Bridge L4778, constructed in 1914, carries Township Road 222 (also known as Heron Road) over the South Branch of the Root River in Carrollton Township, Fillmore County, Minnesota. Carrollton Township owns the bridge. Bridge L4778 is significant as the work of a Minnesota bridge building master, Alexander Y. Bayne.

Bridge L4778 is a single-span, pin-connected, steel, Pratt through-truss, with a main span length of approximately 97 feet and a total structure length of 103 feet. It has a deck width of 16 feet 2 inches, with a clear roadway width of 15 feet 2 inches. Prior to its closure to traffic, the bridge served as a one-lane, two-way structure. The bridge’s northeast abutment is made of mortared limestone blocks, with a concrete cap that serves as a seat for the stringers and truss bearing shoes. The bridge’s southwest abutment is made of concrete.

Bridge L4778 is in generally poor condition. Both abutments are in poor condition; erosion and spalling of stone and deteriorated concrete repairs are prevalent at the north abutment, with significant areas of concrete deterioration and delamination at the south abutment. The steel truss members are in fair condition with the most notable deficiency being rust section loss to specific elements. The truss bearings are in poor condition with the steel deck stringers experiencing significant section loss in their bottom flanges where bearing on the abutment seats. Due to limited access, the steel floorbeams and interior stringers could not be closely assessed; however, their condition can be inferred to be similar to the adjacent elements which could be viewed, making significant corrosion/section loss at spot regions likely. With proper maintenance, stabilization and preservation activities it is believed Bridge L4778 could serve in a pedestrian and/or light vehicular load carrying capacity for 20 years or longer.

Any work on Bridge L4778 should proceed according to the Secretary of the Interior’s Standards for the Treatment of Historic Properties (Standards) [36 CFR part 67] and The Secretary’s Standards with Regard to Repair, Rehabilitation, and Replacement Situations, as adapted by the Virginia Transportation Research Council (Guidelines).
Minneapolis Department of Transportation (MnDOT) Local Historic Bridge Report

Bridge Location

Bridge Number: L4778

Bridge L4778 – TWP 222 OVER MILL POND S BRANCH ROOT

PROJECT LOCATION
FILLMORE COUNTY
SEC. 21 (NE 1/4 of SE 1/4), TO 103NN, R 10W
USGS QUAD NAME: PRESTON
UTM ZONE: 15 NAD: 83
EASTING: 577845 m (1895814 ft.)
NORTHING: 4840083 m (15879505 ft.)
Executive Summary

Bridge Location

I. Project Introduction
II. Historic Data
III. Bridge Data
IV. Existing Conditions/Recommendations
V. Projected Costs

Appendices

A. Glossary
B. Guidelines for Bridge Maintenance and Rehabilitation based on the Secretary of the Interior’s Standards
C. Documents
This Bridge Report is a product of a comprehensive study performed for historic bridges owned by county, city, township, private and other state agencies besides MnDOT. The study is the third phase of a multi-phased process developed and executed in partnership with representatives from the Federal Highway Administration (FHWA); State Historic Preservation Office (SHPO); MnDOT State Aid; MnDOT Cultural Resources Unit (CRU); the US Army Corps of Engineers (USACE); local public works and county highway departments; county and township boards and city councils; the preservation community and the general public. To perform the study, MnDOT retained the consultant team of LHB Inc., Mead & Hunt Inc., and The 106 Group.

The general goals of the study include:

- Identification of bridges not included in the SIMS database or identified in previous studies, to either be studied further (those on local roads/systems) or tabulated for SHPO’s use (trails and abandoned bridges)
- Gathering and compiling the existing historic and bridge condition data and other relevant information on the bridges in the study group into bridge reports
- Reevaluation of Chicago, Milwaukee & St. Paul Grade Separation Historic District (Midtown Corridor)
- Preparing HAER documentation for a selected group of bridges
- Investigating and preparing a summary regarding how other states have funded historic bridge programs and suggestions for creation of a new funding mechanism for Minnesota’s local historic bridges

The Bridge Reports compile and summarize the historic and engineering information concerning the structures. It is important to note that this report indicates if a bridge is located within a known historic district, but it does not identify all known or potential historic properties. Potential impacts to adjacent or surrounding historic properties, such as archaeological sites or other structures must be considered. Contact MnDOT CRU early in the project planning process in order to identify other potential historic properties. The reports also document the existing use and condition of the bridges along with assessments of the maintenance, stabilization and preservation needs of each structure, including cost estimates. The maintenance activities, along with regular structural inspections and anticipated bridge component replacement activities are routine practices directed toward continued structure serviceability. Stabilization activities address immediate needs identified as necessary to maintain a bridge’s structural and historic integrity and serviceability. Preservation activities are near term or long term steps that need to be taken to preserve and in some cases restore a bridge’s structural and historic integrity and serviceability. In assessing preservation activities, a design life of 20 years or longer is typically considered. In addition to general restoration activities and dependent on the severity of deterioration, preservation activities may include spot repair, disassembly and reassembly or replacement of specific bridge components.

Recommendations within the Bridge Reports are consistent with the Secretary of the Interior’s Standards for the Treatment of Historic Properties (Standards). The Standards are basic principles created to help preserve the distinct character of a historic property and its site, while allowing for reasonable changes to meet new engineering standards and codes. The Standards recommend repairing, rather than replacing...
deteriorated features whenever possible. The Standards apply to historic properties of all periods, styles, types, materials and sizes and encompass the property's location and surrounding environment.

The Standards were developed with historic buildings in mind and cannot be easily applied to historic bridges. The Virginia Transportation Research Council (Council) adapted the Standards to address the special requirements of historic bridges. They were published in the Council's 2001 Final Report: A Management Plan for Historic Bridges in Virginia, *The Secretary's Standards with Regard to Repair, Rehabilitation, and Replacement Situations*, provide useful direction for undertaking maintenance, repair, rehabilitation, and replacement of historic bridges and are included in the Appendix to this plan.

Existing bridge data sources typically available for Minnesota bridges were gathered for the study. These sources include:

- Structure Information Management System (SIMS): system used by MnDOT to manage its inventory of bridges statewide
- The current MnDOT Structure Inventory Report and MnDOT Bridge Inspection Report. Reports are available for the majority of the bridges (not available for bridges in private ownership or bridges that are not tracked in SIMS)
- Database and inventory forms resulting from Phase II of the Minnesota Local Historic Bridge Study and other prior historic bridge studies as incorporated into the database
- Existing Minnesota historic contexts studies for bridges in Minnesota, including *Reinforced-Concrete Highway Bridges in Minnesota, 1900-1945*, *Minnesota Masonry-Arch Highway Bridges, 1870-1945*, *Iron and Steel Bridges in Minnesota, 1873-1945* and *Minnesota Bridges 1955-1970*
- Field investigations documenting the general structural condition and determining character-defining features

Additional data sources researched and gathered for some of the bridges as available also included:

- Files and records at MnDOT and Local Owner offices
- Original bridge construction plans, rehabilitation plans, and maintenance records of local owners
- Files and documents available at the SHPO office, including previous inventory forms, determinations of eligibility, studies, and compliance documents
- Existing historic and documentary material related to the National Register-eligible bridges

The Appendix contains the following: a Glossary explaining structural and historic preservation terms used in the report, the Guidelines for Bridge Maintenance and Rehabilitation based on the Secretary of the Interior’s Standards, a list of engineering and historic documents available for this bridge, and copies of the MnDOT Structure Inventory and Bridge Inspection Reports current at the time of the report preparation.

The Bridge Report will provide the bridge owner and other interested parties with a comprehensive summary of the bridge condition and detailed information related to the historic nature of the bridge. This information will enable historic bridge owners to make informed decisions when planning for their historic properties.
**II – Historic Data**

**Contractor**
Alexander Y. Bayne, Minneapolis Bridge Company

**Designer/Engineer**
Alexander Y. Bayne, Minneapolis Bridge Company

**Description**

Bridge L4778, constructed in 1914, carries Township Road 222 (also known as Heron Road) over the South Branch of the Root River, in Carrollton Township, Fillmore County, Minnesota. This location is about 0.8 miles east of the junction of Township Road 222 and County-State-Aid Highway (CSAH) 17. Bridge L4778 is oriented in a northeast-southwest direction to provide a perpendicular crossing of the river. However, Township Road 222 on either end of the bridge follows a general north-south alignment; therefore, most bridge inspection documents have referred to the bridge’s features assuming the north-south orientation.

Bridge L4778 crosses the river at a location also known historically as Mill Pond, in reference to a flour mill once located at the site. The bridge is closed to traffic and Township Road 222 is blocked to prevent vehicular access to the bridge’s approaches. The surrounding property is now operated as the Old Barn Resort. Several buildings and a paved parking area are located several hundred feet northeast of the bridge, with a golf course situated northwest, southwest, and southeast of the bridge. The general vicinity of the bridge is rural, with a mix of farmed and forested land.

Bridge L4778 is a single-span, pin-connected, steel, Pratt through-truss. Per bridge inspection records, the bridge has a main span length of 97.4 feet and a total structure length of 103.0 feet. It has a deck width of 16.2 feet, with a clear roadway width of 15.2 feet. Prior to its closure to traffic, the bridge served as a one-lane, two-way structure. The bridge has a vertical clearance of 13.5 feet at its portals. The bridge’s superstructure is composed of five truss panels, each nominally 20 feet in length, with members arranged in a Pratt configuration with riveted built-up members.

The top chords and endposts are built up with two channel beams with continuous top cover plate and V-lacing on the bottom. Top lateral bracing members are round-bar diagonals, with riveted paired angles as transverse struts. End vertical members are composed of two angles connected with batten plates, while interior verticals are made up of two channels with V-lacing. Diagonal members in the center panels are paired square eyebars with turnbuckles. Diagonals in the other truss panels are paired flat eyebars. The bridge’s bottom chords are composed of paired punched eyebars. Pins connect the top chords, verticals, and diagonals at each upper panel point and connect the bottom chords, verticals, and diagonals at each lower panel point. Riveted and bolted steel straps connect each vertical member into the pin assemblies at its corresponding lower panel point. The portals are functional and unornamented, with angles forming the portal web and knee bracing between the trusses.
The bridge’s floor system is made up of four rolled I-section floorbeams, each located below a panel point and connected to the pin assembly by riveted and bolted angles and plates. The floorbeams support six rolled I-beams and two fascia channel beams that serve as stringers. Round-bar diagonal bracing extends between the floorbeams. Transverse timber boards with timber runners form the bridge’s deck. The current deck was installed sometime between 1988 and 1998, replacing a non-original concrete deck with pan-curved steel forms that had been in place since before the bridge’s initial inspection in 1962.

Bridge L4778’s railing is made up of two horizontal angle members as rails, connected to vertical truss members by bolted angle plates. Intermediate railing posts are situated at the midpoint of each panel, each composed of an angle bolted to the rails and connected to the fascia stringers.

The bridge’s northeast abutment is made of mortared limestone blocks, with a concrete cap that serves as a seat for the stringers and truss bearing shoes. The abutment extends outward from the bridge at a swept angle to form wingwalls. The truss shoes rest on roller-nest expansion bearings, which exhibit considerable rust and deterioration. In addition, the concrete cap and portions of the limestone have deteriorated and spalled. Steel supports have been added c. 2000 under the bottom chords and outside fascia stringers, where the original bearing surface is no longer present due to rusting steel and spalling concrete. The bridge’s southwest abutment is made of concrete and exhibits spalling and deterioration. A rigid polyvinyl chloride (PVC) utility pipe extends along the east side of the bridge, supported by the bottom chord eyebars via a series of metal hangers.

Significance

Bridge L4778 is located in central Fillmore County, nearly equidistant between the cities of Preston and Lanesboro, in Carrollton Township. The bridge spans the South Branch of the Root River, at the former location of the Clear Grit community. Clear Grit was established in 1869 with the construction of a flour mill. The South Branch is also known as Mill Pond at the location of the current bridge, reflecting the mill’s former presence. Through the 1870s Clear Grit attracted a dozen residences and a few businesses, including a general store, hardware store, and hotel. However, none of the commercial enterprises stayed in operation more than a few years, although a post office remained into the 1880s. In 1881 the Clear Grit mill and surrounding farmland was acquired by noted Milwaukee industrialist Edward Allis, after the mill’s owner experienced financial difficulties. Jere Allis, Edward’s son, moved to Clear Grit and operated the farm until 1906, when he sold the land to a local speculator.

While the exact date of the mill’s closure is not known, it is clear that the Clear Grit community had declined by the 1890s. An 1896 plat map of Carrollton Township indicates only two buildings at Clear Grit: the Allis residence on present-day Heron Road north of the river crossing and an associated barn on a hill just above the river crossing. The 1896 map also shows a local road crossing over the South Branch at the current bridge’s location, indicating the presence of a bridge. A bridge at this location would have been important for farmers on both sides of the South Branch to easily access Clear Grit’s mill and the Allis farm property.

In 1914 the current bridge was constructed at the Clear Grit crossing, presumably to replace an earlier structure at the site. The construction date is based on a manufacturer’s plaque, affixed to the bridge until recent years. According to the bridge’s inventory form, the bridge was erected by Alexander Y.
Bayne’s Minneapolis Bridge Company. Bayne was an important Minnesota truss bridge fabricator and constructor. Born in Ohio in 1855, Bayne entered the bridge construction field in 1880 as a salesman for the prominent Minneapolis bridge firm of Jones and Hewett. He later served as partner and highway bridge department manager for Gillette-Herzog Manufacturing Company of Minneapolis from 1890 to 1900 and as manager of the Minneapolis office of the American Bridge Company from 1900 to 1903. Bayne then started his own firm as a bridge contractor and agent, eventually founding the Minneapolis Bridge Company in 1914. He died in 1917, after nearly four decades as an influential Minnesota bridge builder.

After founding his own company in 1903, Bayne constructed many bridges throughout Minnesota, including several in Fillmore County. Other bridges built by Bayne include Bridge L4885 (Bear Creek Bridge, 1909) and Bridge 7970 (Deer Creek Bridge, 1909) in Fillmore County, as well as Bridge L5391 (Third Street North Bridge, 1909) in Cannon Falls, Goodhue County and Bridge L733 (Walcott Township Bridge, 1904) in Rice County. Soon after the establishment of his Minneapolis Bridge Company, Bayne constructed Bridge L4883 (Bear Creek Bridge, 1914) and Bridge L4778 (Clear Grit Bridge, 1914), both in Fillmore County.

Carrolton Township plat maps from 1915, 1928, and 1940 all show a similar roadway and bridge alignment as that depicted on the 1896 map. Present-day Township Road 222, or Heron Road, is generally aligned east-west, connecting two more important county routes extending from Preston and Lanesboro. The land surrounding the bridge remained in use as farmland through the late twentieth century. In 1988 the farm was purchased for conversion to use as a recreational-vehicle campground and casual resort centered around the old Allis barn. A golf course, adjacent to Bridge L4778, was later added to the property, now known as the Old Barn Resort. The bridge itself appears to have experienced few changes during its lifespan. A concrete deck supported by steel pan-curved forms was added to the bridge at an unknown date prior to 1962, but was removed and replaced with timber deck boards sometime between 1988 and 1998. Due to structural deterioration, Bridge L4778 was closed to traffic in 2010. Concrete blocks were placed on Township Road 222 at the southwest end of the bridge and about 400 feet north of the bridge to prevent vehicular traffic from accessing the structure. The bridge remains closed.

Bridge L4778 retains a high degree of integrity. The bridge remains in its original location and therefore it retains integrity of location and feeling. The bridge’s immediate setting has been altered from rural farmland to use as a golf course and resort. However, the golf course and resort retain considerable vegetation and rural character, and surrounding parcels remain in agricultural use. The bridge therefore retains its integrity of setting. The bridge no longer carries vehicular traffic. However, Township Road 222 extends to either end of the bridge and the bridge is clearly recognizable as a transportation facility in relation to the adjacent roadway, therefore retaining its integrity of association. Bridge L4778 exhibits no notable alterations to its superstructure or substructure elements. The current timber deck, while installed sometime between 1988 and 1998, is likely very similar to the original decking and is historically accurate. A utility pipe has also been added to the northeast side of the bridge. The bridge’s abutments exhibit considerable deterioration and portions of the original metal railing have suffered minor impact damage. However, these minor modifications and general deterioration do not impact the bridge’s character.
defining superstructure and do not affect the bridge’s ability to convey its engineering significance. As such, the bridge retains integrity of materials, design, and workmanship.

Bridge L4778 is significant under National Register Criterion C in the area of Engineering within the Historic Iron and Steel Bridges in Minnesota, 1873-1945 Multiple Property Documentation Form as a bridge constructed by important Minnesota bridge builder Alexander Y. Bayne. The bridge exhibits minor alterations and some deterioration to substructure and railing, but retains all aspects of integrity sufficient to convey its associations with Bayne. Therefore, Bridge L4778 is recommended as eligible for the National Register under Criterion C in the area of Engineering as the work of a master. The period of significance is 1914, which corresponds with the year the bridge was built.

**Historic Context**

Historic Iron and Steel Bridges in Minnesota, 1873-1945

**National Register Status**

Eligible (Individually)

**Criterion A Significance**

N/A

**Criterion C Significance**

Engineering: Work of a Master

**Historic District**

N/A

**SHPO inventory number**

FL-CRL-002

**Sources Used to Compile Section II -- Historic Data**

Field inspection Mead & Hunt, Inc. November 19, 2015

“About the Old Barn.” The Old Barn Resort, 2011. [www.barnresort.com/about.htm](http://www.barnresort.com/about.htm).


Fillmore County Farm Bureau. *Plat Book of Fillmore County.* Mankato, Minn.: Forde Printing Inc., 1940.


Character-Defining Features

Character-defining features are prominent or distinctive aspects, qualities, or characteristics of a historic property that contribute significantly to its physical character. Features may include materials, engineering design, and structural and decorative details. Often, the character-defining features include important historic fabric. However, historic fabric can also be found on other elements of a bridge that have not been noted as character-defining. For this reason, it is important to consider both character-defining features and the bridge’s historic fabric when planning any work.

Feature 1: Riveted truss members and pinned connections.
## Minnesota Department of Transportation (MnDOT)  
Local Historic Bridge Report

### Bridge Number: L4778

#### Bridge Data

<table>
<thead>
<tr>
<th>Date of Construction (remodel)</th>
<th>1914</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Name (if any)</td>
<td></td>
</tr>
</tbody>
</table>

#### Location

| Feature Carried:              | TWP 222 |
| Feature Crossed:              | MILL POND S BRANCH ROOT |
| County:                       | Fillmore |
| Ownership:                    | Carrolton Township |

#### MnDOT Structure Data

*Data Current (as of): Nov 2016*

| Main Span Type:               | 303 STEEL HIGH TRUSS |
| Main Span detail:             | PRATT |
| Substructure Type - Foundation Type: | 7-Differ - 0-Unknown |
| Abutment:                     | N-Not Applicable - N-Not Applicable |
| Piers:                        | N-Not Applicable - N-Not Applicable |
| Total Length:                 | 103 ft |
| Main Span Length:             | 97.4 ft |
| Total Number of Span(s):      | 1 |
| Skew (degrees):               | 0 |
| Structure Flared:             | No Flare |
| Roadway Function:             | Rural, Local |
| Custodian/Maintenance Type:   | Township |

#### Reported Owner Inspection Date

4/29/2010

#### Sufficiency Rating

13.8

#### Operating Rating

HS 6

#### Inventory Rating

HS 4

#### Posted Load

K - Bridge closed

#### Posting

VEH: 8 SEMI: DBL:

#### Design Load

UNKN

#### Current Condition Code

| Deck:                  | 6 |
| Superstructure:        | 4 |
| Substructure:          | 4 |
| Channel and Protection:| 6 |
| Culvert:               | N |

#### Current Appraisal Rating

| Structure Evaluation:   | 0 |
| Deck Geometry:          | 0 |
| Underclearances:        | N |
| Waterway Adequacy:      | 8 |
| Approach Alignment:     | 3 |

#### Fracture Critical

Yes

#### Deficient Status

S.D.

#### Roadway Clearances

| Roadway Width:           | 15.2 ft |
| Vert. Clearance Over Rdwy: | 13.5 ft |
| Vert. Clearance Under Rdwy: | 0 ft |
| Lat. Clearance Right:    | 0 ft |
| Lat. Clearance Left:     | 0 ft |

#### Roadway Data

| ADT Total (Year):        | 43 (1973) |
| Truck ADT Percentage:    | Not given |
| Bypass Detour length:    | 8 miles |
| Number of Lanes:         | 1 |

#### Waterway Data

| Scour Code:               | R-CRIT; MONITOR |

#### Non-MnDOT Data

| Roadway Characteristics:  | **Number of Crashes reported in MnMCAT within 500 feet of Bridge Site** |
| Lane Widths:              | 5 ft Trail |
| Shoulder Width:           | No Shoulder |
| Shoulders Paved or Unpaved: | N/A-No Shoulder |
| Roadway Surfacing:        | Aggregate |

| Location of Plans:        | N/A |
| Plans Available:          | No Plan Available |

* Non-MnDOT data collected during field survey. All other fields of data collected from MnDOT November of 2016. See Appendix C for MnDOT inventory and inspection report data.

** Unless a significant number of crashes are noted on or near a bridge, the accident data is not detailed in this report.
Existing Conditions
Available information, as detailed in the Project Introduction section, concerning Bridge L4778 was reviewed prior to visiting the bridge site. The site visit was conducted to establish the following:

1. General condition of structure
2. Conformation to available extant plans
3. Current use of structure
4. Roadway/pedestrian trail geometry and alignment (as applicable)
5. Bridge geometry, clearances and notable site issues

General Bridge Description
Bridge L4778 is currently barricaded/closed to vehicular traffic; however, it originally carried Township Road 222 over the South Branch of the Root River. Bridge L4778 is a single-span, pin-connected, steel, Pratt through-truss with a span length of approximately 97 feet. It has a deck width of 16 feet 2 inches, with a clear roadway width of 15 feet 2 inches. The existing bridge deck consists of transverse timber deck planks overlain by longitudinal timber running planks in the wheel lines. The floor system beneath the timber deck consists of steel I-shaped floorbeams located at the truss panel points and longitudinal steel I-shaped interior stringers and fascia channel stringers spanning between the floorbeams. Steel roller expansion bearings are located at the north abutment and the truss appears to be fixed at the south abutment. A slender two-line steel angle railing with steel angle posts lies on each edge of the deck directly in front of the steel trusses.

The steel truss is supported by abutments on either end with the north abutment (directional northeast) comprised of stone masonry (limestone blocks) and the south abutment (directional southwest) comprised of concrete.

Bridge L4778 is in generally poor condition. Both abutments are in poor condition with erosion and spalling of stone and deteriorated concrete repairs prevalent at the north abutment and significant areas of concrete deterioration and delamination at the south abutment. The steel truss members are in fair condition with the most notable deficiency being rust section loss to specific elements. The truss bearings are in poor condition and the steel deck stringers were noted to be experiencing significant section loss in their bottom flanges where bearing on the abutment seats. Due to limited access, the steel floorbeams and interior stringers could not be closely assessed; however, their condition can be inferred to be like the adjacent elements which could be viewed, making significant corrosion/section loss at spot regions likely.

Serviceability Observations
The bridge is currently closed to vehicular traffic with concrete barriers placed at each end; however, the barriers appear to have been repositioned resulting in the ability of ATVs and similar small vehicles to utilize the bridge. It is likely pedestrians also utilize it.

The bridge is currently load posted with a single 8-ton load limit sign at its south end.

Condition Observations
Due to the size of this bridge, its large span over water and lack of aerial inspection equipment incorporated with this project, access to some portions of the structure was extremely limited. All
observations and quantity estimates were made from ground level at the bridge ends or from the bridge deck. As such, the condition observations and recommendations that follow in this report are general in nature. A more in-depth inspection utilizing the appropriate access equipment to permit hands-on inspection should be undertaken to better quantify required repairs prior to refining a rehabilitation assessment and undertaking any rehabilitation work.

Abutment and Wingwalls

Both abutments are in poor condition. The north abutment consists of mortared limestone masonry blocks (9-inch to 10-inch coursing height). Primary deficiencies noted include face spalling of individual stones and joint cracking within the pointing mortar. Lower regions of the stone were observed to be in better condition than upper regions, and large regions of previously patched and repaired stone were observed in the upper regions on both the abutment front face and the wingwalls. These regions are noted to be patched with concrete and in many instances the concrete is now eroded or unsound. The majority of the upper region of the abutment and wingwalls is capped with concrete, potentially the result of repairs to deteriorated stone. Deterioration, spalling and loss of the concrete cap is prevalent, including regions surrounding the truss bearing locations, particularly at the northeast bearing location. The north abutment appears to be perched/ seated on a rock ledge of approximate 3 feet to 5 feet exposed height. The rock ledge was observed to be fractured but still capable of providing support to the abutment base.

The south abutment is comprised of concrete. It is in generally fair to poor condition with observed face spalling and delaminations extending up to 1-foot-deep. Most notable is spalling/ delaminations at the abutments lower southwest corner, as well as the faces of both wingwalls. At one spall location, a spiral reinforcing bar was observed, thus it is presumed there is a limited quantity of concrete reinforcing steel present. Steel channels were also observed anchored to the abutment front face beneath the trusses; it is believed they may have been placed at some point to allow for truss jacking/lifting, potentially for making repairs to either the abutment seat area or the trusses themselves.

Steel Trusses and Truss Floor System

Steel Trusses

The steel truss members were observed to be in fair condition with some elements noted to be in poor condition. The truss top chords and end posts are built up with two channel beams with continuous top cover plate and V-lacing on the bottom. Truss vertical members consist of two steel channels with V-lacing on either face between channels at the two interior verticals and paired vertical angles at the vertical end panel points near either end of the truss. Diagonal truss members consist of rectangular (flat) pin-connected eyebars in all but the center panels. The center panels consist of pin-connected square bars with turnbuckles. Truss lower chord members consist of paired rectangular eyebars. The paint system on the truss is entirely failed and not detectable but for remnant locations. As a result, light to moderate surface rust is prevalent throughout and localized areas of significant rust/ section loss were noted. The most significant section loss observed is to the lower chord eyebar ends of the west truss at its north end where they wrap around the truss end pin. The inside eyebar is estimated to have approximately 30 percent section loss and 20 percent loss is estimated for the exterior eyebar at the same location.
Truss Floor System
The truss floor system consists of steel I-shaped floor beams at each interior panel point (four total) with steel stringers running longitudinally over the tops of the transverse floor beams at each interior panel point and extending onto the abutment seats at the end panel points. There are six interior I-shaped stringers and a single C-channel fascia stringer on each side, resulting in eight total stringer lines. The floor beams and stringers out in the main span area were observed from a distance and their condition information is limited, though surface and spot rusting to a 10 percent to 20 percent section loss extent at spot regions was observed. The ends of the stringers where they run onto and bear on the abutment seats were partially observed. Significant section loss to the stringer bottom flanges and lower web regions was observed at these end locations. This section loss was observed to be as much as 50 percent loss to bottom flange thickness and up to 50 percent loss to the bottom flange width in the end 18 inches of the stringers where they meet/bear onto the abutment seats.

Timber Bridge Deck
The timber bridge deck consists of 12-inch-wide by 3-inch-deep transverse deck timbers which bear on the longitudinal stringers and longitudinal timber running planks. The running planks are 12-inch-wide by 2-1/2-inch-deep planks which are secured to the transverse deck timbers within the vehicle wheel lines. The deck timbers were sounded and are estimated to be on the order of 30 percent to 40 percent deteriorated. The longitudinal runner planks are estimated to be on the order of 50 percent deteriorated with rot, cracking and general decay noted to all elements.

Truss Bearings
Steel roller (nested) bearings are present at the north end of the truss (north abutment), and the south end bearings (south abutment) appear to be fixed steel shoe bearings. The north end expansion bearings appear significantly compromised due to section loss and pack rust. The northeast bearing was observed to be fully extended (contracted orientation) towards the river (span interior) with the bearing plate anchor rods also significantly racked inward towards the span interior. Significant loss in composition/bearing to the concrete cap (over the stone masonry) directly beneath the truss bearing was also observed in the northeast corner.

Steel Bridge Rails
The bridge railing is made up of two horizontal angle members as rails, connected to vertical truss members by bolted angle plates. Intermediate railing posts are situated at the midpoint of each panel, each composed of an angle bolted to the rails and connected to the fascia stringers. The railing is generally intact, though some individual members have been hit/twisted/displaced.

Approach “Roadway”
The approaches are generally intact, though noticeably overgrown etc., due to road closure. Concrete barriers have been placed at each end however, it appears over time they have been moved/repositioned. It is likely that ATVs and pedestrians still cross the bridge.

Date of Engineering Site Visit by LHB
November 8, 2016
Condition 1: Closure signage at northerly bridge approach

Condition 2: 8-ton load posting sign at north end of bridge
Condition 3: Bridge L4778, north end view

Condition 4: Bridge L4778, looking northeast
Condition 5: South concrete abutment, looking west – note large areas of delamination

Condition 6: Delamination and spalling, southwest corner of south abutment
IV – Existing Conditions/Recommendations

Bridge Number: L4778

Condition 7: North stone masonry abutment

Condition 8: North abutment base, loss in composition to bedrock beneath
Condition 9: North abutment, west corner – note stone deterioration and concrete wall cap
Condition 10: North abutment, deterioration in region of east truss bearing (concrete cap over stone masonry)

Condition 11: Underside structure view looking towards south abutment
Condition 12: Top deck view, looking north

Condition 13: Deterioration in transverse deck timbers and longitudinal runner planks
Condition 14: Deterioration in transverse deck timbers

Condition 15: Section loss in floor stringer ends at abutment seat (typical)
Condition 16: Section loss, floor stringer ends at abutments (typical)

Condition 17: Failing roller (nested) expansion bearing, north abutment, east truss
Condition 18: Vertical to lower chord connection (L1 and L4)
Condition 19: Deterioration in lower chord eyebars, truss pin and bearing plates

Condition 20: Close-up view of Condition 19 photo
Overall Recommendations

The bridge is currently closed to vehicular traffic though the concrete barricades at either end of the bridge have been moved sufficiently to allow passage of ATVs and similar traffic. Until the bridge can be thoroughly inspected and assessed for vehicular loading, including ATVs and similar, and until the bridge is placed on a routine inspection cycle, it is recommended the concrete barricades be realigned to maintain bridge closure to all vehicle types.

The recommendations that follow present a scenario for rehabilitation which would allow for the bridge to be restored to its original load capacity and returned to service potentially for single lane vehicular or pedestrian trail/ ATV use etc.

Recommended Stabilization Activities

1. No immediate stabilization activities for structure preservation beyond the overall preservation recommendations have been identified.

Recommended Preservation Activities

Due to the size of this bridge and its span over the waterway, access to critical portions of the structure was extremely limited. All observations and quantity estimates were made from ground level beneath the bridge and from assessment of the bridge from the bridge deck. As such, the following recommendations are generalized. A more in-depth inspection utilizing the appropriate access equipment to permit hands-on inspection and subsequent load analysis should be undertaken to better quantify required repairs prior to completing the rehabilitation assessment or undertaking any rehabilitation work.

Abutments and Wingwalls

Both abutments are in a significantly deteriorated state. Because of its modular construction (comprised of block stone elements), it is believed the north abutment can be rehabilitated/ rebuilt through disassembly and reassembly, and select replacement of deficient/ deteriorated stones. To maintain historic integrity and meet SOI Standards, it will be required for the existing features, geometry, stone orientation etc. to be fully documented to ensure replication prior to dis-assembly, and for the work to proceed in accordance with the SOI Standards. This will include requiring the existing historic masonry and pointing mortar to be analyzed and matched in terms of proper compressive strength, color, and texture as well as ensuring replacement stones match the original stones in terms of geometry, color, texture and grain patterning. Maintaining the original stone assembly patterns, orientation, size variation and mortar joint width and pointing profile will also be essential. It is believed the original abutment incorporated a concrete cap as presently exists and it should be re-established in accordance with original details as best they can be determined through further research and assessment. Prior to rehabilitation of the north abutment the composition of the underlying/ exposed bedrock beneath the abutment should be further assessed to ensure its long-term competency and adequacy for supporting the rebuilt abutment.

The north abutment is constructed of stone masonry and the south abutment is concrete. It could not be concluded during this study whether this is an original condition or if the concrete abutment is an alteration. Given the lack of evidence/information it is recommended that, prior to completing a final
Minnesot a Departmen t of Transportatio n (MnDOT)
Local Historic Bridge Report

IV – Existing Conditions/Recommendations

Bridge Number: L4778

preservation scope, further research be conducted to determine the original construction material of the south abutment. For purposes of this study, the recommendations will assume that the south abutment was originally concrete.

The south abutment concrete is significantly deteriorated and further study will be required to determine if it can be rehabilitated or will require full replacement. Well over half of the exposed concrete surface is delaminated with much of it extending a foot or more in depth. Additionally, back side delaminations were observed in the few regions where the abutment back side was exposed. Further study is recommended to determine the overall condition of the south abutment and if rehabilitation efforts are possible. SOI Rehabilitation Standards will allow for full in-kind replacement of the abutment if the level of deterioration precludes rehabilitation. If it is determined rehabilitation is feasible, it is recommended the abutment be repaired. Repairs would consist primarily of complete resurfacing of the exterior abutment face to a significant depth along with back face and seat repairs, as feasible. Concrete work will need to be performed in accordance with SOI Standards (as would also be required for concrete work for a replacement abutment), including matching the original historic concrete color, texture, forming and surface finishing. For the purposes of this study, this work scope presumes full replacement of the south abutment.

Steel Trusses and Truss Floor System

Steel Trusses

The steel trusses will require miscellaneous repairs at areas of localized section loss. Most significant areas of section loss, noted from the field assessment, are the lower chord eyebar ends, particularly at the north end of the west truss as well as the truss pins at the same locations. These elements are recommended to be replaced in-kind. Any replacement should be done in a manner which utilizes a member of like geometry, shape, and materials as the original. A load capacity rating for the intended bridge use/ load requirements should be performed to establish the required extent of strengthening repairs or replacements. Following repair or replacement of the required elements, the truss (and floor support elements) should be blasted and repainted. There is very little of the existing paint system still in place, however due to the structure’s age it is presumed what remains likely contains lead. Due to the toxicity of lead, the removal of a lead paint system requires an intensive encapsulation process.

Truss Floor System

The in-place floor beams could not be accessed to determine condition. This work scope presumes rehabilitation and repairs to the floorbeams will be required. It is presumed they can be rehabilitated in place and a cost allowance has been included in the preservation work scope for potential repairs needed. It is believed longitudinal stringer work will consist of a combination of some strengthening repairs as well as in-kind replacement of some of the more deteriorated interior I-beam stringers and fascia channel stringers.

Truss Bearings

The north end expansion bearings are heavily deteriorated and compromised and should be replaced in-kind. Further study and examination of the south end fixed bearings will be needed to determine if they are able to be rehabilitated or if in-kind replacement is necessary. For purposes of the preservation
Existing Conditions/Recommendations

estimate it is assumed all four bearings will require replacement with in-kind bearings to maintain historic integrity.

Bridge Railings
The bridge railings are in fair condition. The railings at minimum would require straightening of various elements and re-establishing solid connections etc. Any major rehabilitation of the bridge that leaves the railings in their current geometric configuration and design strength will require a design exception since the existing railing does not meet the current standards for height, opening size, or strength. Further study will be warranted during the design phase of any planned rehabilitation to determine a railing design that will be acceptable aesthetically, structurally, and from a safety standpoint. For purposes of the preservation estimate it is assumed the bridge railings are preserved in kind.

Timber Deck and Runner Planks
Due to the current deteriorated condition of the timber deck planks and runner planks, this estimate assumes in-kind replacement of these elements.

Approach “Roadway”
Since the bridge is currently closed and there are no major erosion or washout concerns with the approaches there are no preservation recommendations for the approaches at this time.

Recommended Annual Maintenance Activities
1. Clean dirt, debris etc. annually from four corners of bridge at bearings/ truss end panel locations to slow rusting/ corrosion at the truss ends and bearings.

2. Assess bridge annually/ as warranted to remove flood debris accumulation.

3. Maintain closure barricades in proper position and closure signage.
**Summary Maintenance, Stabilization and Preservation Construction Cost Estimates**

It is important to recognize that the work scope and cost estimates presented herein are based on a limited level assessment of the existing structure. In moving forward with future project planning, it will be essential to undertake a detailed structure assessment addressing the proposed work for the structure. It is also important that any future preservation work follow applicable preservation standards with emphasis to rehabilitate and repair in-place structure elements in lieu of replacement. This includes elements which are preliminarily estimated for replacement within the work scope of this report. Only through a thorough review of rehabilitation and repair options and comprehensive structural and historic assessment can a definitive conclusion for replacement of historic fabric be formed.

The opinions of probable construction and administrative costs provided below are presented in 2016 dollars. These costs were developed without benefit of a detailed, thorough bridge inspection, bridge survey or completion of preliminary design for the estimated improvements. The estimated costs represent an opinion based on background knowledge of historic unit prices and comparable work performed on other structures. The opinions of cost are intended to provide a programming level of estimated cost. These costs will require refinement and may require significant adjustments as further analysis is completed in determining the course of action for future structure improvements. A 20 percent contingency and 7 percent mobilization allowance has been included in the construction cost estimates.

Administrative and engineering costs are also presented below. Engineering and administrative costs are also to be interpreted as programming level only. Costs can be highly variable and are dependent on structure condition, intended work scope, project size and level of investigative, testing and documentation work necessary. Additional studies, evaluation, and historic consultation costs not exclusively called out may also be incurred on a case-by-case basis.

**Maintenance, Stabilization, and Preservation Costs (refer to the work item breakdown on the next page)**

- **Opinion of Annual Cost- Maintenance Activities:** $1,800
- **Opinion of Construction Cost- Stabilization Activities:** $0
- **Opinion of Construction Cost- Preservation Activities:** $991,220

**Estimated Preliminary Design, Final Design, Construction Administration Costs**

- **Preliminary Design and Assessment:** $20,000
- **Final Design and Plans:** $90,000
- **Construction Administration:** $100,000
### MAINTENANCE, STABILIZATION & PRESERVATION COST ESTIMATE (2016 DOLLARS)

**Bridge No. L4778**  
*July 17, 2017*

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<th>ITEM NO.</th>
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**STABILIZATION COSTS**

No stabilization activities identified.

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**PRESERVATION COSTS**

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<td></td>
<td><strong>$991,220.00</strong></td>
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Appendix A. Glossary
**Glossary**

**Abutment** – Component of bridge substructure at either end of bridge that transfers load from superstructure to foundation and provides lateral support for the approach roadway embankment.

**Appraisal ratings** – Five National Bridge Inventory (NBI) appraisal ratings (structural evaluation, deck geometry, under-clearances, waterway adequacy, and approach alignment, as defined below), collectively called appraisal ratings, are used to evaluate a bridge’s overall structural condition and load-carrying capacity. The evaluated bridge is compared with a new bridge built to current design standards. Ratings range from a low of 0 (closed bridge) to a high of 9 (superior). Any appraisal item not applicable to a specific bridge is coded N.

**Approach alignment** – One of five NBI inspection ratings. This rating appraises a bridge’s functionality based on the alignment of its approaches. It incorporates a typical motorist’s speed reduction because of the horizontal or vertical alignment of the approach.

**Character-defining features** – Prominent or distinctive aspects, qualities, or characteristics of a historic property that contribute significantly to its physical character. Features may include structural or decorative details and materials.

**Condition, fair** – A bridge or bridge component of which all primary structural elements are sound, but may have minor deterioration, section loss, cracking, spalling, or scour.

**Condition, good** – A bridge or bridge component which may have some minor deficiencies, but all primary structural elements are sound.

**Condition, poor** – A bridge or bridge component that displays advanced section loss, deterioration, cracking, spalling, or scour.

**Condition rating** – Level of deterioration of bridge components and elements expressed on a numerical scale according to the NBI system. Components include the substructure, superstructure, deck, channel, and culvert. Elements are subsets of components, e.g., piers and abutments are elements of the component substructure. The evaluated bridge is compared with a new bridge built to current design standards. Component ratings range from 0 (failure) to 9 (new) or N for (not applicable); elements are rated on a scale of 1-3, 1-4 or 1-5 (depending on the element type and material). In all cases condition state 1 is the best condition with condition state 3, 4 or 5 being the worst condition. In rating a bridge’s condition, MnDOT pairs the NBI system with the newer and more sophisticated Pontis element inspection information, which quantifies bridge elements in different condition states and is the basis for subsequent economic analysis.

**Corrosion** – The general disentegration of metal through oxidation.

**Cutwater** – The wedge-shaped end of a bridge pier, designed to divide the current and break up ice.
*Decay* – Deterioration of wood as a result of fungi feeding on its cell walls.

*Delamination* – Surface separation of concrete, steel, glue laminated timber plies etc. into layers.

*Deck geometry* – One of five NBI appraisal ratings. This rating appraises the functionality of a bridge's roadway width and vertical clearance, taking into account the type of roadway, number of lanes, and ADT.

*Deficiency* – The inadequacy of a bridge in terms of structure, serviceability, and/or function. Structural deficiency is determined through periodic inspections and is reflected in the ratings that are assigned to a bridge. Service deficiency is determined by comparing the facilities a bridge provides for vehicular, bicycle, and pedestrian traffic with those that are desired. Functional deficiency is another term for functionally obsolete (see below). Remedial activities may be needed to address any or all of these deficiencies.

*Deficiency rating* – A nonnumeric code indicating a bridge’s status as structurally deficient (SD) or functionally obsolete (FO). See below for the definitions of SD and FO. The deficiency rating status may be used as a basis for establishing a bridge’s eligibility and priority for replacement or rehabilitation.

*Design exception* – A deviation from federal design and geometric standards that takes into account environmental, scenic, aesthetic, historic, and community factors that may have bearing upon a transportation project. A design exception is used for federally funded projects where federal standards are not met. Approval requires appropriate justification and documentation that concerns for safety, durability, and economy of maintenance have been met.

*Design load* – The usable live-load capacity that a bridge was designed to carry, expressed in tons according to the AASHTO allowable stress, load factor, or load resistance factor rating methods. An additional code was recently added to assess design load by a rating factor instead of tons. This code is used to determine if a bridge has sufficient strength to accommodate traffic load demands. A bridge that is posted for load restrictions is not adequate to accommodate present or expected legal truck traffic.

*Deterioration* – Decline in condition of surfaces or structure over a period of time due to chemical or physical degradation.

*Efflorescence* – A deposit on concrete or brick caused by crystallization of carbonates brought to the surface by moisture in the masonry or concrete.

*Extant* – Currently or actually existing.

*Extrados* – The upper or outer surfaces of the voussoirs which compose the arch ring. Often contrasted with intrados.
**Footing** – The enlarged, lower portion of a substructure which distributes the structure load either to the earth or to supporting piles.

**Fracture Critical Members** – Tension members or tension components of bending members (including those subject to reversal of stress) whose failure would be expected to result in collapse of the bridge.

**Functionally obsolete** – The Federal Highway Administration (FHWA) classification of a bridge that does not meet current or projected traffic needs because of inadequate horizontal or vertical clearance, inadequate load-carrying capacity, and/or insufficient opening to accommodate water flow under the bridge. An appraisal rating of 3 or less for deck geometry, underclearance, approach alignment, structural evaluation or waterway adequacy will designate a bridge as functionally obsolete.

**Gusset plate** – A plate that connects the horizontal and vertical members of a truss structure and holds them in correct position at a joint.

**Helicoidal** – Arranged in or having the approximate shape of a flattened coil or spiral.

**Historic fabric** – The material in a bridge that was part of original construction or a subsequent alteration within the historic period of the bridge (i.e., more than 50 years old). Historic fabric is an important part of the character of the historic bridge and the removal, concealment, or alteration of any historic material or distinctive engineering or architectural feature should be avoided if possible. Often, the character-defining features include important historic fabric. However, historic fabric can also be found on other elements of a bridge that have not been noted as character-defining.

**Historic bridge** – A bridge that is listed in, or eligible for listing in, the National Register of Historic Places.

**Historic integrity** – The authenticity of a bridge’s historic identity, evidenced by the survival and/or restoration of physical characteristics that existed during the bridge’s historic period. A bridge may have integrity of location, design, setting, materials, workmanship, feeling, and association.

**Inspections** – Periodic field assessments and subsequent consideration of the fitness of a structure and the associated approaches and amenities to continue to function safely.

**Intrados** – The inner or lower surface of an arch. Often contrasted with extrados.

**Inventory rating** – The load level a bridge can safely carry for an indefinite amount of time expressed in tons or by the rating factor described in design load (see above). Inventory rating values typically correspond to the original design load for a bridge without deterioration.

**Keystone** – Wedge-shaped stone, or voussoir, at the crown of an arch.
**Load Rating** – The determination of the live load carrying capacity of a bridge using bridge plans and supplemented by field inspection.

**Maintenance** – Work of a routine nature to prevent or control the process of deterioration of a bridge.

**Minnesota Historical Property Record** – A documentary record of an important architectural, engineering, or industrial site, maintained by the Minnesota Historical Society as part of the state’s commitment to historic preservation. MHPR typically includes large-format photographs and written history, and may also include historic photographs, drawings, and/or plans. This state-level documentation program is modeled after a federal program known as the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER).

**National Bridge Inventory** – Bridge inventory and appraisal data collected by the FHWA to fulfill the requirements of the National Bridge Inspection Standards (NBIS). Each state maintains an inventory of its bridges subject to NBIS and sends an annual update to the FHWA.

**National Bridge Inspection Standards** – Federal requirements for procedures and frequency of inspections, qualifications of personnel, inspection reports, and preparation and maintenance of state bridge inventories. NBIS applies to bridges located on public roads.

**National Register of Historic Places** – The official inventory of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture, which is maintained by the Secretary of the Interior under the authority of the National Historic Preservation Act of 1966 (as amended).

**Non-vehicular traffic** – Pedestrians, non-motorized recreational vehicles, and small motorized recreational vehicles moving along a transportation route that does not serve automobiles and trucks. Includes bicycles and snowmobiles.

**Operating rating** – Maximum permissible load level to which a bridge may be subjected based on a specific truck type, expressed in tons or by the rating factor described in design load (see above).

**Pack rust** – Rust forming between adjacent steel surfaces in contact which tends to force the surfaces apart due to the increase in steel volume.

**Pier** – A substructure unit that supports the spans of a multi-span superstructure at an intermediate location between its abutments.

**Pointing** – The compaction of mortar into the outermost portion of a joint and the troweling of its exposed surface to secure water tightness and/or desired architectural effect (when replacing deteriorated mortar).
**Pony truss** – A through bridge with parallel chords and having no top lateral bracing over the deck between the top chords.

**Posted load** – Legal live-load capacity for a bridge which is associated with the operating rating. A bridge posted for load restrictions is inadequate for legal truck traffic.

**Pontis** – Computer-based bridge management system to store inventory and inspection data and assist in other bridge data management tasks.

**Preservation** – Preservation, as used in this report, refers to historic preservation that is consistent with the Secretary of the Interior’s *Standards for the Treatment of Historic Properties*. Historic preservation means saving from destruction or deterioration old and historic buildings, sites, structures, and objects, and providing for their continued use by means of restoration, rehabilitation, or adaptive reuse. It is the act or process of applying measures to sustain the existing form, integrity, and material of a historic building or structure, and its site and setting. MnDOT’s *Bridge Preservation, Improvement and Replacement Guidelines* describe preservation differently, focusing on repairing or delaying the deterioration of a bridge without significantly improving its function and without considerations for its historic integrity.

**Preventive maintenance** – The planned strategy of cost-effective treatments that preserve a bridge, slow future deterioration, and maintain or improve its functional condition without increasing structural capacity.

**Reconstruction** – The act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location. Activities should be consistent with the Secretary of the Interior’s *Standards for the Treatment of Historic Properties*.

**Rehabilitation** – The act or process of returning a historic property to a state of utility through repair or alteration which makes possible an efficient contemporary use, while preserving those portions or features of the property that are significant to its historical, architectural, and cultural values. Historic rehabilitation, as used in this report, refers to implementing activities that are consistent with the Secretary of the Interior’s *Standards for the Treatment of Historic Properties*. As such, rehabilitation retains historic fabric and is different from replacement. MnDOT’s *Bridge Preservation, Improvement and Replacement Guidelines* describe rehabilitation and replacement in similar terms.

**Restoration** – The act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time. Activities should be consistent with the Secretary of the Interior’s *Standards for the Treatment of Historic Properties*.

**Ring stone** – One of the separate stones of an arch that shows on the face of the headwall, or end of the arch. Also known as a voussoir.
**Scaling** – The gradual distentegration of a concrete surface due to the failure of the cement surface caused by chemical attack or freeze-thaw cycles or rebar too close to the surface and oxidizing from exposure to chlorides.

**Scour** – Removal of material from a river’s bed or bank by flowing water, compromising the strength, stability, and serviceability of a bridge.

**Scour critical rating** – A measure of a bridge’s vulnerability to scour (see above). MnDOT utilizes letter designations to represent specific descriptions of a bridges susceptibility and/ or present condition in regards to scour. Range in condition and scour susceptibility does not necessarily correlate alpha numerically to the MnDOT scour code letters so it is important to understand the specific scour description for each MnDOT scour code. The scour codes and descriptions can be found in the “MNDOT Bridge Inspection Field Manual”.

**Section loss** – Loss of a member’s cross sectional area and resulting strength usually by corrosion or decay.

**Serviceability** – Level of facilities a bridge provides for vehicular, bicycle, and pedestrian traffic, compared with current design standards.

**Smart flag** – Special Pontis inspection element used to report the condition assessment of a deficiency that cannot be modeled, such as cracks, section loss, and steel fatigue.

**Spall** – Depression in concrete caused by a separation of a portion of the surface concrete, revealing a fracture parallel with or slightly inclined to the surface.

**Spring line** – The imaginary horizontal line at which an arch or vault begins to curve. As example, the point of transition from the vertical face of an abutment to the start of arch curvature extending from abutment face.

**Stabilization** – The act or process of stopping or slowing further deterioration of a bridge by means of making minor repairs until a more permanent repair or rehabilitation can be completed.

**Stringcourse** – A horizontal band of masonry, generally narrower than other courses and sometimes projecting, that extends across the structure’s horizontal face as an architectural accent. Also known as belt course.

**Structural evaluation** – Condition rating of a bridge designed to carry vehicular loads, expressed as a numeric value and based on the condition of the superstructure and substructure, the inventory load rating, and the ADT.
**Structurally deficient** – Classification indicating NBI condition rating of 4 or less for any of the following: deck condition, superstructure condition, substructure condition, or culvert condition. A bridge is also classified as structurally deficient if it has an appraisal rating of 2 or less for its structural evaluation or waterway adequacy. A structurally deficient bridge is restricted to lightweight vehicles; requires immediate rehabilitation to remain open to traffic; or requires maintenance, rehabilitation, or replacement.

**Sufficiency rating** – Rating of a bridge’s structural adequacy and safety for public use, and its serviceability and function, expressed on a numeric scale ranging from a low of 0 to a high of 100. It is a relative measure of a bridge’s deterioration, load capacity deficiency, or functional obsolescence. MnDOT may use the rating as a basis for establishing eligibility and priority for replacement or rehabilitation. Typically, bridges which are structurally deficient and have sufficiency ratings between 50 and 80 are eligible for federal rehabilitation funds and those which are structurally deficient with sufficiency ratings of 50 and below are eligible for replacement.

**Through truss** – A bridge with parallel top and bottom chords and top lateral bracing with the deck generally near the bottom chord.

**Under-clearances** – One of five NBI appraisal ratings. This rating appraises the suitability of the horizontal and vertical clearances of a grade-separation structure, taking into account whether traffic beneath the structure is one- or two-way.

**Variance** – A deviation from State Aid Operations Statute Rules that takes into account environmental, scenic, aesthetic, historic, and community factors that may have bearing upon a transportation project. A design variance is used for projects using state aid funds. Approval requires appropriate justification and documentation that concerns for safety, durability and economy of maintenance have been met.

**Vehicular traffic** – The passage of automobiles and trucks along a transportation route.

**Voussoir** – One of the separate stones forming an arch ring; also known as a ring stone.

**Waterway adequacy** – One of five NBI appraisal ratings. This rating appraises a bridge’s waterway opening and passage of flow under or through the bridge, frequency of roadway overtopping, and typical duration of an overtopping event.
Appendix B. Guidelines for Bridge Maintenance and Rehabilitation based on the Secretary of the Interior’s Standards
The Secretary’s Standards with Regard to Repair, Rehabilitation, and Replacement Situations

Adapted from:

The Secretary of the Interior’s Standards for the Treatment of Historic Properties, first codified in 1979 and revised in 1992, have been interpreted and applied largely to buildings rather than engineering structures. In this document, the differences between buildings and structures are recognized and the language of the Standards has been adapted to the special requirements of historic bridges.

1. Every reasonable effort shall be made to continue an historic bridge in useful transportation service. Primary consideration shall be given to rehabilitation of the bridge on site. Only when this option has been fully exhausted shall other alternatives be explored.

2. The original character-defining qualities or elements of a bridge, its site, and its environment should be respected. The removal, concealment, or alteration of any historic material or distinctive engineering or architectural feature should be avoided.

3. All bridges shall be recognized as products of their own time. Alterations that have no historic basis and that seek to create a false historic appearance shall not be undertaken.

4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.

5. Distinctive engineering and stylistic features, finishes, and construction techniques or examples of craftsmanship that characterize an historic property shall be preserved.

6. Deteriorated structural members and architectural features shall be retained and repaired, rather than replaced. Where the severity of deterioration requires replacement of a distinctive element, the new element should match the old in design, texture, and other visual qualities and where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

7. Chemical and physical treatments that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the most environmentally sensitive means possible.
8. Significant archaeological and cultural resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

9. New additions, exterior alterations, structural reinforcements, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.
Appendix C. Documents
Additional Electronic Data
Bridge L4778

Historic Data
- Research

Local Data
- L4778_Information from County Engineer

MnDOT Reports
- L4778_Bridge Rating_2004
- L4778_Inspection Report_04-29-2010
- L4778_Structure Inventory Report_10-20-2015
- L4778_Structure Inventory Report_11-07-2016
- L4778_Crash Detail Report_07-18-2016

Photos
- L4778_M&H Photos_11-24-2015
- L4778_JDL Report Site Visit_11-08-2016
- L4778_Report Photos

Plans
- N/A
STRUCTURE UNIT: 0

<table>
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<tr>
<th>ELEM NBR</th>
<th>ELEMENT NAME</th>
<th>ENV INSPECT DATE</th>
<th>QUANTITY</th>
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<th>QTY CS 2</th>
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<td>Notes:</td>
<td>[2007] - Timber planks added at the wheel path. The ends of the deck timber are splitting and starting to decay.</td>
<td></td>
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<td>334</td>
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<tr>
<td>Notes:</td>
<td>[2006] - Minor distortion to the railing. Failed paint with active corrosion to all of the rail sections. All rail sections are firmly attached to the bridge. The ends of the railing attach into the truss end posts. The Condition State railing has changed due to the 2006 revision to Mn/DOT's Bridge Inspection Manual.</td>
<td></td>
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<td></td>
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<td>PAINT STEEL STRINGER</td>
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<td>560</td>
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<td>0</td>
<td>561</td>
<td>240</td>
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<td>Notes:</td>
<td>[2006] - Complete paint system failure with active corrosion. There are areas of minor section loss to the ends of the stringers at the abutments and to the top flange of the stringers.</td>
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<tr>
<td>121</td>
<td>P/STL THRU TRUSS/BOT</td>
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<td>0</td>
<td>180</td>
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<td>0</td>
<td>0</td>
<td>180</td>
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<td>0</td>
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<td>Notes:</td>
<td>[2006] - Pin and eye bar lower chord. Complete paint system failure with active corrosion, paint rust, and loss of section. The paint rust between the vertical gusset and the vertical member at panel point L2 on the east truss and L3 on the west truss has caused up to 1/16&quot; loss of section to the 1/4&quot; thick gusset plate. THESE PANEL POINTS ARE APPROACHING A CONDITION STATE 5 AND IF LEFT UATTENDED WILL EVENTUALLY REQUIRE ANALYSIS AND OR REPAIR. 2008 - THESE PANEL POINTS ARE CURRENTLY IN THE SAME CONDITION AS REPORTED IN 2007. 2010 - These panel points are approaching a Cond. State 5, but currently are in the same condition as reported in 2008. If the above panel points are left unattended they will eventually require analysis and or repair.</td>
<td></td>
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<td>126</td>
<td>P/STL THRU TRUSS/TOP</td>
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<tr>
<td>Notes:</td>
<td>[2006] - Complete paint system failure with active corrosion and minor loss of section. There is pitting corrosion located at the interior surfaces of the upper chord.</td>
<td></td>
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<td>152</td>
<td>PAINT STL FLOORBEAM</td>
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<td>Notes:</td>
<td>[2006] - Complete paint system failure with active corrosion and minor loss of section.</td>
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<tr>
<td>425</td>
<td>PINNED CONN (PAINT)</td>
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<td>20 EA</td>
<td>0</td>
<td>20</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>Notes:</td>
<td>[2010] - The connection should be a pinned connection not a gusset plate connection. All of the pinned connections are experiencing paint system failure with surface corrosion and paint rust between the eye bar ends. This paint rust has caused minor areas of distortion between the eye bar ends. The eye bar pins were ultrasonically inspected in 2006. No indications were detected.</td>
<td></td>
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<tr>
<td>311</td>
<td>EXPANSION BEARING</td>
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<td>N/A</td>
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<tr>
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<td>2 EA</td>
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<td>0</td>
<td>2</td>
<td>N/A</td>
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<tr>
<td>Notes:</td>
<td>[2006] - The movable bearings (roller nest) are located on the north end of the bridge. The bridge is tight up against the abutment. The bearings are not functioning as designed.</td>
<td></td>
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# Mn/DOT Bridge Inspection Report

**Structure Unit:** 0  
**Bridge:** LA778  
**TWP 222 Over Mill Pond S Branch Root**  
**Inspected by:** Fillmore County  
**Inspection Date:** 04-29-2010

<table>
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<th>ENV INSP. DATE</th>
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<td>313</td>
<td>FIXED BEARING</td>
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<tr>
<td></td>
<td></td>
<td>07-09-2009</td>
<td>2 EA</td>
<td></td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>N/A</td>
</tr>
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<tr>
<td>Notes:</td>
<td>The fixed bearings are located at the south end of the bridge. Paint system failure with active corrosion.</td>
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<td>16</td>
<td>0</td>
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<td>04-29-2010</td>
<td></td>
<td>04-29-2010</td>
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<tr>
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<td>07-09-2009</td>
<td>18 LF</td>
<td></td>
<td>0</td>
<td>0</td>
<td>16</td>
<td>N/A</td>
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<tr>
<td>Notes:</td>
<td>South abutment - exposed rebar entire lower portion of the abutment. The concrete is deteriorated and cracked along the entire face of the abutment.</td>
<td></td>
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<tr>
<td>217</td>
<td>ABUTMENT - OTHER</td>
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<td>04-29-2010</td>
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<td>04-29-2010</td>
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<td>07-09-2009</td>
<td>18 LF</td>
<td></td>
<td>0</td>
<td>0</td>
<td>16</td>
<td>N/A</td>
</tr>
<tr>
<td>Notes:</td>
<td>North abutment - block and mortar is deteriorated along the entire face of the abutment. There is approximately 25% loss of bearing area under the east and west side movable bearings.</td>
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<tr>
<td>387</td>
<td>CONCRETE WINGWALL</td>
<td>2</td>
<td>4 EA</td>
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<td>4</td>
<td>0</td>
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<td>04-29-2010</td>
<td></td>
<td>04-29-2010</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>07-09-2009</td>
<td>4 EA</td>
<td></td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>N/A</td>
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</table>
| Notes:   | SW wingwall - Has deteriorated concrete on the entire surface of the wingwall. There is a vertical crack that extends 3/4 of the wingwall height. There is an exposed horizontal rebar in the end of the wingwall. The wingwall is separated from the abutment. No tilting or leaning of the wingwall.  
SE wingwall - Has significant areas of deteriorated concrete. The original end of the wingwall is broken off. There is exposed reinforcement at the end of the wingwall. No tilting or movement.  
NE wingwall - Reinforced concrete resting on top of a block and mortar wingwall. The top of the wingwall has shifted. The end of the concrete portion of the wingwall has shifted to the east and is hanging out over the east end of the north abutment.  
NW wingwall - Reinforced concrete resting on top of block and mortar wingwall. The top of the wingwall has shifted to the west. |
| 357      | PACK RUST            | 2              | 1 EA     | 0        | 0        | 1        | 0        | N/A      |
|          |                      | 04-29-2010     |          | 04-29-2010 |          |          |          |          |
|          |                      | 07-09-2009     | 1 EA     |          | 0        | 1        | 0        | N/A      |
| Notes:   | There is pack rust at the faying surfaces between the upper chord channels and the riveted plates and between the I bars of the lower chord. See notes for element 121. |
| 360      | SETTLEMENT           | 2              | 1 EA     | 1        | 0        | 0        | N/A      | N/A      |
|          |                      | 04-29-2010     |          | 04-29-2010 |          |          |          |          |
|          |                      | 07-09-2009     | 1 EA     |          | 0        | 1        | 0        | N/A      |
| Notes:   | The top portion of the north end wingwalls has shifted. |
| 361      | SCOUR                | 2              | 1 EA     | 1        | 0        | 0        | N/A      | N/A      |
|          |                      | 04-29-2010     |          | 04-29-2010 |          |          |          |          |
|          |                      | 07-09-2009     | 1 EA     |          | 1        | 0        | 0        | N/A      |
| Notes:   | [2008] R - Scour critical. Monitoring required. |
| 363      | SECTION LOSS         | 2              | 1 EA     | 0        | 1        | 0        | 0        | N/A      |
|          |                      | 04-29-2010     |          | 04-29-2010 |          |          |          |          |
|          |                      | 07-09-2009     | 1 EA     |          | 1        | 0        | 0        | N/A      |
| Notes:   | [2008] Minor loss of section to the ends of the stringers and the floorbeams. See notes for element 121 and 126. |
| 964      | CRITICAL FINDING     | 2              | 1 EA     | 1        | 0        | N/A      | N/A      | N/A      |
|          |                      | 04-29-2010     |          | 04-29-2010 |          |          |          |          |
|          |                      | 07-09-2009     | 1 EA     |          | 1        | 0        | N/A      | N/A      |
| Notes:   | [2008] No critical findings were observed at the time of inspection. |
| 966      | FRACTURE CRITICAL    | 2              | 1 EA     | 1        | 0        | 0        | N/A      | N/A      |
|          |                      | 04-29-2010     |          | 04-29-2010 |          |          |          |          |
|          |                      | 07-09-2009     | 1 EA     |          | 1        | 0        | 0        | N/A      |
| Notes:   | [2008] An in-depth fracture critical inspection was completed on the bridge in June of 2007. |
## Mn/DOT Bridge Inspection Report

**Bridget L4778 TWP 222 Over Mill Pond S Branch Root**  
**Inspection Date: 04-29-2010**

### Structure Unit: 0

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<th>ELEMENT NAME</th>
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<th>QUANTITY</th>
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<td></td>
<td>07-09-2009</td>
<td>1 EA</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
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</tbody>
</table>

**Notes:**  
* [[2006] - The north end delineator signs that are glued to the end posts of the truss are no longer effective. The south end delineator sign posts are welded to the truss end posts. The south end load posting sign is loose and leaning. [2007] - The South end load posting sign is laying down along the east wingwall. 2010 - all the signs need to be replaced.]*

| 985  | SLOPES         | 04-29-2010      | 1 EA     | 0   | 0   | 1   | N/A | N/A |     |
|      |                | 07-09-2009      | 1 EA     | 0   | 0   | 1   | N/A | N/A |     |

**Notes:**  
* [[2006] - There is significant slope erosion at all of the wingwalls.]*

| 988  | MISCELLANEOUS  | 04-29-2010      | 1 EA     | 1   | 0   | 0   | N/A | N/A |     |
|      |                | 07-09-2009      | 1 EA     | 1   | 0   | 0   | N/A | N/A |     |

**Notes:**  
* [[2006] - There is a utility line attached to the north abutment and the lower chord of the east truss.]*

| 967  | GUSSET DISTORTION | 04-29-2010 | 1 EA | 0   | 1   | 0   | 0   | N/A |     |
|      |                    | 07-09-2009 | 1 EA | 0   | 1   | 0   | 0   | N/A |     |

**Notes:**  
* [[2009-see element 423]]*

### General Notes:

- There is bank erosion to the downstream side of the bridge. A new bridge has been added at the golf course downstream of the truss. This bridge is higher than the old bridge.
- An in-depth fracture critical inspection was completed on the bridge in October of 2002.  
- **Inspected by Eric Evans**

An in-depth fracture critical inspection was completed on the bridge in October of 2002. For this report the downstream truss is the east side of the bridge and the north end of the bridge is on the same end as the Old Barn site. There is bank erosion to the downstream side of the bridge. A new bridge has been added at the golf course downstream of the truss. This bridge is higher than the old bridge. All of the banks are well vegetated.  
A new bridge has been added upstream of the truss.  
2007 - inspected by Eric Evans

An in-depth fracture critical inspection was completed on the bridge in 2007. For this report the downstream truss is the east side of the bridge and the north end of the bridge is on the same end as the Old Barn site. There is bank erosion to the downstream side of the bridge. There are bridges that cross the river at the golf course downstream and upstream of the truss. All of the banks are well vegetated.

2008 - inspected by Eric Evans

An in-depth fracture critical inspection was completed on the bridge in June of 2007. For this report the downstream truss is the east side of the bridge and the north end of the bridge is on the same end as the Old Barn site. There is bank erosion to the downstream side of the bridge. There are bridges that cross the river at the golf course downstream and upstream of the truss. All of the banks are well vegetated.

2009 - inspected by Eric Evans & Ramon Riba

2010 - inspected by Eric Evans

No change 2009

---

**Inspector's Signature**  
**Reviewer's Signature / Date**
## MINNESOTA STRUCTURE INVENTORY REPORT

**Bridge ID:** L4778  **TWP 222 over MILL POND S BRANCH ROOT**  
**Date:** 11/07/2016

### GENERAL
- **Agency Br. No.:**  
- **District:** 6  **Mant. Area:**  
- **County:** 23 - FILMMORE  
- **City:**  
- **Township:** CARROLTON  
- **Desc. Loc.:** 0.8 MI E OF JCT CSAH 17  
- **Sect., Twp., Range:** 21 - 100N - 10W  
- **Latitude:** 43d 42m 34.94s  
- **Longitude:** 92d 02m 00.76s  
- **Owner:** TOWNSHIP  
- **Inspection By:** OTHER  
- **Year Built:** 1974  
- **MN Year Remodeled:**  
- **FHWA Year Reconstructed:**  
- **Bridge Plan Location:** NO PLAN  
- **Potential ABC:** N.A.

### ROADWAY
- **Bridge Match ID (TIS):** 1  
- **Roadway O/U Key:** 1-ON  
- **Route Sys/Nbr:** TWNS 222  
- **Roadway Name or Description:** TWNS 222  
- **Roadway Type:** 1 L/N:2 WAY  
- **Control Section (TH Only):**  
- **Date Opened to Traffic:** 11-01-1974  
- **Detour Length:** 8 mi.  
- **Lanes:** 1 Lane ON Bridge  
- **ADT (YEAR):** 43 (1973)  
- **HCADT:**  
- **Functional Class:** RURAL LOCAL  
- **If Divided:** NB-EB SB-WB  
- **Roadway Width:** 15.2 ft.  
- **Vertical Clearance:** 13.5 ft  
- **Max. Vert. Clear.:** 13.5 ft  
- **Horizontal Clear.:**  
- **Aprr. Surf. Wdth:** 20.0 ft  
- **Bridge Roadway Width:** 15.2 ft  
- **Median Width on Bridge:**  

### INSPECTION
- **Deficient Status:** S.D.  
- **Sufficiency Rating:** 13.8  
- **Last Inspection Date:** 04-29-2010  
- **Inspection Frequency:** 12  
- **Inspector Name:** OTHER  
- **Status:** K-CLOSED

### NSI CONDITION RATINGS
- **Deck:** 6  
- **Superstructure:** 4  
- **Substructure:** 4  
- **Channel:** 6  
- **Culvert:** N  
- **Underclearances:** N  
- **Waterway Adequacy:** 6  
- **Approach Alignment:** 3

### NSI APPRAISAL RATINGS
- **Structure Evaluation:** 0  
- **Deck Geometry:** 0  

### SAFETY FEATURES
- **Bridge Railing:** 0-SUBSTANDARD  
- **GR Transition:** 0-SUBSTANDARD  
- **APPR. Guardrail:** 0-SUBSTANDARD  
- **GR Terminai:** 0-SUBSTANDARD

### DEPTH INSPECTION
- **Frac. Critical:** Y 24 mo 09/2009  
- **Underwater:**  
- **Pinned Asbylty:**  
- **Spec. Feat.:**

### WATERWAY
- **Drainage Area:**  
- **Waterway Opening:** 1751 sq ft  
- **Navigation Control:** NOT RPM REQD  
- **Pier Protection:** NOT APPL  
- **Nav. Vert./Horiz. Clr.:**  
- **Nav. Vert. Lift Bridge Clear:**  
- **MN Scour Code:** R-CRIT,MONITOR  
- **Scour Evaluation Year:** 2006

### CAPACITY RATINGS
- **Design Load:** UNKN  
- **Operating Rating:** HS 6.00  
- **Inventory Rating:** HS 4.00  
- **Posting:** VEH: 08 SEMI; DBL:  
- **Rating Date:** 03-01-2004  
- **Overweight Permit Codes:** A: N  B: N  C: N

### STRUCTURE
- **Service On:** HIGHWAY  
- **Service Under:** STREAM  
- **Main Span Type:** STEEL HIGH TRUSS  
- **Main Span Detail:** PRATT  
- **Appr. Span Type:**  
- **Appr. Span Detail:**  
- **Skew:**  
- **Culvert Type:**  
- **Barrel Length:**
  - **Number of Spans:** MAIN: 1  APPR: 0  TOTAL: 1  
  - **Main Span Length:** 97.4 ft  
  - **Struct. Length:** 103.0 ft  
  - **Deck Length:** 16.2 ft  
  - **Deck Material:** TIMBER  
  - **Wear Surf. Type:** TIMBER  
  - **Wear Surf. Install Year:**  
  - **Wear Course/Fill Depth:** 0.04 ft  
  - **Deck Membrane:** NONE  
  - **Deck Rebars:** N/A  
  - **Deck Rebars Install Year:**  
  - **Structure Area:** 1,689 sq ft  
  - **Roadway Area:** 1,561 sq ft  
  - **Sidewalk Width - L/R:**  
  - **Curb Height - L/R:** 0.42 ft  
  - **Rail Codes - L/R:** 32 32

### MISC. BRIDGE DATA
- **Structure Flared:** NO  
- **Parallel Structure:** NONE  
- **Field Conn. ID:** PINNED  
- **Cantilever ID:**  
- **Foundations:**  
- **Abut.:** DIFF - UNKN  
- **Pier:** N/A  
- **Historic Status:** NOT ELIGIBLE  
- **On-Off System:** OFF

### PAINT
- **Year Painted:**  
- **Potted Underside:**  
- **Painted Area:**  

### BRIDGE SIGNS
- **Posted Load:** BRIDGE CLOSED  
- **Traffic:** NOT REQUIRED  
- **Horizontal:** OBJECT MARKERS  
- **Vertical:** ROADWAY RESTRICTION

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[Image: minnesota-structure-inventory-report.png]