FINAL REPORT

A SURVEY OF MOVABLE SPAN BRIDGES IN VIRGINIA

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Virginia Transportation Research Council
(A Cooperative Organization Sponsored Jointly by the
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ABSTRACT

Bridges are among the cultural resources that must be considered for historic significance under the Historic Preservation Act of 1966. The Virginia Transportation Research Council conducted a study of Virginia's movable span bridges in 1996-1997, thus establishing an historic context for all such bridges in Virginia. This study was carried out in fulfillment of a 1994 Memorandum of Agreement between VDOT, the FHWA, the Advisory Council on Historic Preservation, and the Virginia Department of Historic Resources. The Memorandum of Agreement provided for the initiation of a project to identify and field survey all movable-span bridges within the VDOT transportation system in Virginia over the age of forty years, and to develop an assessment and management plan for each of these bridges.

Due to the small number (eleven) of pre-1960 movable-span bridges in Virginia, the project was expanded to include field survey of all twenty extant movable span highway bridges in Virginia, as well as documentary research into movable span bridge types, data tabulation, and comparison of the resulting information on movable span chronology and technology. The information gathered during the survey provided a means for an evaluation for historical significance by the Historic Structures Task Group (an interdisciplinary historic transportation study committee) and the State Historic Preservation Officer. Out of eleven extant, pre-1960 movable span bridges under VDOT ownership or management, none were determined to be eligible for the National Register of Historic Places, reflecting the extremely commonplace engineering and technology of these structures.

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INTRODUCTION

Reliable bridges are an essential and integral component of a safe transportation system. However, many of our older bridges are becoming obsolete due to natural deterioration of the materials used in construction, and because they were not designed to meet the speed, dimensions and volume of modern traffic. Before decisions about upgrade or replacement can be made, these bridges must be evaluated for historical significance, as specified by the National Historic Preservation Act. Which bridges are "historically significant?" That is, which bridges provide valuable information about our cultural heritage, including architectural uniqueness, innovations in engineering, and the evolution of the transportation system, and which ones are just "old?"

A few pre-1932 movable span bridges were included in Debler and Spero's 1970s survey of early truss bridges (Deibler, 1975, 1976a, 1976b; Spero, 1981). However, before the advent of this study, Virginia's movable span bridges had never undergone a *comprehensive* assessment. The lack of both general and specific historical data on these bridges was revealed during studies for the impending replacement of the Walkerton bridge (carrying Rt. 629 over the Mattaponi River, between King William County and King and Queen County). To address future such problems, VDOT, the Department of Historic Resources, the FHWA and the Advisory Council on Historic Preservation developed a 1994 Memorandum of Agreement (MOA). The parties agreed that VDOT would survey, evaluate for historical significance, and develop an assessment and management plan for each movable span highway bridge in Virginia over 40 years old. Appendix A contains this MOA. This report provides VDOT's findings. For the purposes of this project, "survey" is used in the historic preservation sense, indicating an inventory of a structure's physical characteristics and historical background. The researchers conducted an overview of the history of Virginia's movable span bridges, developed an inventory and an historic context, and evaluated the bridges for historic significance.

PURPOSE AND SCOPE

The purpose of this project was to identify and categorize movable span bridges within the VDOT transportation system. The study provides a comprehensive comparison and

evaluation of all such bridges in Virginia, identifies which of these are historically significant, and to provides a management plan for each bridge over the age of forty years.

RESEARCH DESIGN AND METHODOLOGY

The research design for this project followed closely those of two other recent VTRC bridge surveys: the non-arched concrete bridge survey (1992-1996) and the survey of metal truss bridges (1996-97). The researchers obtained an inventory of all movable span highway bridges in Virginia from the VDOT bridge files, using "Supernatural" to query the "HTRIS" database. Each bridge in the inventory was identified by construction district and county. The researchers located the bridges on county maps and then field-surveyed each bridge to obtain all data deemed necessary to describe the bridge and evaluate its historic significance. This information was then collated for presentation to The Historic Structures Task Group, a standing interdisciplinary study committee. The Task Group reviewed and evaluated the survey information to determine which bridges are historically significant.

The research design included the following tasks:

1. *Use an existing interdisciplinary group to aid in the conduct of the study.* The National Register program is the recognized basis for making decisions concerning historical significance. To be considered historically significant, a structure must be 50 years of age or older and fulfill one or more of the following criteria: the structure is associated with events or with the lives of persons significant in our past; it embodies a distinctive characteristics of a type, period, or method of construction; it represents the work of a master; it possesses high artistic values; or, it has yielded, or may be likely to yield, information important in history or prehistory. The structure must also retain historic integrity. The Historic Structures Task Group evaluated the movable span bridges based on these criteria. This interdisciplinary group includes members with backgrounds in engineering, history, archaeology, and architectural history, representing the Research Council, VDOT, the Department of Historic Resources, and the FHWA.

2. *Establish the historical period of bridge construction to be studied.* In accordance with the 1994 MOA, all of Virginia's movable span bridges forty years old and older within the VDOT system were surveyed. There are 20 movable span highway bridges extant in Virginia, ranging in age from 2 to 70 years old. Of these, 11 are owned by VDOT and are 40 years of age or older. The rest are under separate city ownership (6) or are under the purview of the U. S. Army Corps of Engineers (3). Given the small number of movable span bridges, the researchers decided to include *all* twenty structures in the survey. The resulting data provided information for comparison of all extant movable span bridges (and associated technology), established a comprehensive context for movable span bridges in Virginia, and removed the need for additional survey work on bridges that were extant in 1996-7.

3. *Select the geographic area to be studied.* Movable span bridges in Virginia are found only in VDOT's Suffolk, Richmond and Fredericksburg construction districts. The survey was confined to these areas.

4. *Generate an inventory of all movable span bridges currently on-system.* The Structure and Bridge Division of VDOT supplied a comprehensive inventory of movable span bridges. Bridges were located on county maps for use in the survey.

5. *Decide upon the data to be obtained on each site.* A standarized survey/inventory form adapted from the form used during the truss bridge survey was used (Appendix B). The information gathered included:
   - Geographic location
   - Engineering profile, including: designer (if known), builder (if known), date of construction, design and technological data, physical description, and photographic documentation
   - Historical context, including: photographs of associated buildings and surroundings, and documentation of historic relevance

6. *Conduct the survey.* Several teams, each consisting of a researcher and a technician, conducted the survey. In addition to field survey of the bridges, other documentary evidence, including the corresponding VDOT files for each structure, was reviewed, and the construction and inspection data were identified and added to the field survey information.

7. *Organize the field and documentary data.* The survey teams organized the information and presented it to the Historic Structures Task Group. To facilitate comparison and evaluation, the information for each bridge included:

- County/City Code
- Bridge Number
- Route
- Crossing
- Construction Date
- Bridge Type
- Total Number of Bridge Spans
- Total Length and Width
- Designer/Builder Information
- Formal Name

8. *Evaluate the bridges for historical significance.* Using the data from the field survey and associated historical research, the Historic Structures Task Group met in February of 1997 and evaluated the surveyed bridges for eligibility for the National Register of Historic Places. The Task Group had previously determined that the criteria successfully used to evaluate Virginia's non-arched concrete bridges and metal truss bridges were appropriate for determining the historical significance of all bridges. None of the pre-1960 movable span bridges within the VDOT system were recommended as eligible for National Register. As

was previously done with the non-arched concrete bridges and metal truss bridge evaluations, the results of the movable span bridge evaluations were then presented to the Virginia Department of Historic Resources Evaluation Team and the State Historic Preservation Officer. These parties accepted the Task Group's Findings.

HISTORICAL BACKGROUND AND OVERVIEW

Fredericksburg, Richmond and Suffolk Construction Districts

Until the early 20th century, counties controlled local road and bridge construction. Virginia's highway construction districts came into existence as a result of the 1922 departmental organization. Earlier attempts to develop construction "divisions" within Virginia had failed primarily due to shortages and disruptions in materials and manpower imposed by World War I. The establishment of the 1922 construction districts likely grew out of the needs of the State Highway System, created in 1918. Virginia currently has nine construction districts: Staunton, Culpeper, Northern Virginia (NOVA), Fredericksburg, Suffolk, Richmond, Lynchburg, Salem, and Bristol. Only three of these districts--Suffolk, Richmond and Fredericksburg, comprising most of Virginia's Tidewater region--currently contain movable span bridges. Since Suffolk District has been altered over the years, these districts are briefly described below, for purposes of historic background.

The Fredericksburg District includes the region lying south of the Potomac River and north of the York and its branches: the counties of Stafford, King George, Westmoreland, Northumberland, Lancaster, Richmond, Gloucester, Mathews, Middlesex, Essex, King William, King and Queen and Spotsylvania.

The Richmond District contains the counties of Goochland, Hanover, New Kent, Charles City, Henrico, Powhatan, Chesterfield, Amelia, Nottoway, Dinwiddie and Prince George.

The Suffolk District encompasses southeast Virginia and the Eastern Shore. At its formation in 1922, it contained the counties of James City, York, Warwick, Elizabeth City, Princess Anne, Norfolk, Nansemond, Accomack, Northampton, Isle of Wight, Southampton, Surry, Sussex, and Greensville. After World War II, the old counties of Warwick, Elizabeth City, Princess Anne, Norfolk, and Nansemond underwent intense urbanization and development as industrial and recreational centers. These counties eventually ceased to exist, becoming the independent cities of Newport News, Hampton, Virginia Beach, Chesapeake, Norfolk, Portsmouth and Suffolk. This has produced two distinct regions within the district: the highly urban southeastern section and the primarily rural Eastern Shore and counties west of Suffolk.

Movable Span Technology

The VTRC published a concise general history of movable span as part of the 1970s truss bridge survey (Spero, 1981). In 1996, the Wisconsin DOT published a survey of that state's movable span bridges, along with a lengthy history of movable span technology and development (Hess & Frame, 1996). Given the availability of these sources, only a brief overview of movable span types is repeated here.

By the early 20th century, six primary categories of movable bridges existed: 1) swing spans; 2) bascules; 3) lift spans; 4) retractile (transporter) bridges; 5) transporter (ferry) bridges; and 6) pontoon (floating) bridges. General descriptions of these bridge types follow.

Swing Spans

A swing span bridge turns on a horizontal plane around a vertical axis. Such bridges are divided into three sub-types: center-bearing, rim-bearing and combination. In center-bearing spans, the entire dead load, when swinging, is carried on a vertical pivot. Rim-bearing spans carry the dead load on a circular girder (drum) which moves on rollers. Combination spans, as the name implies, combine these technologies to make the bridge partly center-bearing and partly rim-bearing. Swing bridges apparently existed in Europe as far back as the seventeenth century, with the earliest bridges being apparently of a center-bearing design. As swing bridges became heavier and wider, the belief in greater stability brought about the evolution toward rim-bearing designs. In the early twentieth century bridge designers came to the consensus that center-bearing spans were easier to design, build, operate and maintain. (Hess & Frame, 1996; Spero, 1981).

Swing span bridges require a central pier to support the pivot or drum. This pier prevents the entire width of the waterway from being available to vessels, limiting the size of passing watercraft to a width less than one-half the length of the movable span.

Bascules

A bascule is a deck that can be raised to an inclined or vertical position. Bascules either rotate in a vertical plane around a horizontal axis (similar to a seesaw, which is one meaning of the word in French) or roll back on a circular segment. This form of bridge has its antecedents in the drawbridges of medieval castles, where they served the dual purpose of spanning the moat when lowered and barricading the entry when raised. Although early examples often featured various arrangements of chains, pulleys and counterweights, the results rarely produced a truly balanced system, making it difficult to start and stop the bridge↥s motion.

General types of bascules are single leaf (one movable deck segment) and double leaf (twin movable segments). There are three major modern categories of bascule bridge

mechanisms: trunnion, roller-bearing, and rolling-left. The trunnion bridge has a horizontal steel pivot, and moves around a fixed center of rotation at the center of gravity of the rotating part. The roller-bearing bascule also moves about a fixed center of rotation at the center of gravity, but instead of a trunnion, the load is carried by a segmental circular bearing on rollers. The rolling-lift bascule changes its center of rotation as its center of gravity moved horizontally (e.g. as the leaf rises vertically, it also moves horizontally towards the shore, much like a rocking chair). There have been numerous patented sub-types in each bascule category (Hess & Frame, 1996; Spero, 1981).

*Vertical Lift*s

A vertical-lift span rises and descends in the same vertical plane, always maintaining a horizontal position. During the middle decades of the 19th century, several vertical-lift spans were constructed in Europe and the United States. Although their engineering was often ingenious, the bridges themselves were quite modest, designed mainly for canals and small navigable streams in cases where it was only necessary to lift the spans a few feet to provide clearance for water traffic. The modern, long-span, high-rise vertical lift bridge dates from the last decade of the nineteenth century. By the early 20th century, most vertical lift bridges fell into one of three categories: 1) bridges in which the entire span was raised; 2) bridges in which the deck was raised to a fixed overhead span; and 3) bridges in which the deck was raised to a movable overhead span which could also be raised (Hess & Frame, 1996; Spero, 1981).

Retractile (Traversing) Bridges

As the name implies, retractile bridges move horizontally, withdrawing a section of deck away from the navigational passage. Like the two following varieties of movable span bridges, they are rarely seen today.

Transporter (Ferry) Bridges

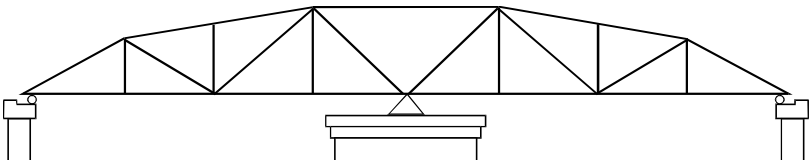
Transporter bridges consist of a fixed span with a suspended traveler.

Pontoon (Floating) Bridges

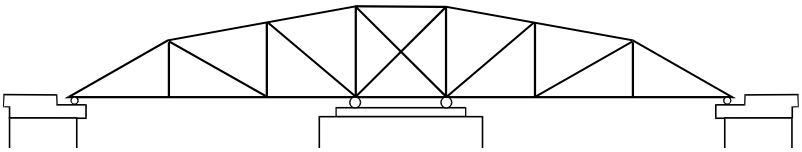
Pontoon bridges are supported by the buoyancy of the water itself. Their use is generally confined to emergency or military situations,

All extant movable span bridges in Virginia are of swing, bascule, or lift design (see Figure 1). Retractile, ferry and pontoon designs were already losing popularity by the early 20th century, and are extremely rare today. None exist in Virginia today.

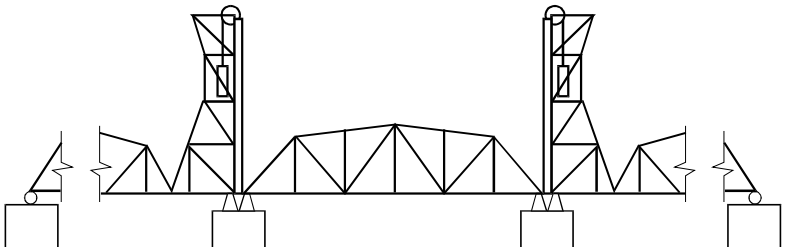
Figure 1. Swing, lift and bascule moveable bridge types



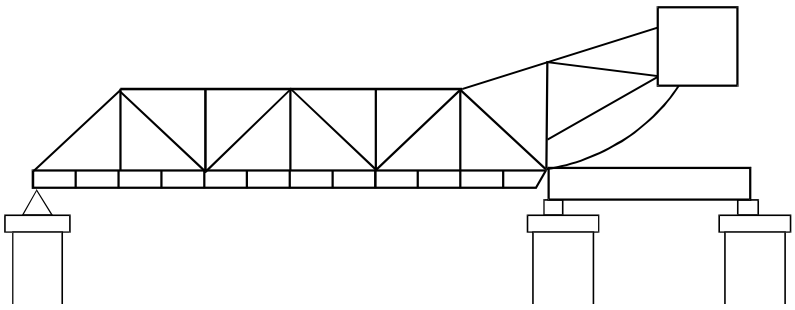
(a) Center-bearing swing bridge



(b) Rim-bearing swing bridge



(c) Vertical-lift bridge



(d) Bascule bridge

Movable Span Bridges in Virginia

Bridge technology and construction was minimal in most regions of 17th and 18th century Virginia. Fords served for crossing most streams and rivers, while wet or marshy places were frequently traversed by causeways (raised roads or pathways on a base of stones, logs, timbers and earth, capped with clay for weatherproofing). Travellers used ferries to cross broad rivers. In the few areas where these methods would not suffice, simple timber bridges were commonly used. Timber bridges took the form of basic beam bridges and the most rudimentary and traditional wooden trusses (e.g. king post and queen post). Stone bridges were expensive and time-consuming to build; only a handful were erected in Virginia during this period.

The 19th century saw the advent of a number of improved timber truss bridges, including patented varieties such as the Town lattice truss and the Long panel truss, as well as the combination wood-and-iron Howe truss that was patented in 1840 (Deibler, 1975). A few early 19th century stone lintel or arched masonry bridges were constructed as well, primarily as turnpike bridges, but stone construction generally remained cost- and time-prohibitive (Newlon, 1973). Metal truss bridges were first developed in the 1840s and 1850s, although they did not appear in many areas of Virginia until the 1870s (Miller & Clark, 1997).

The invention of the automobile, and with it the increased demand for faster crossing of large bodies of navigable water previously served by ferries, encouraged Virginia↑s use of movable span bridges over those bodies of water where water traffic needed to be maintained. Movable span bridges have their advantages and disadvantages. On the positive side, they require lower initial construction cost and less land for approaches than conventional bridges. The negatives, however are considerable. Movable span bridges require extensive maintenance. They also cost more to operate, requiring machinery, power and staffing (since bridge operators must be in constant attendance). In addition, by their nature movable span bridges block either roadway traffic (when open) or marine traffic (when closed).

Beginning in the late 19th century, the United States Congress gave the War Department control over bridges that crossed navigable waters. Nationally, the War Department discouraged the construction of swing span bridges because they reduced the width of the navigable channel, making some areas inaccessible for larger vessels such as naval ships. This problem could be averted if the crossing were served by a different movable span type. But contrary to the national trend, Virginia continued to build a number of swing span bridges over smaller bodies of water, apparently to provide the most economical vehicular crossings over these still-navigable but less commercially and militarily important waters.

In 1941, there were thirty-nine movable span bridges in Virginia, all confined to the Tidewater region (*List of Bridges over Navigable Waters,* 1941). The oldest bridge on the list was a swing span bridge owned by the Commissioners of Westmoreland County. No date of construction was given, merely a citation: ↳Rebuilt 1908.↵ Although authorized by the State in 1888, the second-oldest of those structures was not completed until 1912: this was the bascule bridge at West Point over the Mattaponi River, owned by the Virginia Department of Highways. Of the highway bridges on the 1941 list, twenty were swing spans, fourteen were bascules, and

two were vertical lift spans. Also listed were two retractible span bridges and one removable span bridge. No examples of these later two types survive in Virginia today, although a retractible bridge existed in Richmond County (on Rt. 634 crossing Cat Point Creek) as late as the 1980s: this bridge was replaced after a vehicle crashed into the railing, causing fatalities. The 1970s survey of Virginia⮥s pre-1932 metal truss bridges included seven movable span bridges, including examples of swing span, bascule and vertical lift span designs. Two of these structures survive: Chesapeake #1801, a vertical lift bridge; and Suffolk #1830, a swing span. In comparison, of the twenty movable span highway bridges that are currently in service, three are vertical lifts spans, six are bascules, and eleven are swing spans.

The 1914 Annual Report of the State Highway Commission described the replacement of a primitive wooden bascule bridge in Nansemond County by a metal truss swing span. This bridge, like Virginia's other early swing span bridges, was cranked by hand. By the second quarter of the 20th century, hand-cranked technology was becoming obsolete, and was relegated to a few smaller bridges. Larger and more modern bridges were motor-powered. The 1936 Walkerton Bridge, which crossed the Mattaponi River near Walkerton between King and Queen County and King William County, is the last surviving Virginia example of a hand-cranked swing span. Out of service and no longer operable, the bridge truss, part of the swing mechanism, and the bridge keeper's house are presently displayed at a wayside near their former location.

Contrary to the standard War Department recommendations, Virginia not only continued to build swing span bridges but even replaced some bascule bridges with swing spans. Examples include the bridges at Great Bridge (City of Chesapeake # 1845, built 1942 over the Chesapeake & Albemarle Canal), North Landing (City of Chesapeake # 1826, built 1951 over the Chesapeake & Ohio Canal) and West Point (King William County # 1958, built 1957 over Pamunkey River). The use of swing spans at these locations probably reflected the fact that the small bodies of water they spanned were not major navigation channels, and therefore were of little military or navigational importance.

The most common type of swing truss in Virginia is a variation on the basic Warren truss, a polygonal top chord Warren with verticals (a Warren truss with a vertical bracing member either at each panel point or at alternate panel points, and a polygonal top chord). Less common within this group are plain Warren trusses with verticals. Among the bridges surveyed in the 1970s was a pony truss Warren with verticals and a polygonal top chord: the 1931 Reid⮥s Ferry Bridge carrying Rts. 10 & 32 over the West Branch of the Nansemond River. This bridge no longer exists.

Of the eleven swing span highway bridges currently in service in Virginia, one is a deck Warren truss: the George P. Coleman Bridge (York County # 1946, built 1996 over the York River); and two are steel girders: the North Landing Bridge (Chesapeake City # 1826, built 1951 over the Chesapeake and Ohio Canal), and the Great Bridge Bridge (Chesapeake City # 1845, built 1942 over the Chesapeake and Albemarle Canal).

The remaining eight swing spans are through Warren trusses: the Lord Delaware Bridge (King and Queen County #1949, built 1945 over the Mattaponi River), the Eltham Bridge (King William County # 1958, built 1957 over the Pamunkey River), Gwynns Island Bridge (Mathews County # 1002, built 1938 over Milford Haven), the Chickahominy River Bridge (Charles City County # 1917, built 1939 over the Chickahominy River), Chincoteague Channel Bridge (Accomack County # 1006, built 1940 over Chincoteague Channel), Chesapeake City # 8003, built 1955 over the Chesapeake and Albemarle Canal), Southampton County # 1966, built 1940 over Blackwater River, and the King's Highway Bridge (Suffolk City # 1803, built 1928 over the Nansemond River).

In the first quarter of the 20th century the most popular type of movable bridge was the ↳wooden drawbridge↵ (bascule). The early reports of the State Highway Commissioner describe a number of plans being furnished to Tidewater counties for wooden drawbridges. Steel bascules came into use in Virginia in the second quarter of the century. A total of 14 of the 39 Virginia movable span bridges cited in *List of Bridges over the Navigable Waters of the United States* (1941), were bascule bridges. The listed completion dates of these bridge fall into two distinct groups, the early group between 1912 and 1916 and the later group between 1927 and 1935. It appears that this break reflects the change in technology between the wooden drawbridges and the modern steel bascule bridges.

The 1970s truss survey identified one pre-1932 bascule bridge, a Scherzer single leaf bascule built in 1929. This was the now-replaced Hodges Ferry Bridge in the city of Portsmouth, carrying West Norfolk Road over the West Branch of the Elizabeth River. Other bascule bridges were in service at the time, but this was the only one of a truss configuration.

The six bascule bridges currently in highway service in Virginia include one single leaf and five double leaf, all built after 1932. The single leaf bascule is Deep Creek Bridge (Chesapeake City # 1818, built 1934 over Dismal Swamp Creek). The double leaf bascules are: Gilmerton Bridge (Chesapeake City # 1809, built 1938 over the south branch of Elizabeth River), the Elizabeth River Bridge (Chesapeake City # 1833, built 1962 over the South Branch Elizabeth River); Chesapeake City # 2527, built 1969 over the South Branch of Elizabeth River; Norfolk City # 1804, built 1952 over the East Branch of Elizabeth River; and the Berkley Bridge (Norfolk City # 2722, built 1990 over the East Branch of Elizabeth River).

On the 1941 *List of Bridges*, two vertical lift bridges are listed for Virginia. The first one is the Jordan Bridge (City of Chesapeake #1801); the second is the original James River Bridge at Newport News (now replaced by a new vertical lift bridge). Both bridges were completed in 1928. The Jordan Bridge was extensively damaged at 8:30 a.m. on June 2, 1939, when the oil tanker *Rhode Island* struck the bridge, pushing the east tower span and tower off its pier and dropping the lift span 122 feet into the river. The Jordan Bridge was restored to traffic on February 1, 1940, and remains in service. A plaque on the bridge commemorates this chapter in its history.

The three vertical lift bridges currently in highway service in Virginia are: the Jordan Bridge, the new James River Bridge (Isle of Wight County # 1901, built in 1980), and the

Benjamin Harrison Bridge (Prince George County # 1930, built in 1966). The Jordan Bridge is a through camelback truss; the James River Bridge and Benjamin Harrison bridges are through Warren trusses with verticals and polygonal top chords.

Of the twenty movable span highway bridges in Virginia, eleven are in the VDOT system and are forty years of age or older. Three are owned by the Federal government and are the responsibility of the U. S. Army Corps of Engineers. The remaining six are less than forty years old.

SURVEY RESULTS AND EVALUATIONS FOR HISTORIC SIGNIFICANCE

Virginia's twenty movable span highway bridges currently in service were built between 1928 to 1996. Chronologically, the construction dates of these bridges run as follows:

1928: 2
1934: 1
1938: 2
1939: 1
1940: 2
1943: 1
1945: 1
1951: 1
1952: 1
1955: 1
1957: 1
1962: 1
1967: 1
1969: 1
1980: 1
1990: 1
1996: 1

Virginia's movable span bridges were evaluated for historical significance by the Historic Structures Task Group during February 1997. All bridges under VDOT ownership or maintenance and forty years or more in age were evaluated. In accordance with the terms of the 1994 MOA, no evaluation was made of bridges under forty years of age. Similarly, the three bridges under Federal ownership, and thus not under VDOT purview, were not evaluated. Under the National Historic Preservation Act of 1966, Section 110, Federal agencies have a defined and primary role in determining which of their properties are eligible for listing on the National Register.

The evaluation utilized the criteria previously formulated by the Historic Structures Task Group for use in determining the potential historic significance of bridges (Appendix C), and the

results of the evaluations were reported to the Virginia Department of Historic Resources Evaluation Team. Each bridge was given a score rating. The maximum possible score with a determination of national significance is 38; the maximum score with a determination of statewide significance is 33; with regional significance, 30; with local significance, 28. A score of 18 or higher is required for National Register eligibility.

None of the movable span bridges forty years old or older that were evaluated for historical significance were found eligible for the National Register. All are adaptations of common truss types with nothing unique or significant in their structure or history. By far the most common type was a standard polygonal top chord Warren through truss, used as a swing span. Although they range in date from 1928 to 1957, it is notable that these bridges, built over a nearly thirty-year span of time, are indistinguishable in design.

Bridges in the VDOT system which were evaluated for historical significance are described below.

Fredericksburg District

King and Queen County

No. 1949: Swing Span (polygonal top chord through Warren with verticals) built in 1945, Rt. 33 crossing Mattaponi River

King William County

No. 1958: Swing Span (polygonal top chord through Warren with verticals) built in 1957, Rt. 30 crossing Pamunkey River

Mathews County

No. 1002: Swing Span (polygonal top chord through Warren with verticals) built in 1938, Rt. 223 crossing Milford Haven

Richmond District

Charles City County

No. 1917: Swing Span (polygonal top chord through Warren) built 1939, Rt. 5 crossing Chickahominy River

Suffolk District

Accomack County

No. 1006: Swing Span (polygonal top chord through Warren) built 1940, Rt. 175 crossing Chincoteague Channel

Chesapeake City

No. 1801: Lift (through camelback) built 1928, Rt. 337 crossing South Branch Elizabeth River
No. 1809: Bascule (double leaf) built 1938, Rt. 13 crossing South Branch Elizabeth River
No. 8003: Swing Span (through Warren with verticals) built 1955, Centerville Turnpike crossing Chesapeake and Albemarle Canal

Norfolk City

No. 1804: Bascule (double leaf) built 1952, Rt. 264 crossing East Branch Elizabeth River

Southampton County

No. 1966: Swing Span (polygonal top chord through Warren with verticals) built 1940, Rt. 189 crossing Blackwater River

Suffolk City

No. 1803: Swing Span (polygonal top chord through Warren with verticals) built 1928, Rt. 125 crossing Nansemond River

The following bridges are under forty years old, or are under Federal ownership (and under the purview of the Corps of Engineers), and thus were not evaluated:

Richmond District

Prince George County:

No. 1930: Lift span (polygonal top chord through Warren with verticals), **built 1966**, Rt. 156 crossing James River

Suffolk District

Chesapeake City

No. 1818: Bascule (single leaf) built 1934, Rt. 17 crossing Dismal Swamp Creek. *Corps of Engineers*

No. 1826: Swing Span (steel girder), built 1951, Rt. 165 crossing Chesapeake & Ohio Canal. *Corps of Engineers*

No. 1833: Bascule (double leaf), *built 1962,* Rt. 104 crossing South Branch Elizabeth River

No. 1845: Swing Span (steel girder), built 1942, Rt. 168 Business crossing Chesapeake & Albemarle Canal. *Corps of Engineers*

No. 2527: Bascule (double leaf), *built 1969,* Rt. 64 crossing South Branch Elizabeth River

Isle of Wight County

No. 1901: Lift span (through Warren), *built 1980,* Rt. 17 crossing James River

Norfolk City

No. 2722: Bascule (double leaf), *built 1990,* Rt. 264 crossing East Branch Elizabeth River

York County

No. 1946: Swing Span (deck Warren double swing span), *built 1996,* Rt. 17 crossing York River

Appendix D contains the complete list of surveyed bridges and their rating status.

MANAGEMENT PLAN RECOMMENDATIONS

Given the fact that none of the bridges in the VDOT system over forty years old are individually eligible for the National Register, the recommended management plan for these structures is as follows:

1) Standard and accepted inspection and maintenance procedures may continue to be applied to these bridges without danger of compromising the integrity of any historically significant structures.

2) The bridges may continue to be maintained for the safety of the traveling public, without management restrictions.

3) Any movable span bridges subsequently found to be contributing structures to a National Register-eligible historic district must be managed according to the period(s) of significance of that particular district as well as safety and transportation planning restraints.

4) Movable span bridges within the VDOT transportation system but currently less than forty years of age should be evaluated for possible historical significance as they reach the fifty-year mark.

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APPENDIX A: MEMORANDUM OF AGREEMENT REGARDING THE SURVEY OF VIRGINIA'S MOVABLE SPAN BRIDGES

APPENDIX B: MOVABLE SPAN BRIDGE SURVEY AND INVENTORY FORMS

APPENDIX C: BRIDGE ELIGIBILITY RATING SHEET

APPENDIX D: INVENTORY OF VIRGINIA'S MOVABLE SPAN BRIDGES

KEY:

NE = Not eligible for the National Register
Corps = Under Federal ownership; responsibility of U. S. Army Corps of Engineers
NR = Not rated (due to being under 40 years old or not in VDOT system)

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