. Library of Congress Geography and Map Division, Washington, D.C.

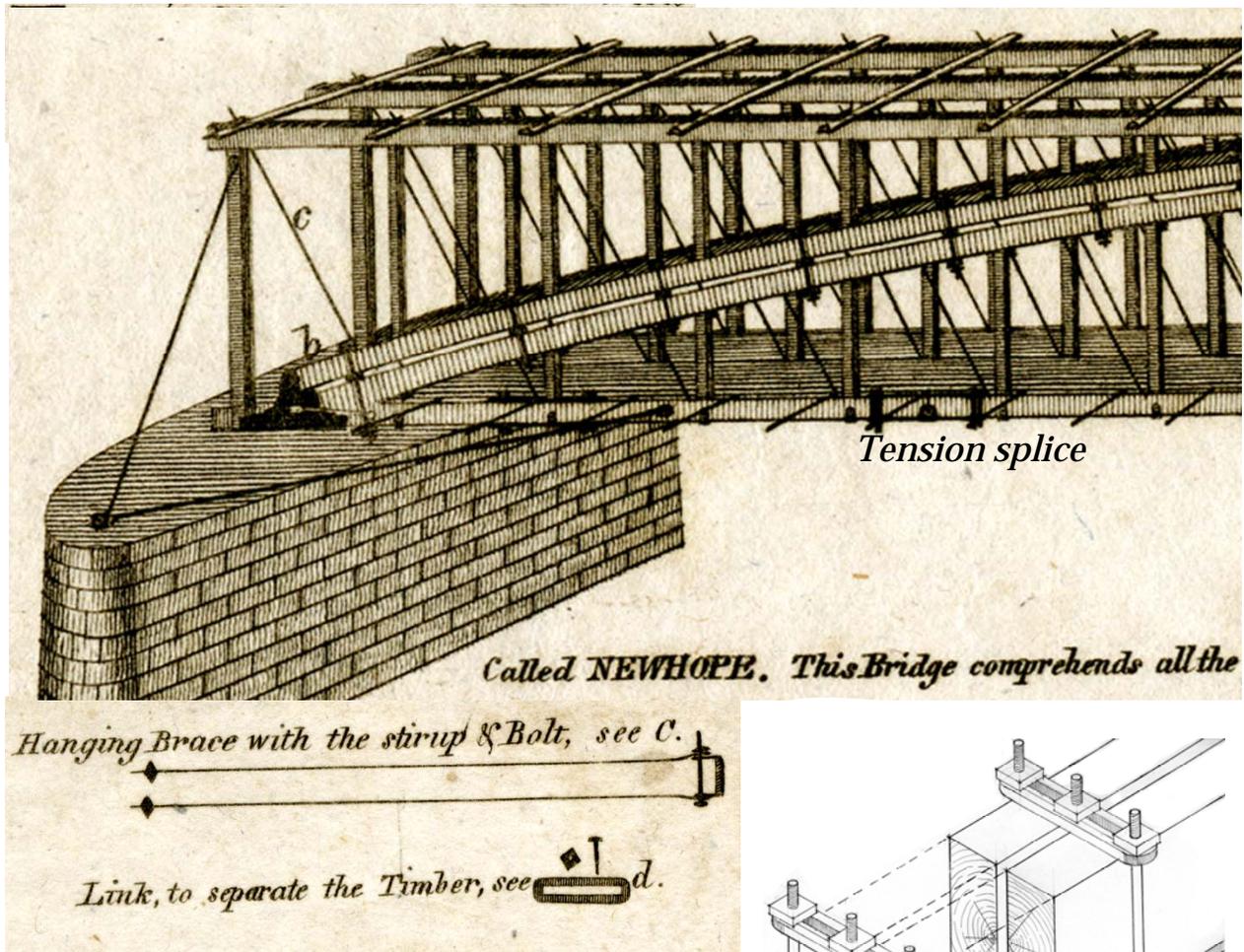


Figure 3. Details of the New Hope Bridge design, showing the tied arch anchored to the top of the abutment, and details of the wrought-iron bracing (c), and cast-iron links (d). Also note the tension splices in the lower chord, further diagrammed in figure 7. From: "Illustrations of Lewis Wernwag Bridges."

Figure 4. Detail of iron rings and cut timbers making up lower chord. Drawing by Christopher H. Marston, from a drawing by Lee H. Nelson.

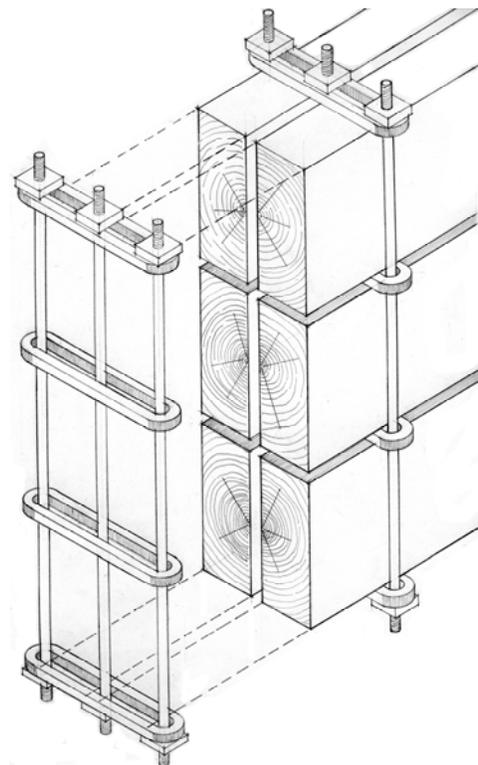
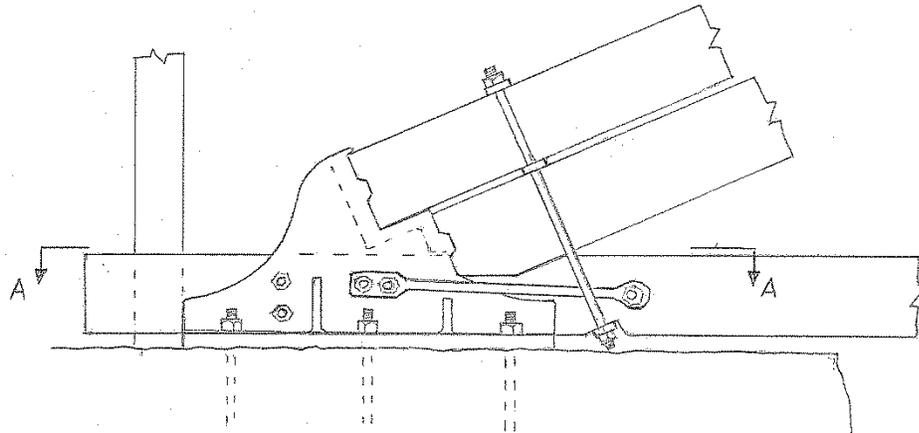
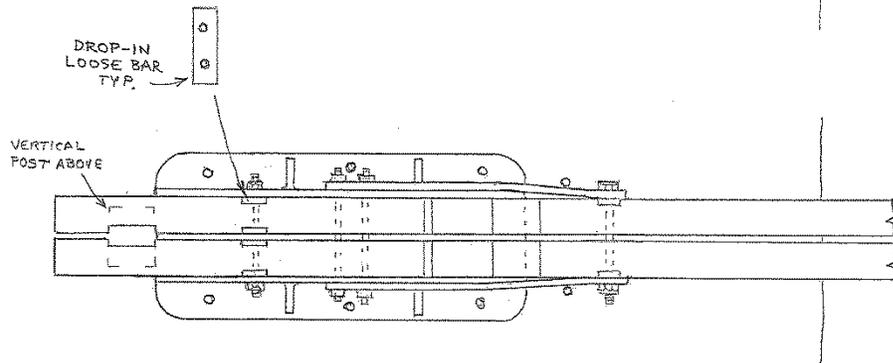




Figure 5. Rare photograph of the original Wernwag truss remains from the 1814 New Hope Bridge, after Delaware River flood in 1903. Note wrought-iron diagonal rod in panels, and cast-iron rods and spacers in four-piece arch, as shown in figure 3. Courtesy Lambertville Historical Society.



ELEVATION



SECTION A-A

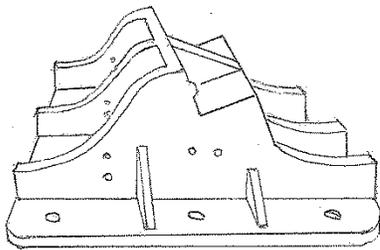
BEARING SEAT CONNECTIONS FOR ARCH & LOWER CHORD TIMBERS

Speculative conjecture attempting to fit 1813 etching by E.G. Gridley

The horizontal tie appears to be shown in etching, at left end of span.
The drop-in bars are speculative, to improve force transfer.

The anchor bolts into abutments are speculative, but common elements that resist transverse wind forces.

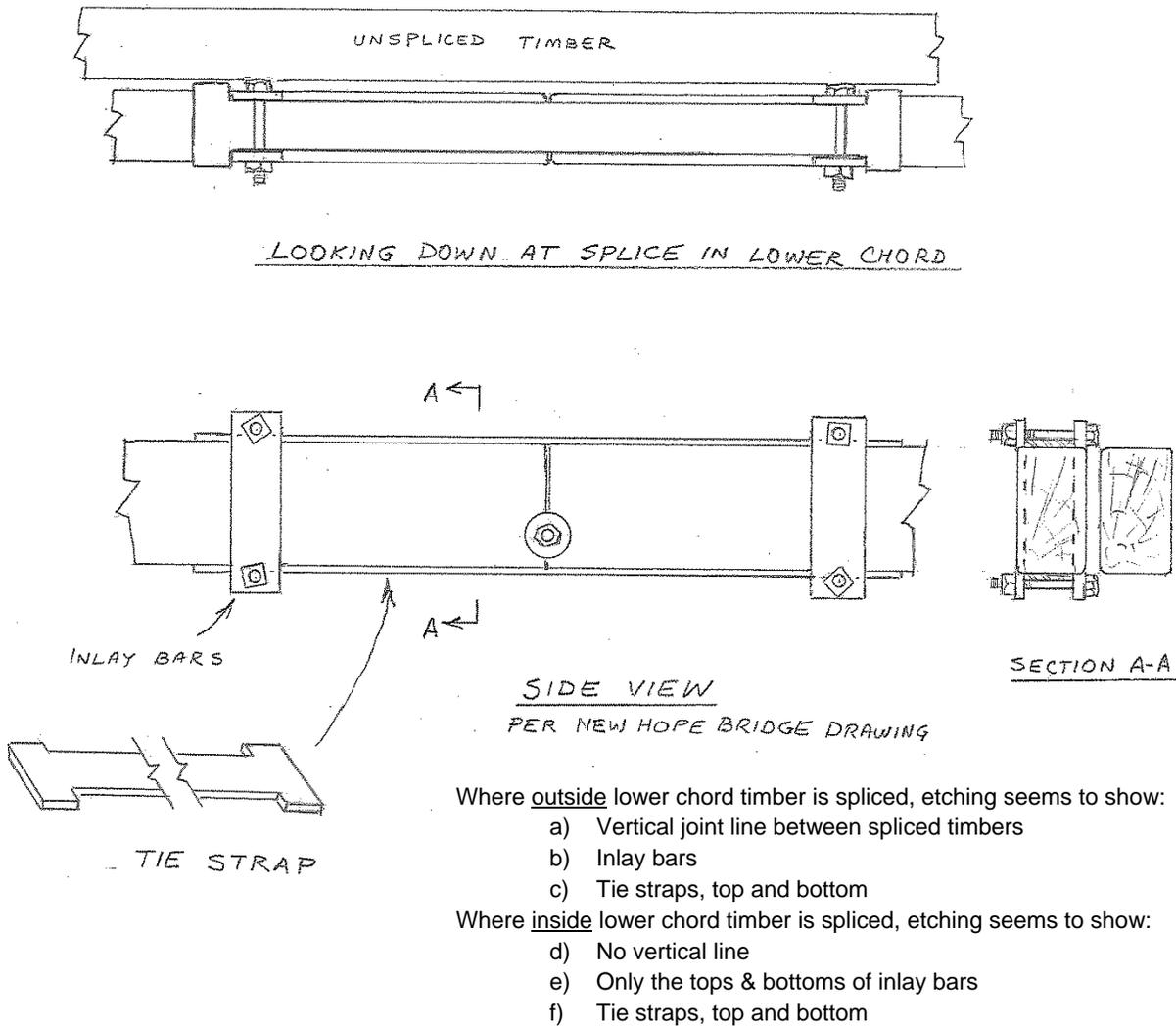
The small wedge-shaped buttresses are speculative.



PERSPECTIVE SKETCH

JB 2016

Figure 6. Speculative drawing of the bearing seat connection for arch and lower chord.
Drawing by James Barker, 2016.



TENSION SPLICES IN LOWER CHORD TIMBERS

Speculative conjecture attempting to fit 1813 etching by E.G. Gridley

J.B. 2016

Figure 7. Speculative drawing of tension splices in lower chord timbers, as seen in figure 3.

Drawing by James Barker, 2016.



Figure 8. Wernwag and Johnson's Monongahela Bridge after the failure of one pier and the loss of two spans from ice forces in January 1832. The pier and bridge were repaired and the bridge was re-opened in October 1832. It served until it was burned in the great Pittsburgh fire of April 10, 1845. Also note the Wernwag-designed toll house, which inspired Nashville's. Oil painting by Russell Smith, 1832; from a reproduction photograph by B. H. L. Dabbs, ca. 1885. Historical Society of Western Pennsylvania Archives, PSS#0022, Folder 5.

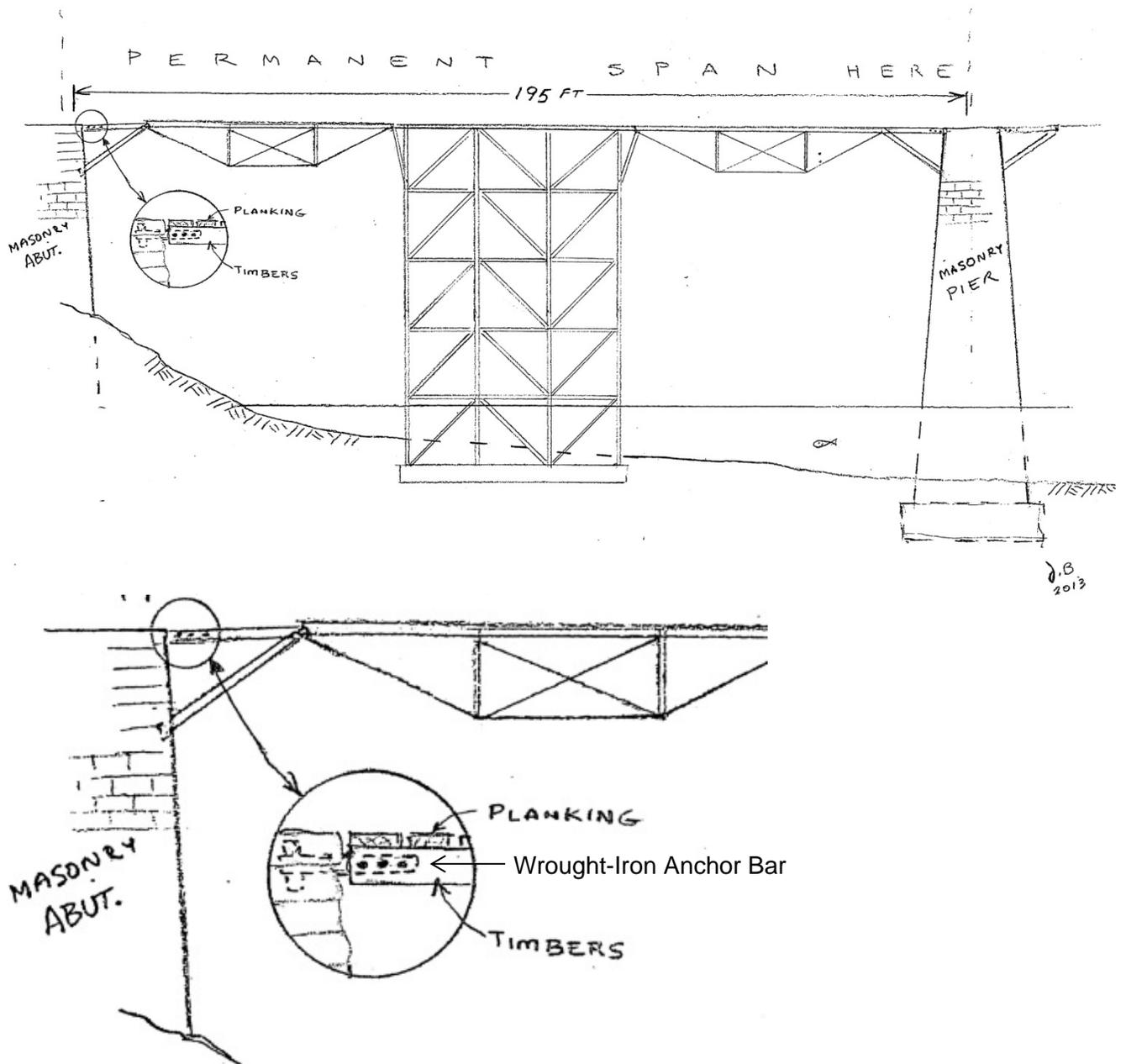


Figure 9. A speculative sketch that shows how the iron anchor bars may have held timbers supporting decking, and how the pockets may have supported bracing. The falsework and hanging trusses could have been reused for all three trusses. Drawing by James Barker, 2013.



Figure 10. The east abutment can be seen at the foot of Gallatin Street on the opposite side of the Cumberland River from the public square in downtown Nashville, a block downstream of the 1886 Woodland Street truss bridge. The Victory Memorial Bridge was constructed over the abutment on roughly the same right of way as the Nashville Toll Bridge in 1956. From aerial photo 166, ca. 1940, courtesy Tennessee State Library & Archives.

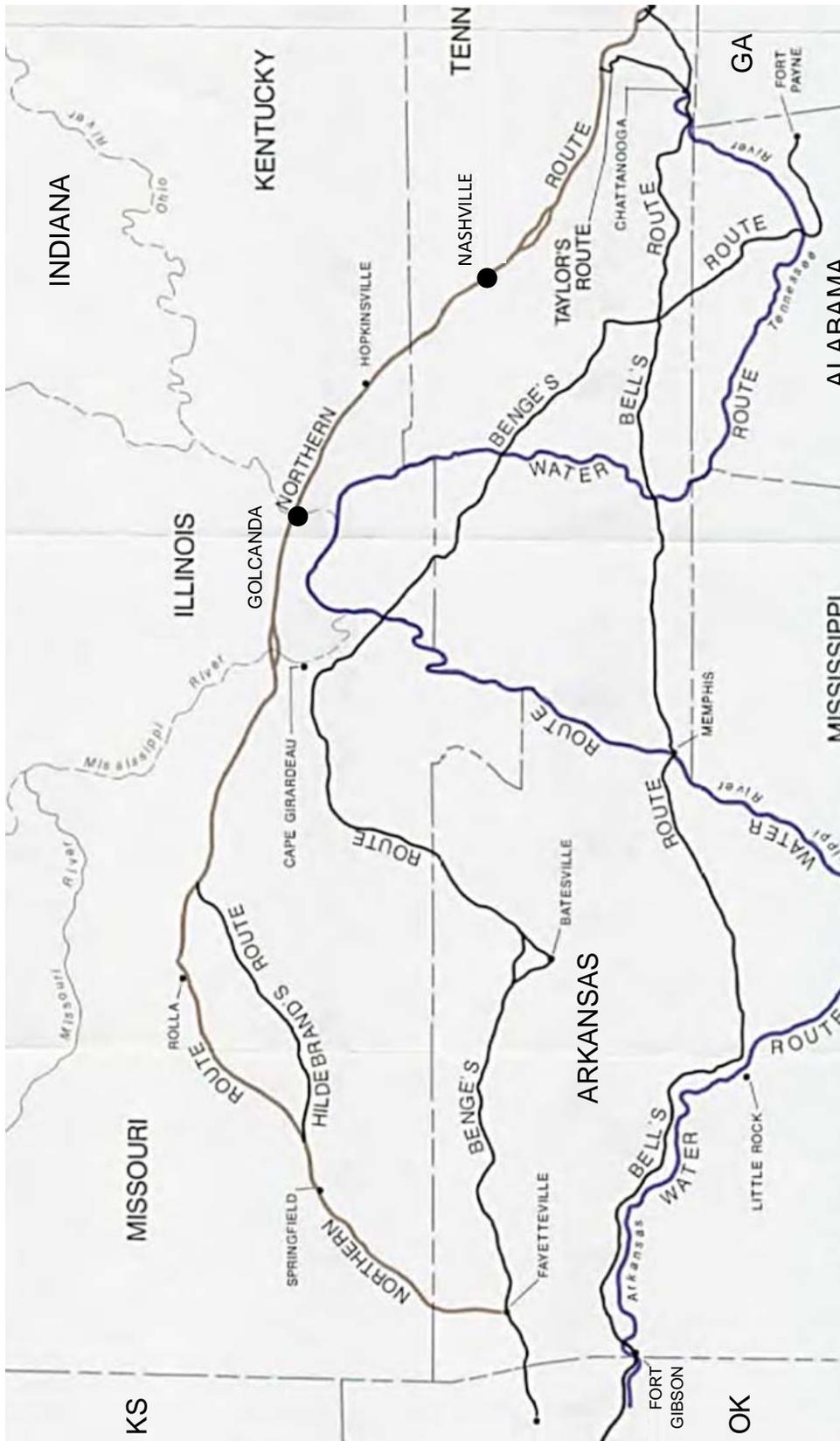


Figure 11. Map of Cherokee Routes. From: *Comprehensive Management and Use Plan: Trail of Tears National Historic Trail*. U.S. Department of the Interior, National Park Service, Denver Service Center (1992): 20.

Appendix B. Supplemental Digital Photographs

All color digital photographs were taken by Martin Stupich, March 2015.

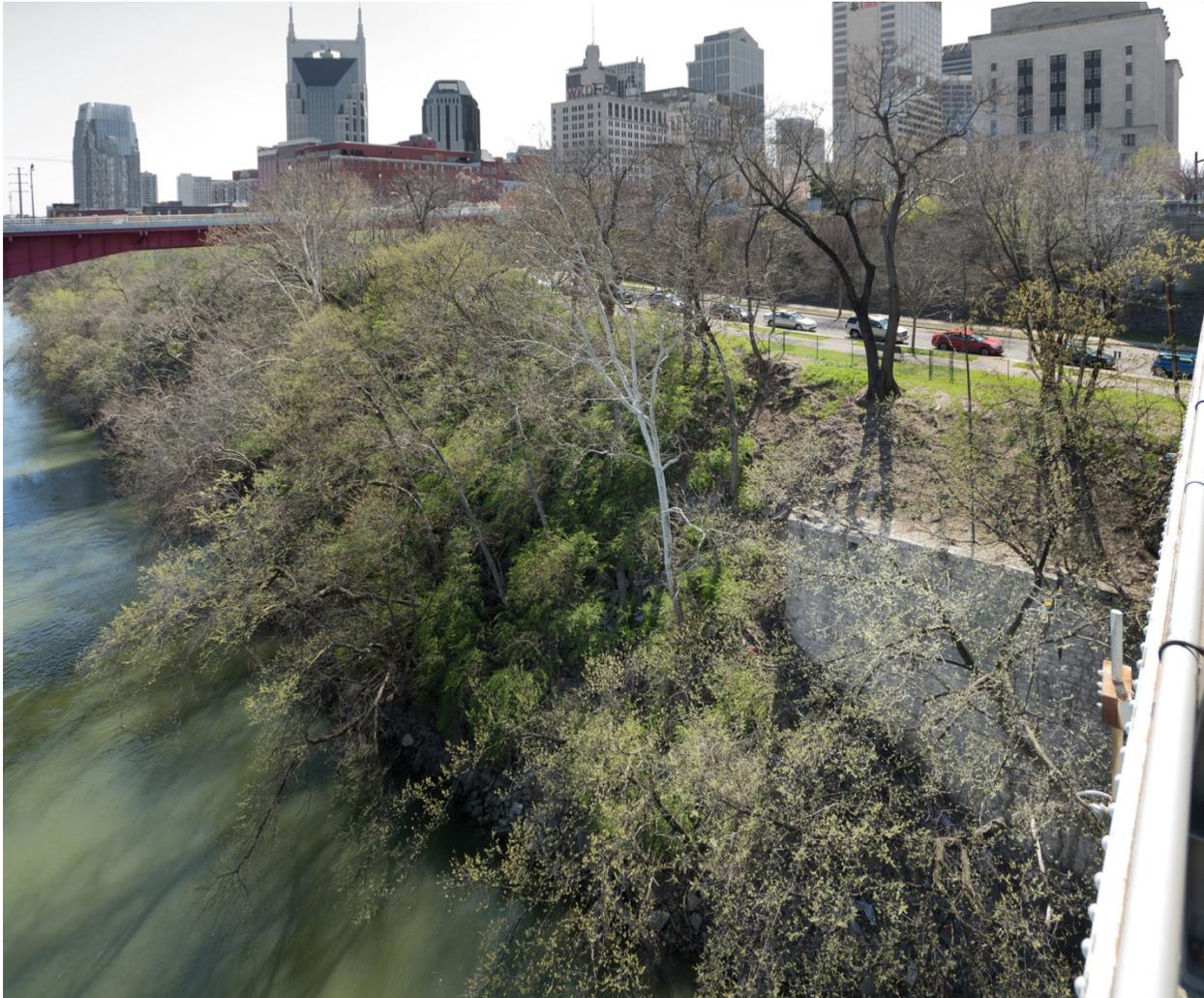


Figure 12. General view of west abutment context along the Cumberland River, viewed from Victory Memorial Bridge. The 1966 Woodland Street Bridge and Nashville skyline in background; view to southwest.



Figure 13. General view of west abutment projecting from the steep limestone bluff on the west bank of the Cumberland River. Note masonry retaining wall to right of abutment, which include the remains of a former H.J. Heinz Co. warehouse.



Figure 14 (top). View of top course of west abutment, looking down from Victory Memorial Bridge; view to south. Figure 15 (bottom). Detail of wrought-iron anchor bar at top of abutment; view to east.



Figure 16. View of west abutment in foreground, Victory Memorial Bridge spanning the Cumberland River. Remains of east abutment are obscured behind far pier on the east bank; view to east from Gay Street Connector.



Figure 17. Detail of north face of west abutment showing masonry stonework. Note projecting wrought-iron anchor bar top left; view to southeast.



Figure 18. Elevation view of west abutment, shot from the east bank of Cumberland River. An iron anchor bar is positioned directly above each of the seven 3"x24" rectangular notches in the abutment face.



Figure 19. Elevation of surviving lower courses of east abutment, with deteriorated remains of upper portion of roadbed in distance; view east.



Figure 20. View of lower courses of east abutment; with 4' scale. Deteriorated remains of upper portion of abutment/roadbed viewable just below Victory Memorial Bridge; view east.



Figure 21. View of artifacts recovered from the riverbank in front of the west abutment. Some of the artifacts, such as the circular rods with ogee washers, appear be associated with the 1823 Nashville Toll Bridge. Photo taken at Tennessee Division of Archaeology.

Appendix C. 1819 Nashville Bridge Company contract for a Bridge over the Cumberland
 Nashville Bridge Company 1819-1953 Records, Folder 1; Tennessee State Library and Archives.
 (Scans of original document; see Appendix D for transcription)

MANUSCRIPT SECTION AC. NO. 207 [1819] [Agreement to build Bridge over 'Cumberland]

Memorandum of an agreement made and entered into. This 23rd day of June in the year of our Lord one Thousand eight Hundred & nineteen. Between The President Managers & Company for erecting a Bridge over the Cumberland River opposite Nashville in the County of Davidson & State of Tennessee of the first Part; And Joseph Johnston of Philadelphia Bridge Architect of the second Part. Witness That the said Joseph for and in consideration of the sum of Seventy Five Thousand dollars to be paid at the times and in the manner herein after mentioned Doth hereby covenant promise and agree to and with the said President Managers & Company. The parties of the first, and their successors. That he the said Joseph shall and will, well and truly build, erect, put up, and finish, across the Cumberland River opposite the Town of Nashville a permanent and substantial Bridge of the general description herein after contained together with its roof weather boarding, cornice, end gates, & toll house, and their appendages, all to be complete and perfect. The said Bridge shall be erected on the principles of Lewis Wernwags patent as displayed in the New Hope, Reading, and Pittsburgh Bridges, and which in design, appearance, proportion, and workmanship, shall be done in the best stile of Bridge Architecture

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and also that the form and combination of the stone, iron, and wooden work, of the same shall in every respect, be calculated ^{for} durability and security -

And further the said Joseph of the second part, shall and will, at his own proper cost, charge, risk and expense, find, furnish and provide all the materials, of every description, necessary for the erection and completion of the work, aforesaid, and that on or before the first day of January next ensuing the date of this agreement, he will commence the stone work of said Bridge, and that on or before the first of January which will be in the year of our Lord one thousand eight hundred and twenty two: they will complete and finish, and deliver over to the parties of the first part or their successors the said Bridge, with its appertinances, and the whole of the work herein contained, to be done on his part, so far as related, to the abutments, pier superstructure, and floor. And if it so happens that they shall finish the same, before the said first of January 1822. Then and in such case they will deliver possession of the said Bridge and work to the parties of the first part or their successors: And further, that if on the completion of the superstructure alone, the said parties of the first part or their successors, should be desirous of

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of appointing a Gate-keeper, and collecting toll, they shall then also have possession of the said Bridge so far as may be necessary for that purpose and provided it causes no obstruction or hindrance to the execution or completion of the rest of the work: And that on or before the first day of October which will be in the year of our Lord one Thousand eight Hundred & Twenty Two. They shall and well finally complete and finish and deliver possession of the whole of the said Bridge, and work together with the roof, Toll-House, Gates, and all and every part of the same herein mentioned to be done. And the said Joseph of the second part doth in manner aforesaid - further covenant promise and agree, to and with the parties of the first part, That the Bridge and work aforesaid shall consist of the general dimensions, and be executed in the manner following to wit:

The Mason-work shall be done with large and sufficient stones, substantially and well combined together, and worked in mortar of good lime and quick sand: completely and sufficiently pointed; and that in that part of the work, where the stones may be liable to be sometimes dry and at other times wet by the water of the river. Particular care shall be taken to select

the best stones, and such as are best qualified to stand and resist the wet and frost. There shall be two stone abutments. That on the North or opposite side from Nashville shall extend feet beyond the Bank and front fifty two feet up and down the river. The foundation of the front wall shall be ~~made~~ as low as the lowest bed of the River, or to the solid ^{rock}, if it can be ascertained to be not more than ten feet below the bed of the River, and at the bottom it shall be sixteen feet thick, battering as it rises one inch to the foot. To be raised full five feet higher than the highest water mark, and a well built strong ^{stone} Spur shall run from the centre of each into the Bank. The wing walls of these abutments shall be at the bottom and at their junction with the front walls sixteen feet thick tapering as they rise, back & splaying as they recede from the river; at their junction they shall be as high as the front walls. These walls to be finished on the top, pointed & the front wing walls, and side walls, as far as may be exposed to view shall be hammered, dressed work. The abutments shall be filled in with stone, and as much clay as will be necessary to render the same compact, and shall be levelled and finished off. And the side walls leading to the bridge shall be filled in with stone and other

A

necessary materials, so as to form a firm and compact road. With a gentle easy ascent to the entrance upon the Bridge. The abutment on the Town side to be cut out of the Bluff of the River at least as wide as the Bridge with an easy ascent extending at least fifty feet from the termination of the arch, and to be so constructed as to answer all the purposes of the abutment on the opposite side of the River.

There shall be two stone Piers, constructed as follows to wit: Their base shall consist of a mass or platform of large squared pine or cedar timber spreading one foot wider every way than the bottom of the stone work, framed dovetailed and joined together in a solid and compact manner, to be sunk on the solid rock, and they shall be so made as always to be at least two feet under the low water mark. On these masses the stone work shall be commenced. At the top each of these Piers shall be fifty two feet in length up and down the river, and as much more at the bottom of the stone work, as will be produced by spreading them one inch to the foot. They shall be twenty four feet wide at the bottom of the stone work and ten feet at the top. The Heads shall be well clamped and connected together with iron. The lower ends shall be semicircular, and their Heads or upper ends.

MANUSCRIPT SECTION AC. NO. 207

end be angular brought to a point. The tops of the piers shall be well finished and cased with large stones, and their foundations shall be amply surrounded by large stones and gravel, or small stone rising up on their bases and spreading a considerable distance round so as to prove a complete defence against undermining. The heads and lower ends of the Piers shall be hammered, dressed, range work and the sides hammered dressed work.

The Superstructure shall be built with pine, cedar or yellow poplar using white oak in some particular places where the pressure is great, and shall consist of three arches each of two hundred feet; each arch shall be composed of three segments with an elevation of thirteen feet and a half in the centre; each of the segments shall be composed of six ribs of choice timber, each six by twelve inches at the ends and diminishing towards the centre, and the grain running the curve of the arch. They shall be set in cast iron head blocks, confined together with strong iron clamps and screw bolts prevented from coming into contact by one thick iron bar placed between them six feet apart, and these ribs shall be placed and

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 on their edges. Two in^t Breadth & three in^t
 depth. At the entrance, and at the ends
 of each arch this Superstructure shall be
 thirty seven feet wide and at the crown of each
 arch thirty six feet wide. Thereby contracting at
 the center of every arch the extreme ribs, so as
 to prevent any lateral motion or deviation, and
 giving the effect of stay or braces to these ribs on
 both sides of the Bridge.

The floor shall
 pass on the chord lines of the arches, and be
 one foot higher than the heads of the arches,
 shall be double, the first layer of three inch pine
 planks, laid deck fashion, with the joints broken
 and well and substantially fastened down;
 the upper layer of two inch white ^{oak} planks, well
 spiked down. The whole shall be divided into
 two carriage ways, and two foot ways. The latter
 shall be raised higher than the carriage ways,
 shall be on the outside, each four feet
 three inches wide in the clear, and floored
 cross-ways, with strong inch boards jointed.
 The former shall have strong white oak
 fenders, or ways to confine the wheels, extending
 from one end of the Bridge to the other.

MANUSCRIPT SECTION AC. NO. 1207

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shall be no oblique support on the piers.

The ends of the bridge shall be finished with a strong frame building as wide as the bridge projecting sixteen feet beyond the ends and raised six feet above the comb of the roof, the weather boarding slanted, the carriage and foot ways arched, finished with pilasters and a neat frontispiece and this frame to rest on square blocks of stone, and the whole to be finished in a neat and workman like manner, and to have two coats of white paint.

The whole of the bridge shall be weatherboarded in with half inch boards, planks having eleven windows on each side, three feet by six, with two pannell shutters to each window, with the necessary fastenings - there shall be a plain and proper proportioned cornice round the whole. The string board shall have two coats of black paint. The weatherboard- ing two coats of light yellow, and the shutters and cornice two coats of white lead. To all the entrance there shall be neat pallisade gates painted white, and the whole shall be covered in with good and workman like Roof of joint pine or Cedar shingles.

8
A small neat and well finished toll
House, with a proper degree of ornament shall
be erected at such end of the Bridge as
may be directed by the board of managers
and painted with two coats of paint.

It is understood that the aforesaid sum
of money includes the purchase or fees of
the patent right of Lewis Weirway and that
on that account no further charge is to be made

And now the parties of
the first part, in consideration of the
fulfilment of the aforesaid covenant by the
parties of the second part, and their finding
all materials and labor and completing
the work as aforesaid do covenant and
agree and promise well and truly to pay
or cause to be paid in such good current
Bank notes as will be received in
payment at the Nashville Bank to the
said parties to the second part, their heirs
executors or administrators, the full sum of
seventy five Thousand dollars aforesaid

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at such times and in such sums as may
be reasonably required during and according to
the progress of the work.

In Testimony whereof the
Parties of the first Part have caused their
President to sign & seal the same. And
the party of the second part have also signed
and sealed the same. This day and year first
written.

Attest Thomas Tabb Jr.



Appendix D. Transcription of 1819 Nashville Bridge Company contract for a Bridge over the Cumberland

Transcription by James Barker, 2013

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Memorandum of an agreement made and entered into this 28th day of June in the year of our Lord one thousand eight hundred nineteen. Between: The President, Managers & Company for erecting a Bridge over the Cumberland River opposite Nashville, in the County of Davidson & State of Tennessee of the first part: And Joseph Johnston of Philadelphia, Bridge Architect of the second part: Witness. That the said Joseph for and in consideration of the sum of Seventy Five Thousand dollars to be paid at the times and in the manner herein after mentioned Doth hereby covenant promise and agree to and with the said President, Managers & Company, The parties of the first, and their successors. That he, the said Joseph, shall and will, well and truly build, erect, put up, and finish, across the Cumberland river opposite the Town of Nashville, a permanent and substantial Bridge of the general description herein after contained, together with its roof, weather boarding, cornice, end gates, & toll house, and their appendages, all to be completed and perfect; which said Bridge shall be erected on the principles of Lewis Wernwag's patent as displayed in the New Hope, Reading, and Pittsburgh Bridges, and which in design, appearance, proportion, and workmanship, shall be done in the best stile of bridge architecture, and

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and also that the form and combination of the stone, iron, and wooden work of the same shall in every respect be calculated for durability and security –

And further the said Joseph of the second part, shall and will at his own proper cost, charge, risk and expense, find, furnish and provide all the materials of every description, necessary for the erection and completion of the work aforesaid, and that on or before the first day of January next ensuing the date of this agreement. He will commence the Stone work of said Bridge, and that on or before the first of January which will be in the year of our Lord one Thousand eight hundred and Twenty two: They will compleat and finish, and deliver over to the parties of the first part, or their successors the said Bridge, with its appertenances and the whole of the work herein contained to be done on his part, so far as related to the abutments, piers, superstructure, and floor. And if it so happens that they shall finish the same, before the said first of January 1822. Then and in such case they will deliver possession of the said Bridge and work to the parties of the first part or their successors. And further, that if on the completion of the superstructure alone, the said parties of the first part or their successors, should be desirous of

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of appointing a Gate Keeper, and collecting toll. They shall then also have possession of the said Bridge so far as may be necessary for that purpose and providing it causes, no obstruction or

hinderance to the execution or completion of the rest of the work. And that on or before the first day of October which will be in the year of our Lord one Thousand eight hundred & Twenty Two. They shall and will finally complete and finish and deliver possession of the whole of the said Bridge, and work, together with the roof, Toll-House, Gates, and all and every part of the same herein mentioned to be done. And the said Joseph of the second part doth in manner aforesaid -- further covenant, promise and agree, to and with the parties of the first part, that the Bridge and work aforesaid shall consist of the general dimensions, and be executed in the manner following to wit:

The Mason-work shall be done with large and sufficient stones, substantially and well combined together, and worked in mortar of good lime and quick sand, completely and sufficiently pointed, and that in that part of the work, where the stones may be liable to be sometimes dry and at other times wet by the water of the river. Particular care shall be taken to select

Page 3a (this page was skipped when original pages were numbered)

the best stones, and such as are best qualified to stand and resist the wet and frost. There shall be two stone abutments: That on the North or opposite side from Nashville shall extend ___ feet beyond the Bank and front Fifty two feet up and down the river: The foundation of the front wall shall be sunk as low as the lowest bed of the River, or to the solid rock if it can be ascertained to be not more than ten feet below the bed of the River, and at the bottom it shall be sixteen feet thick, battering as it rises one inch to the foot. To be raised full five feet higher than the highest water mark, and a well built, strong stone spur shall run from the center of each into the Bank. The wing walls of these abutments shall be at the bottom and at their junction with the front walls, sixteen feet thick tapering as they rise, back & splaying as they recede from the river; at their junction they shall be as high as the front walls. These walls to be finished on the top, pointed & the front wing walls, and side walls, as far as may be exposed to view shall be hammered, dressed work. The abutments shall be filled in with stone, and as much clay as will be necessary to render the same compact, and shall be levelled and finished off. And the side walls leading to the Bridge shall be filled in with stone and other

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necessary materials, so as to form a firm and compact road, with a gentle, easy ascent, to the entrance upon the Bridge. The abutment on the Town side to be cut out of the Bluff of the River at least as wide as the Bridge with an easy ascent, extending at least fifty feet from the termination of the arch, and to be so constructed as to answer all the purposes of the abutment on the opposite side of the River.

There shall be Two stone piers, constructed as follows to wit: Their base shall consist of a mass or platform of large squared pine or cedar timber, spreading one foot wider every way than the bottom of the stone work, framed dovetailed and pinned together in a solid and compact

manner, to be sunk on the solid rock, and they shall be so made as always to be at least two feet under the low water mark. On these masses the stone work shall be commenced. At the top each of these piers shall be fifty two feet in length up and down the river, and as much more at the bottom of the stone work, as will be produced by spreading them one inch to the foot. They shall be twenty four feet wide at the bottom of the stone work, and ten feet at the top. The heads shall be well clamped and connected together with iron. The lower ends shall be semicircular and their heads, or upper ends

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end be angular brought to a point. The tops of the piers shall be well finished and capped with large stones, and their foundations shall be amply surrounded by large stones and gravel, or small stone rising up on their bases and spreading a considerable distance round so as to prove a compleat defence against undermining. The heads and lower ends of the piers shall be hammered, dressed range work and the sides hammered dressed work.

The Superstructure shall be built with pine, cedar or yellow poplar, using white oak in some particular places where the pressure is great, and shall consist of three Arches each of two hundred feet; each arch shall be composed of three segments with an elevation of thirteen feet and an half in the centre; each of the segments shall be composed of six Ribs of choice timber, each six by twelve inches at the ends and diminishing to-wards the centre, and the grain -- running the curve of the arch. They shall be set in cast iron head blocks, confined together with strong iron clamps and screw bolts --- prevented from coming into contact by one inch iron bars placed between them six feet asunder, and these Ribs shall be placed on

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on their edges, Two in Breadth & three in depth. At the entrance, and at the ends of each arch, this Superstructure shall be thirty seven feet wide, and at the crown of each arch thirty six feet wide, Thereby contracting at the centre of every arch the extreme ribs. So as to prevent any lateral motion or deviation, and giving the effect of stays or braces to these ribs on both sides of the Bridge.

The floor shall pass on the chord line of the arches, and be one foot higher than the heads [*presumably meaning the ends of the arches*] of the arches; shall be double, the first layer of three inch pine plank, laid deck fashion with the joints broken, and well and substantially, fastened down. The upper layer of two inch white oak plank, well spiked down. The whole shall be divided into two carriage ways, and two foot-ways. The latter shall be raised higher than the carriage ways, shall be on the outside, each four feet three inches wide in the clear, and floored cross-ways, with strong inch boards jointed. The former shall have strong white oak fenders, or ways to confine the wheels extending from one end of the Bridge to the other.

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shall be no oblique pressure on the piers. [*Text appears to be missing before this fragment, as it logically should be the end of a sentence stating that the thrust of the arches will counter one-another and put no sideways (oblique) pressure on the piers.*]

The ends of the bridge shall be finished with a strong frame building as wide as the Bridge projecting sixteen feet beyond the ends and raised six feet above the comb of the roof, the weather boarding planed, the carriage and foot ways arched, finished with pilasters and a neat frontispiece, and this frame to rest on square blocks of stone, and the whole to be finished in a neat and work-man like manner, and to have two coats of white paint.

The whole of the Bridge shall be weatherboarded in with half inch boards, planed, having eleven windows on each side, three feet by six, with two paneled shutters to each window, with the necessary fastenings – There shall be a plain and proper proportioned cornice round the whole. The string board shall have two coats of black paint, the weatherboarding two coats of light yellow, and the shutters and cornice two coats of white lead. To all the entrance there shall be neat palisade gates painted white and the whole shall be covered in with good and workman like roof of joint pine or cedar shingles.

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A small neat and well finished toll house, with a proper degree of ornament shall be erected at such end of the Bridge as may be directed by the board of managers and painted with two coats of paint.

It is understood that the aforesaid sum of money includes the purchase or fees of the patent right of Lewis Wernwag and that on that account no further charge is to be made.

And now the parties of the first part, in consideration of the fulfillment of the aforesaid covenant by the parties of the second part, and their finding all materials and labor, and completing the work as aforesaid, do covenant and agree and promise well and truly to pay or cause to be paid in such good current bank notes as will be received in payment at the Nashville Bank to the said parties to the second part, their heirs, executors or administrators, the full sum of seventy five Thousand dollars aforesaid.

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at such times and in such sums as may be reasonably required during and according to the progress of the work.

In Testimony whereof the Parties of the first Part have caused their President to sign & seal the same, and the party of the second part have also signed and sealed the same, this day and year first written.

Attest

Thomas Talbot, Pres.

Appendix E. List of Wood Truss Covered Bridges attributed to Lewis Wernwag

The following is a list of all known covered bridges built and/or designed by Lewis Wernwag; sourced from research by John Wernwag, Richard Sanders Allen, Lee Nelson, and Frank Griggs.

World Guide No.	Bridge Name	Location	Description	Builder/Notes	Comp Date	Lost Date
	Neshaminy	Neshaminy Creek, Bucks County, PA	5-span, 250' (est.) cantilever	"Economy" draw bridge	1811	?
	Frankford	Frankford Creek, Philadelphia, PA	2-span, 100' (est.) cantilever	"Economy" draw bridge	1812	?
38-51-03x	Lancaster-Schuylkill/ "Colossus"	Schuylkill River, Philadelphia, PA	1-span ,340'	Built by Wernwag & Joseph Johnson	1812	1838
38-09-38x/ 30-10-08x	New Hope	Delaware River, New Hope, PA-Lambertville, NJ	6-arch spans of 175' , tied arch	Built by Johnson & Samuel Stackers	1814	1845 1903
38-06-27x	Penn Street	Schuylkill River, Reading, Berks County, PA	3-arch spans of 200', tied arch	Johnson and Isaac Nathans	1816	1850
38-51-15x	Falls	Schuylkill River, Philadelphia, PA	3-spans, tied arch	Isaac Nathans	1817	1822
38-40-05x	Market Street or Wilkes-Barre	N. Branch, Susquehanna River, Luzerne County, PA	3-arch spans of 185', tied arch	Mr. Powell	1818	1892
38-02-09x	Monongahela River	Pittsburgh, PA	8-span, 1500' tied arch	Johnson & Stackers	1818	1845
38-02-06x	Sixth Street	Allegheny River, Pittsburgh, PA	6-span, 1122' tied arch	Johnson & Stackers	1819	ca. 1860
20-03-16x	Belvidere	Jones Falls, Baltimore, MD	1-span, 175'	George Milliman	1820	1889
20-07-14x/ 20-12-08x	Conowingo	Susquehanna River, Cecil-Harford counties, MD	10-span, 1744'		1820	1846
08-02-19x	Market Street	Brandywine Creek, Wilmington, DE	145', double-barrel		1822	1839
08-02-07x?	Rockland	Brandywine Creek, New Castle County, DE	1-span, 108'		1823?	1934 ?
20-03-33x?	Gunpowder Falls	Kingsville, Baltimore County, MD			ca. 1825	ca. 1900
42-19-02x	Nashville Toll Bridge	Cumberland River, Davidson County, TN	3-span, 600' tied arch	Johnson & Stackers	1823	1851
48-19-04x / 20-21-03x	Wager's	Potomac River, Harpers Ferry, WV-MD	4-span, 750'		1824- 29	1839
20-07-15x 20-12-09x	Rock Run	Susquehanna River, Harford-Cecil County, MD	Orig 18 spans, 4170' in 1818 by Theodore Burr	Wernwag rebuilt 8 spans after 1824 fire	1824	1857
35-30-31x	Old National Road	Wills Creek, Cambridge, OH, National Road	1-span, double-barrel	Father and son, J.P. Shannon	1828	1913
20-10-09x	Monocacy	Monocacy Jct, Frederick Tpk. Frederick County, MD	2-span , 234'	Burned at Battle of Monocacy	1830	1864
17-09-25x	Cottontown	Stoner Creek, Paris, Bourbon County, KY	1-span, 160'		1833	1933
	Maysville Turnpike bridges	Multiple bridges in Mason, Bourbon, Nicholas Co's, KY	Mostly 40' -75' Queenposts	Many built by John S. Williams	1832- 35	
20-10-17x	Monocacy Railroad	Frederick County, MD, B&O RR	3-span, 350' total		1831	1854

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14-47-03x	Rawlings	Salt Creek, Bedford vic. Lawrence County, IN	1-span, 132' Modified Burr	Moved and rebuilt in 1919	ca. 1833	1919
48-39-01x	Cheat River	Preston County, WV, Northwestern Turnpike	2-span, 339' total	Built by Josiah Kidwell	1834	1964
14-49-12x	White River	Indianapolis, Marion Co., IN, National Road	2-span	Built by sons Lewis & William	1835	1902
48-14-02x	Romney	S. Br. Potomac River, Hamp- shire Co., WV, Northwestern Turnpike	1-span, double- barrel		1837	ca. 1874
48-14-01x	Capon Bridge	Cacapon River, Hampshire Co. WV, Northwestern Tpk	1-span		1835	?
20-21-01x 48-19-01x	Harpers Ferry	Potomac River, WV-MD, B&O RR	7-span, 830' total	Designed by B.H. Latrobe	1836	1861
17-40-03x 17-57-10x	Camp Nelson	Kentucky River, Garrard- Jessamine counties, KY	1-span, 235' double-barrel	Built by Lewis V. Wernwag	1838	1933