CITY OF
WAVERLY

AGENDA MEMORANDUM
City Council Meeting
January 18, 2016

SUBJECT: 3rd Street SE Bridge Study
Presentation – Summary of Alternatives Report

Prepared By: Mike Cherry, Director of Public Works & City Engineer

Recommended City Council Action

Review the comprehensive summary of the various alternatives to repair, replace or relocate the 3rd Street SE Bridge.

Summary Statement

Representatives from WHKS & Co. will review the 3rd Street SE Bridge Study which summarizes the alternatives from the various repair, replace and relocate studies of the Bridge that were completed since 2001:

- 2001 – 3rd Street SE Bridge Repair/Replacement Feasibility Study (by WHKS)
- 2003 – 3rd Street SE Bridge Task Force Report (by WHKS)
- 2015 – 3rd Street SE Bridge Evaluation & Feasibility Study (by VJ Engineering)

Repair costs and options from the 2001 Study were updated to reflect the current condition of the Bridge and current construction pricing.

The intent of the Study is to provide the Council and community with a comprehensive summary of the options previously considered and their associated current costs along with the pros and cons. Upon reviewing and discussing the various options previously considered, the Council is then expected to provide direction as to which option(s) they want more detailed information about or if there are additional options they want explored.

A Public Open House of the various repair, relocate and replacement options is scheduled for Monday, January 18, 2016 from 5-7:00 p.m. with the formal City Council presentation to follow during the 7:00 p.m. Council meeting.

Expenditure Required

VJ Engineering	$ 27,980	
Cedar Valley Engineering	10,050	
WHKS & Co., Estimated Time & Materials	15,500	
Total Estimated Cost of the Project		**$ 53,530**

Source of Funds

Capital Project Acct 453 – City Bridge Projects	$ 144,671	
Total Financing for the Project		**$ 144,671**

Policy

The repair and maintenance of transportation structures and facilities follows recommendations cited in the following documents for the maintenance and construction of infrastructure:

- Waverly Strategic Planning Report – November 12, 2013
- Waverly Comprehensive Plan Update – October 24, 2011
- City of Waverly Hazard Mitigation Plan Update – June 2009

Project Concern

NA

Alternative

NA

Background Information

Bridge inspections began in the later part of the last century and WHKS & Co. has inspected all city bridges since 1999. Per State guidelines, all road bridges are inspected every two years, or biennially. After biennial inspections of city bridges, it was deemed appropriate by WHKS & Co. in 2013 that the 3rd Street SE truss bridge should be inspected annually. In recent reports the inspection engineers showed corrosion and deterioration of the under structure of the bridge, and suggested the formation of a plan to replace the bridge over the next several years.

The bridge was inspected in 2014 with similar findings, and during the biennial 2015 inspection on February 13, 2015, the inspectors recommended the bridge be closed immediately to both vehicle and pedestrian traffic due to advanced deterioration of the structure. Staff was not anticipating a full closure at this time, and had tentatively programmed the replacement process discussion for 2016-2017. In light of the closure, Staff researched options to obtain a feasibility report for bridge repair.

February 13, 2015	3rd Street SE Bridge Closed after Inspection
March 16, 2015	City Council Approved Engineering Agreement with VJ Engineering
July 22, 2015	VJ Engineering Presents 3rd Street SE Bridge Evaluation & Feasibility Study
August 17, 2015	Cedar Valley Engineering Proposes Bridge Repairs
September 28, 2015	City Council Approved Engineering Agreement Cedar Valley Engineering
October 5, 2015	Cedar Valley Engineering Presents Bridge Inspection & Repair Info
November 2, 2015	WHKS & Co. & Council Discuss Bridge Closure
November 16, 2015	City Council Considers Professional Services Agreement with WHKS to Update and review the various repair, relocate and replacement options
January 18, 2016	**WHKS & Co. presentation of the various repair, relocate and replacement options. Public Open House from 5-7 p.m. then Council Presentation at 7 p.m.**

Respectfully submitted,

Mike Cherry
Director of Public Works & City Engineer

Attachments: Summary of Alternatives Report

whks

engineers + planners + land surveyors

3RD STREET SE BRIDGE OVER CEDAR RIVER

Summary of Alternatives from Various Studies

Prepared for:

City of Waverly, IA
Mike Cherry
City Engineer
200 First Street NE
Waverly, IA, 50677

January 4, 2018

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Background

The 3rd Street SE Bridge spans the Cedar River and serves as one of three vehicular bridges crossing the Cedar River within the City of Waverly. The three-span truss bridge was built in 1917 and has undergone several rehabilitation projects. This structure has been a significant and important asset to the community. The bridge was closed February 13, 2015 due to serious deficiencies found during an annual inspection.

To investigate the feasibility of different repair or replacement options, the City of Waverly authorized a feasibility study in 2001, organized a task force in 2003, and then commissioned a second feasibility study in 2015. This report constitutes an update of the options presented in the 2001 and 2003 reports for comparison to the options presented in the 2015 study. Because of the time that has passed since 2003, not only have costs changed, but the scope and viability of some repair options have changed as well.

Summary of 2001 Feasibility Study

In 2001 because of the 3rd Street SE Bridge's age, deteriorating condition, increasing traffic, and susceptibility to flooding, the City of Waverly authorized WHKS to examine the bridge crossing and propose repair and replacement alternatives. The proposed alternatives are summarized in the table below. All new bridge alternatives would support two lanes of vehicular traffic.

Alternative		2001 Cost
1A	5-10 Year Lifespan Repair	$180,000
1B	10-20 Year Lifespan Repair	$720,000
1C	20-30 Year Lifespan Repair	$1,330,000
2A.1	New PPCB Bridge with 30' Roadway and 2-10' Trails	$1,460,000
2A.2	New Steel Bridge with 30' Roadway and 2-10' Trails	$1,600,000
2B.1	New PPCB Bridge with 36' Roadway and 2-6' Sidewalks	$1,420,000
2B.2	New Steel Bridge with 36' Roadway and 2-6' Sidewalks	$1,570,000
3	New Truss Bridge	$5,110,000
4	Convert Existing Bridge for Pedestrian Use	Cost not provided

The 2001 study also estimated raising the bridge (and decreasing bridge susceptibility to flooding) would add approximately $435,000 to any of the repair alternatives. Additionally, heat straightening several bent truss members would add approximately $20,000 to the repair cost.

No specific cost was provided for converting the existing bridge to a pedestrian/bike path crossing. However, the 2001 study notes that some of the repairs outlined in options 1A, 1B, and 1C would need to be completed as part of such a conversion.

The 2001 study presented the options with available funding sources but did not make a recommendation on the best course of action.

Summary of 2003 Task Force Report

In 2003 the City of Waverly commissioned a task force to consider the available options for replacement or rehabilitation of the bridge and to recommend an alternative that best served the interests of the City. The task force was formed by the City Council and made up of City staff, fifteen citizens appointed by the City Council and Mayor, staff from WHKS and Stanley Consultants, and a representative from the Iowa DOT. The task force was challenged to form a consensus recommendation from the options in the following table.

Alternative		2003 Cost
1	Construct New 2-Lane Bridge on 3rd Street SE	$1,500,000
2	Construct New 1-Lane Bridge on 3rd Street SE	$1,300,000
3	Remove 3rd Street SE Bridge and Construct New Bridge at 2nd Street SE	$1,500,000
4	Remove 3rd Street SE Bridge and Construct New Bridge at 4th Street SE	$1,800,000
5A	Construct New Bridge at 8th Street SE (490' Length)	$3,000,000
5B	Construct New Bridge at 8th Street SE (630' Length)	$3,500,000
5C	Construct New Bridge at 8th Street SE (2100' Length)	$7,500,000
6	Repair and Raise Existing Bridge	$600,000-$1,800,000
7	Repair but do not Raise Existing Bridge	$180,000-$1,330,000
8	Retrofit Existing Bridge for Pedestrian/Bike Use	$50,000-$200,000
9	Retrofit Existing Bridge for Pedestrian/Bike Use and Construct New Bridge on Extended 10th Avenue	$5,000,000-$6,000,000
10	Remove Existing Bridge	$25,000-$75,000
11	Do Nothing	Not Considered Viable
12	Repair Existing Bridge and Construct New Bridge on Extended 10th Avenue	$5,180,000-$7,330,000

The costs of several of the alternatives proposed by the task force were presented as a range for various reasons. The cost ranges are a function of the lifespan of the repair from the 5-10 year lifespan repair (low end of range) to the 20-30 year lifespan repair (high end of range). Additionally, the cost range for new bridges is affected by uncertainties of the variability of final alignment and bridge location. Option 10 had a cost range due to the uncertainty of the salvage value of the bridge.

Through a series of meetings, the task force eliminated some options and investigated others in more detail in order to hone in on a preferred alternative. Ultimately, the task force recommended that a

new two-lane bridge be constructed on 3rd Street SE. The second place option was to repair the existing bridge for a 20-30 year lifespan but not to raise the bridge.

Summary of 2015 Feasibility Study

After the bridge was closed in 2015, the City sought a second opinion, hiring VJ Engineering to evaluate the bridge and prepare a feasibility study of rehabilitation and replacement options. The following table summarizes the options presented by VJ Engineering.

	Alternative	2015 Cost
1	Do Nothing	$0
2	Rehabilitate Existing Bridge for Pedestrian Use	$1,045,000
3	Rehabilitate Existing Bridge for Vehicular and Pedestrian Use	$1,730,000
4	Construct Pedestrian Truss Bridge on 3rd Street SE	$1,711,000
5	Construct New Truss Bridge on 3rd Street SE	$2,961,000
6	Construct New PPCB Bridge on 3rd Street SE	$2,446,000

The feasibility study recommended that the City should choose between alternatives 2 and 4 depending on priorities. If historical preservation of the existing bridge takes priority alternative 2 should be selected. If longer lifespan takes priority then alternative 4 is recommended to achieve a 75 year lifespan with the construction of a new bridge. Neither of these options supports vehicular traffic.

Update of 2001 and 2003 Alternatives

The purpose of this report is to present the updated costs of the alternatives presented in 2001 and 2003. In order to be clear and concise, the options presented in 2001 and 2003 have been compared and alternatives included in both studies will only be considered once. Additionally the list of alternatives was filtered in the following ways:

- For comparable alternatives, the less specific alternative will be discarded in favor of the more specific alternative(s). For example, the 2001 study identifies four new two-lane bridge options whereas the 2003 study generically has a single new two-lane bridge option for new construction on 3rd Street SE.
- Where multiple options exist with very similar costs, the options have been merged for simplicity. The 2001 study presents four new bridge options representing two different materials and two different widths. The different materials have a significant difference in cost, but the different widths are not drastic and do not have a substantial difference in cost relative to one another so only the material differences are considered here.
- Some of the 2003 options combined new alignments with work to the existing structure such as removal, repair, or conversion. Repair options were considered twice, with and without raising the structure. In this report, bridge raising, removing, repairing, and conversion are considered individually and can be combined with other options allowing a wider range of combined alternatives.

The following table lists the alternatives to be updated as a part of this report after combining and filtering the lists of options from 2001 and 2003.

Combined Alternatives from 2001 and 2003	
1	Do Nothing
2	Remove Existing Bridge
3	Raise Existing Bridge
4	5 Year Lifespan Repair
--	10 Year Lifespan Repair (eliminated as described below)
5	20 Year Lifespan Repair
6	Retrofit Conversion of Existing Bridge for Pedestrian/Bike Use
7	Construct New Truss Bridge on 3rd Street SE
8	Construct New 1-Lane PPCB Bridge on 3rd Street SE
9	Construct New PPCB Bridge on 3rd Street SE
10	Construct New Steel Bridge on 3rd Street SE
11	Construct New PPCB Bridge at 2nd Street SE
12	Construct New PPCB Bridge at 4th Street SE
13	Construct New PPCB Bridge at 8th Street SE (Three Bridge Lengths)
14	Construct New PPCB Bridge at 10th Avenue

Field Inspection and Condition Evaluation

Routine bridge inspection focuses on the current condition of the structure and its ability to safely remain in service until the next regularly scheduled inspection. In February, 2015 WHKS performed a routine inspection of the bridge and recommended closure due to the serious structural deficiencies including:

- Cracks in the webs of two stringer in the south truss span
- Failed bearings and connections
- Advanced section loss on sidewalk overhang brackets

In order to accurately capture any deterioration that had taken place since February and to evaluate the bridge considering longer term repair options, WHKS performed a field inspection on December 4, 2015.

As part of the December 4, 2015 field inspection, the truss floor system was evaluated and given condition ratings to determine which elements need to be replaced at each repair level. The condition ratings given to the floor system members are based on the condition ratings used for regular bridge inspection as defined by the National Bridge Inspection Standards (NBIS). The NBIS condition rating

definitions are included in Appendix A for reference. A graphical summary of the condition evaluation is included in Appendix B. Estimates were also made of the necessary concrete repairs required for the abutments and piers.

Since 2001 some repairs have been made to the bridge. However, the repair options as stated in the previous studies were not performed completely requiring redundant repairs to be made in the future if the bridge is to be repaired. For example, in 2006 the sidewalk was replaced while the overhang brackets supporting the sidewalk were not, so to replace the sidewalk overhang brackets and stringers may also now include replacement of the sidewalk concrete.

Despite investment made by the City of Waverly, this structure has continued to deteriorate and the condition of the structure is worse than what it was in 2001. Due to this deterioration, the repairs required to achieve various functional lifespans have changed, for example a five year lifespan repair today will require work comparable to a 20 year lifespan repair as defined in the 2001 study. The December 4 field inspection focused on determining the repairs that should, or could, be made to achieve similar lifespans. This inspection also revealed additional repairs must be made due to the present condition of the structure.

In 2001 the following items were presented as the repairs for the different lifespans (Note: longer lifespan repairs include all shorter lifespan repairs):

- 5-10 year lifespan
  - Repairs to the gusset plates at the bearing locations
- 10-20 year lifespan
  - Replace the floor beams, stringers, and sidewalk overhang brackets
  - Replacing the steel grid deck with a new concrete deck
  - Replace the sidewalk concrete and handrail
- 20-30 year lifespan
  - Perform concrete repairs to piers and abutments
  - Sandblast and paint entire bridge

Today, a 5 year lifespan repair includes items that were part of the 10-20 year repair in 2001. Following the inspection and analysis of the results, it was also determined that no middle ground exists. Repairs needed to achieve a 10 year lifespan are the same as required to achieve a 20-30 year lifespan which eliminates the 10-20 year lifespan option. The following items are included as part of this report for the different lifespan repairs:

- 5 year lifespan
  - Repairs to the abutment bearings and gusset plates at the bearings
  - Bearing anchor bolt repairs to the pier bearings
  - Replacement of several floor beams, stringers, and sidewalk overhang brackets and stringers
  - Partial replacement of sidewalk concrete
  - Concrete repairs to abutment and pier caps
- 20 year lifespan
  - Full replacement of floor beams, stringers, and sidewalk overhang brackets and stringers
  - Replacing the steel grid deck with a new concrete deck
  - Replace the sidewalk concrete
  - Perform concrete repairs to piers and abutments
  - Sandblast and paint entire bridge

Summary of Alternatives

The scope, construction cost, lifespan, advantages, and disadvantages of the 14 options are described below and summarized in Appendix C. Note that the option of constructing a new bridge at 8th Street SE has three costs presented for bridges of different lengths; however the general scope, lifespan, advantages, and disadvantages are fundamentally the same.

The costs presented are estimates based on Iowa DOT guidelines and discussions with fabricators. Square foot costs for typical Iowa bridges provided by the Iowa DOT were used to estimate the costs of the new bridges. The truss cost was developed with price information provided by an experienced fabricator. The costs for repair items were based on cost data available from the Iowa DOT for recent projects. The estimates include costs for necessary construction (or reconstruction) of the roadway connecting to the bridge. The roadway costs were estimated based on quantities developed by the 2003 task force and cost data from the Iowa DOT for recent projects. Costs for new bridges on the current alignment include removal of the bridge. Aesthetic costs were also considered for all new bridge options. All costs include 20% contingency as suggested by the Iowa DOT for this stage of the project as well as engineering services estimated at 15%.

1) Do Nothing

The bridge could remain closed to vehicular and pedestrian traffic in its current location. However, it is clear from the action of the City Council that doing nothing is not an option. The Green Bridge Task Force shared the sentiment that something must be done in 2003 as well.

Cost = $0

Lifespan = It may be several years before demolition is required as collapse initiates

Advantages:

- No initial cost
- Historical structure kept in place for a time

Disadvantages:

- No vehicular or pedestrian crossing
- Closure must be maintained to prevent use of the bridge for liability
- Funds will be required to maintain a closed bridge to protect public safety
- The cost of demolition is inevitable without substantial maintenance

2) Remove Existing Bridge

The existing bridge could be removed in order to reduce costs of maintaining a closed bridge and enforcing the bridge closure to protect public safety.

Cost = $165,000

Lifespan = Indefinite

Advantages:

- No future costs associated with maintaining a closed bridge
- Bridge closures do not need to be maintained
- Part of the structure could be moved for display at another location to preserve the historical nature of the structure (at additional cost)

Disadvantages:

- No vehicular or pedestrian crossing unless another is constructed
- The historical structure would not be in use

3) Raise Existing Bridge

In order to meet current hydraulic design requirements, the existing bridge could be raised. This would involve rebuilding the pier and abutment seats and reconstructing the approaches to the new elevation.

Cost = $565,000

Lifespan = Dependent on repairs or retrofit option selected

Advantages:

- Historical structure kept in place and in use (with repairs)
- Decreases the likelihood of bridge damage due to flooding
- Reduces flooding impacts upstream

Disadvantages:

- Significant investment without creating a long-term solution even done in conjunction with repairs to the structure
- Potential impact to residents through purchase of right of way

4) 5 Year Lifespan Repair

In addition to the abutment bearing repair, selected floor beams, stringers, and sidewalk overhang brackets could be replaced to extend the life of the structure for a short time. The pier bearing anchor bolts would be repaired as well.

Cost = $585,000

Lifespan = 5 years

Advantages:

- Historic bridge remains in use

Disadvantages:

- Not a long-term solution both in lifespan of the repair and the needs of the community
- Additional repairs (cost) will be required to keep the bridge open beyond five years
- Bridge will only support one-lane traffic service and sub-legal load capacity
- Additional cost of raising the bridge is necessary to meet current hydraulic requirements

5) 20 Year Lifespan Repair

In order to get a longer-term repair, all the bearings and the entire floor system would be replaced and a new concrete deck (and sidewalk) would be constructed. The entire truss would be sandblasted and repainted. Concrete repairs would be made to the abutments and piers.

Cost = $2,395,000

Lifespan = 20 years

Advantages:

- Historic bridge remains in use

Disadvantages:

- Not a long-term solution in lifespan of the repair
- Not a long term solution to meet the needs of the community
- Bridge will only supports one-lane traffic service and sub-legal load capacity of the structure even after repairs
- Additional cost of raising the bridge is necessary to meet current hydraulic requirements

6) Retrofit Conversion of Existing Bridge for Pedestrian and Bike Use

The bridge could be retrofitted for pedestrian and bicycle use by removing the sidewalk overhang and making repairs to some of the floor system. A concrete trail would be constructed in the center of the

truss with chain link fence on either side. The abutment bearings would be replaced and the pier bearing anchor bolts would be repaired as well. Additionally, concrete repairs would be performed to the abutments and piers and the truss would be painted to extend the life of the structure for 20-30 years.

Cost = $1,800,000

Lifespan = 20 years

Advantages:

- Historic bridge remains in use for pedestrians/bicycles

Disadvantages:

- Bridge will only support pedestrian/bike traffic
- Short-term solution in lifespan of the repair
- Does not meet the traffic needs of the community, additional cost of constructing a bridge on another alignment for vehicular traffic
- Additional cost of raising the bridge is necessary to meet current hydraulic requirements

7) Construct New Truss Bridge on 3rd Street SE

If the existing bridge is removed, a new truss bridge could be constructed in its place in order to maintain the look and feel of the existing bridge. The new bridge would support two-lane traffic with a pedestrian/bicycle trail on one side.

Cost = $5,410,000

Lifespan = 75 years

Advantages:

- New bridge provides long-term solution for legal vehicular and pedestrian/bike traffic
- The look and feel of the existing structure is maintained with a new truss

Disadvantages:

- Highest cost alternative on current alignment
- Truss structure type requires more expensive fracture critical inspections
- Higher maintenance costs than PPCB or steel girder bridge
- Potential impact to residents through purchase of right of way

8) Construct New One-Lane PPCB Bridge on 3rd Street SE

If the existing bridge is removed, a new pretensioned prestressed concrete beam (PPCB) bridge could be constructed to a similar level of service as the existing bridge, with one-lane vehicular traffic and a pedestrian/bicycle trail.

Cost = $2,265,000

Lifespan = 75 years

Advantages:

- Provides a long-term solution for legal vehicular and pedestrian/bike traffic
- Structure is low maintenance

Disadvantages:

- Does not meet current level of service standards with only one lane of traffic
- Does not meet long-term traffic needs for the community
- Funding may be unavailable because the level of service does not meet today's standards
- Potential impact to residents through purchase of right of way

9) Construct New Two-Lane PPCB Bridge on 3rd Street SE

If the bridge is removed, a new PPCB bridge could be constructed to today's traffic standards. The bridge would serve two-lane vehicular traffic and have a sidewalk on one side and a bike trail on the other side.

Cost = $3,170,000

Lifespan = 75 years

Advantages:

- New bridge provides long-term solution for legal vehicular and pedestrian/bike traffic
- Meets the long-term traffic needs of the community
- Structure type is low maintenance
- Lowest cost alternative on the existing alignment meeting today's traffic standards

Disadvantages:

- Does not maintain look and feel of historic truss structure
- Potential impact to residents through purchase of right of way

10) Construct New Two-Lane Steel Bridge on 3rd Street SE

If the bridge is removed, a new steel beam bridge could be constructed to maintain part of the feel of the existing structure through use of similar superstructure material. The bridge would carry two-lane vehicular traffic and have a sidewalk on one side and a bike trail on the other side.

Cost = $3,310,000

Lifespan = 75 years

Advantages:

- New bridge provides long-term solution for legal vehicular and pedestrian/bike traffic
- Meets the long-term traffic needs of the community

Disadvantages:

- More expensive construction cost and higher maintenance costs than comparable PPCB bridge
- Does not maintain look and feel of historic truss structure
- Potential impact to residents through purchase of right of way

11) Construct New PPCB Bridge at 2nd Street SE

An alternative crossing could be constructed at 2nd Street SE. A PPCB bridge could be built to support two-lane vehicular traffic and have a sidewalk on one side.

Cost = $2,970,000

Lifespan = 75 years

Advantages:

- New bridge provides long-term solution for legal vehicular and pedestrian/bike traffic
- Historic structure does not need to be removed for this alternative
- Structure type is low maintenance
- Lowest cost new bridge alternative meeting today's traffic standards

Disadvantages:

- Additional cost to repair, retrofit, or remove and transport the existing structure if desired
- Does not maintain look and feel of historic truss structure
- Impact to additional residents through purchase of right of way

12) Construct New PPCB Bridge at 4th Street SE

Another alternative crossing location is 4th Street SE. A PPCB bridge could be constructed to support two-lane vehicular traffic and have a pedestrian/bicycle trail on one side.

Cost = $3,355,000

Lifespan = 75 years

Advantages:

- New bridge provides long-term solution for legal vehicular and pedestrian/bike traffic
- Historic structure does not need to be removed for this alternative
- Structure type is low maintenance

Disadvantages:

- Additional cost to repair, retrofit, or remove and transport the existing structure if desired
- Does not maintain look and feel of historic truss structure
- Impact to additional residents through purchase of right of way

13) Construct New PPCB Bridge at 8th Street SE

8th Street SE could be extended across the Cedar River in a variety of configurations with several different bridge lengths. The PPCB bridge built would support two-lane vehicular traffic and have a sidewalk on one side and a bike trail on the other side.

Cost = Varies based on bridge length

- $5,670,000 (490' bridge length)
- $7,050,000 (630' bridge length)
- $16,375,000 (2100' bridge length)

Lifespan = 75 years

Advantages:

- New bridge provides long-term solution for legal vehicular and pedestrian/bike traffic
- Historic structure does not need to be removed for this alternative
- Structure type is low maintenance

Disadvantages:

- Additional cost to repair, retrofit, or remove and transport the existing structure if desired
- This alignment is several blocks from the existing and does not provide a convenient pedestrian crossing for homes on the north side of the Cedar River south of 1st Avenue SE
- High cost alternative due to extensive roadway construction and long bridge

14) Construct New PPCB Bridge at 10th Avenue

10th Avenue could be extended and a bridge built for an alternative crossing in southeast Waverly. The PPCB bridge would be constructed to carry two-lane vehicular traffic and have a pedestrian/bicycle trail on one side. The cost estimate takes into account the difference in roadway quantities because of the expansion of 10th Avenue since 2003.

Cost = $8,960,000

Lifespan = 75 years

Advantages:

- New bridge provides long-term solution for legal vehicular and pedestrian/bike traffic
- Historic structure does not need to be removed for this alternative
- Structure type is low maintenance

Disadvantages:

- Additional cost to repair, retrofit, or remove and transport the existing structure if desired

- This alignment does not provide a convenient pedestrian crossing for the neighborhoods currently connected by the existing structure and is considered more for future growth
- High cost alternative due to extensive roadway construction and long bridge

Discussion on Differences

While not specifically tasked with scrutinizing the cost estimates developed in the 2015 feasibility study by VJ Engineering, several of the options are similar to those investigated in this report. The significant cost differences between the two sets of cost estimates warrants a discussion.

- The unit prices used by VJ Engineering appear to be the average provided by the Iowa DOT for recent projects and are not increased to account for future pricing or the complexity of the project as our experience suggest is warranted.
- VJ Engineering does not include costs for painting the existing structure for the similar repair/retrofit alternatives.
- The bridge width assumed by VJ Engineering is less than that assumed by the previous studies and investigated by WHKS in this report (see Appendix C for widths of specific alternatives).
- Additionally, none of the options include contingency as suggested by the Iowa DOT for this stage of the project which represents a 20% difference from the outset.
- Our understanding from the 2015 report and discussions with the City Council is that VJ Engineering's options 2 and 3 include the cost to raise the bridge to meet current hydraulic requirements. However, the cost estimate sheets from VJ Engineering's report do not reflect the items or costs to build up the approaches for raising the bridge.
- Another large cost difference is in the new truss bridge alternative. Our estimate based on information from a truss bridge fabricator suggests that the cost of the steel truss is almost $3 million alone, without considering construction of the abutments, piers, and deck.

The table below summarizes the similar alternatives and the differences in the costs between this report and VJ Engineering's. With the exception of the truss bridge cost estimate, WHKS' cost estimates are very close to VJ Engineering's numbers when compared equivalently.

Alternative	WHKS (Alternate Number & Cost)		VJ Engineering (Alternate Number & Cost)		% Different
Repair Existing Bridge for Vehicles and Pedestrians for 20 Years (and Raise)	5 + 3	$2,9600,000	3	$1,730,000	71%
Repair Existing Bridge for Pedestrians (and Raise)	6 + 3	$2,365,000	2	$1,045,000	126%
New Truss Bridge on 3rd Street SE	7	$5,410,000	5	$2,961,000	83%
New PPCB Bridge on 3rd Street SE	9	$3,170,000	6	$2,446,000	30%

Conclusion

The existing bridge was constructed almost a century ago and was not intended to carry the volume or loads for today's traffic. Even if the repairs are performed for a 20-year lifespan, the bridge will always have a limited load capacity and width restrictions. Additionally, the cost of replacement or further repair must be considered at the end of that lifespan.

The 3rd Street SE bridge is an important icon to the City. Preserving the historical bridge, either through repairs to keep it in service or by transporting it to be displayed elsewhere, should be considered.

Waverly has changed substantially since the bridge was originally constructed, and 3rd Street SE may no longer be the ideal place for a Cedar River crossing. Alternate alignments could have a greater impact to residents through property acquisition or relocation. The impacts to citizens should be considered as the current bridge does not meet today's traffic standards, or hydraulic requirements, but a new alignment may require properties to be purchased and moved.

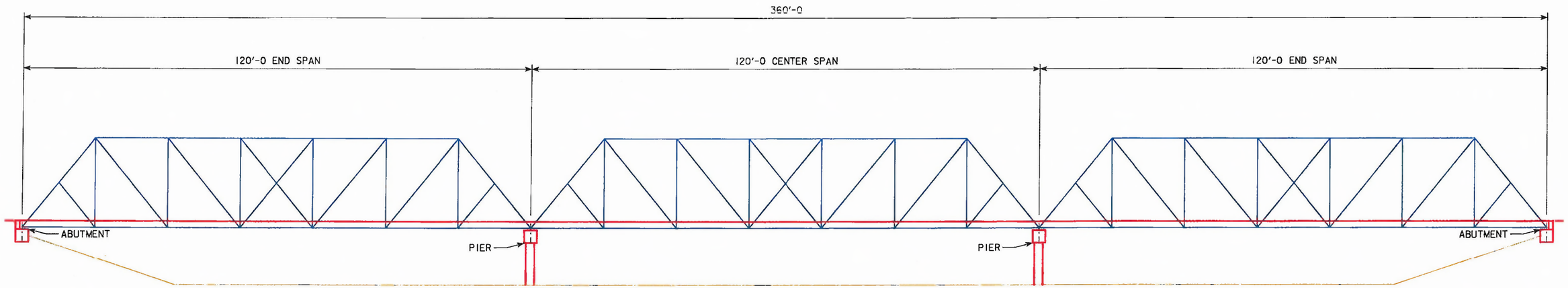
The alternatives presented here highlight advantages and disadvantages not reflected in the cost. The City Council must make a difficult decision about the priorities of the community. Beyond cost and lifespan, the historical and cultural importance of the existing structure must be considered. The best location for a Cedar River crossing must be determined based on the current traffic demands as well as the City's future growth goals.

Appendix A: NBIS Condition Ratings

General condition rating guidelines for Deck (NBI Item 58), Superstructure (NBI Item 59), and Substructure (NBI Item 60) from FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (1995).

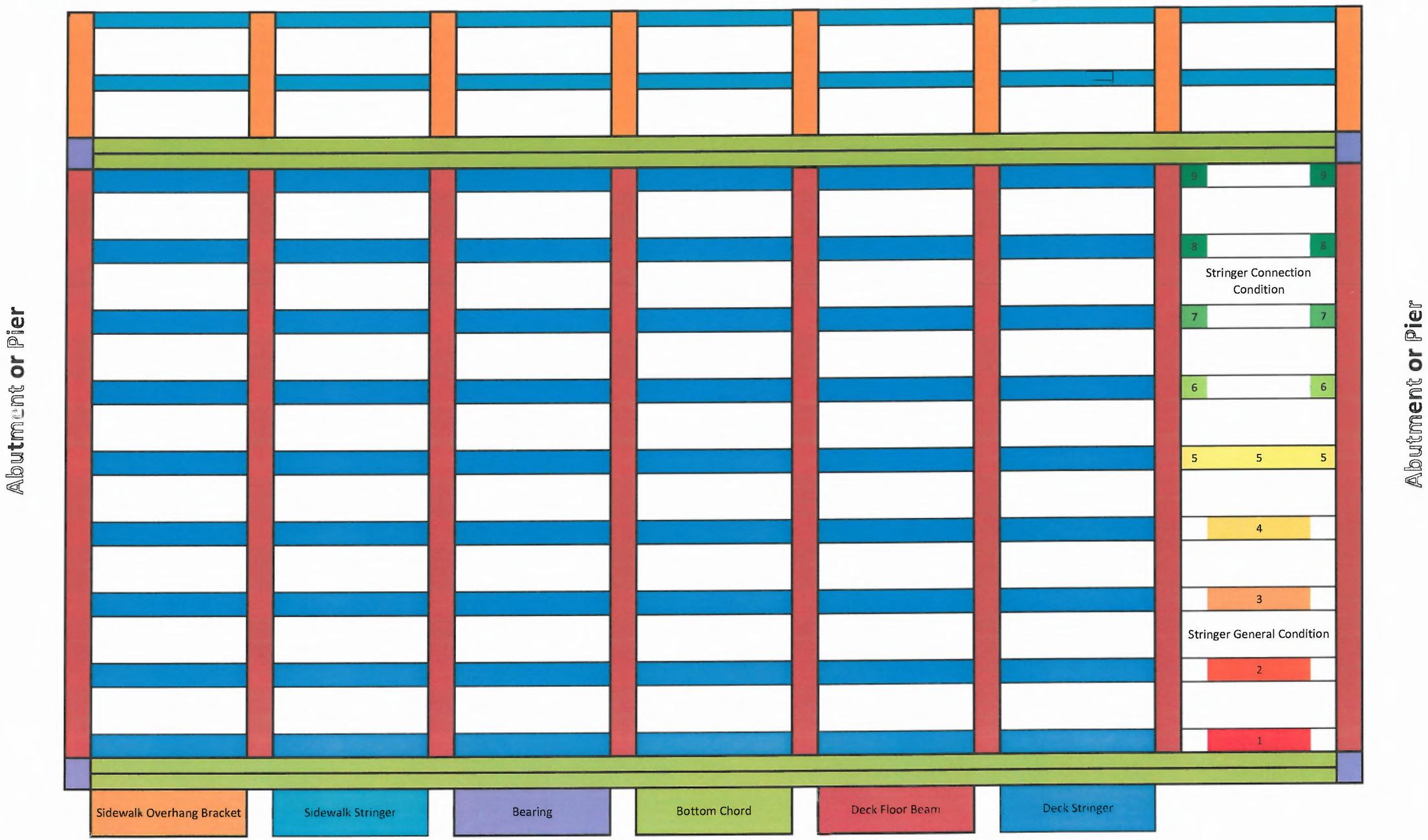
Code	Description
N	**NOT APPLICABLE**
9	**EXCELLENT CONDITION**
8	**VERY GOOD CONDITION** No problems noted.
7	**GOOD CONDITION** Some minor problems.
6	**SATISFACTORY CONDITION** Structural elements show some minor deterioration.
5	**FAIR CONDITION** All primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	**POOR CONDITION** Advanced section loss, deterioration, spalling, or scour
3	**SERIOUS CONDITION** Loss of section, deterioration, spalling, or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	**CRITICAL CONDITION** Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	**"IMMINENT" FAILURE CONDITION** Major deterioration or section loss present in critical structural components, or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put bridge back in light service.
0	**FAILED CONDITION** Out of service; beyond corrective action.

Appendix B: Graphical Condition



ELEVATION VIEW OF 3RD STREET SE BRIDGE OVER THE CEDAR RIVER

Truss Floor System Plan Key



South Truss

Plan view of truss floor system showing NBI Condition Ratings

South Pier

North Pier

Plan view of truss floor system showing NBI Condition Ratings

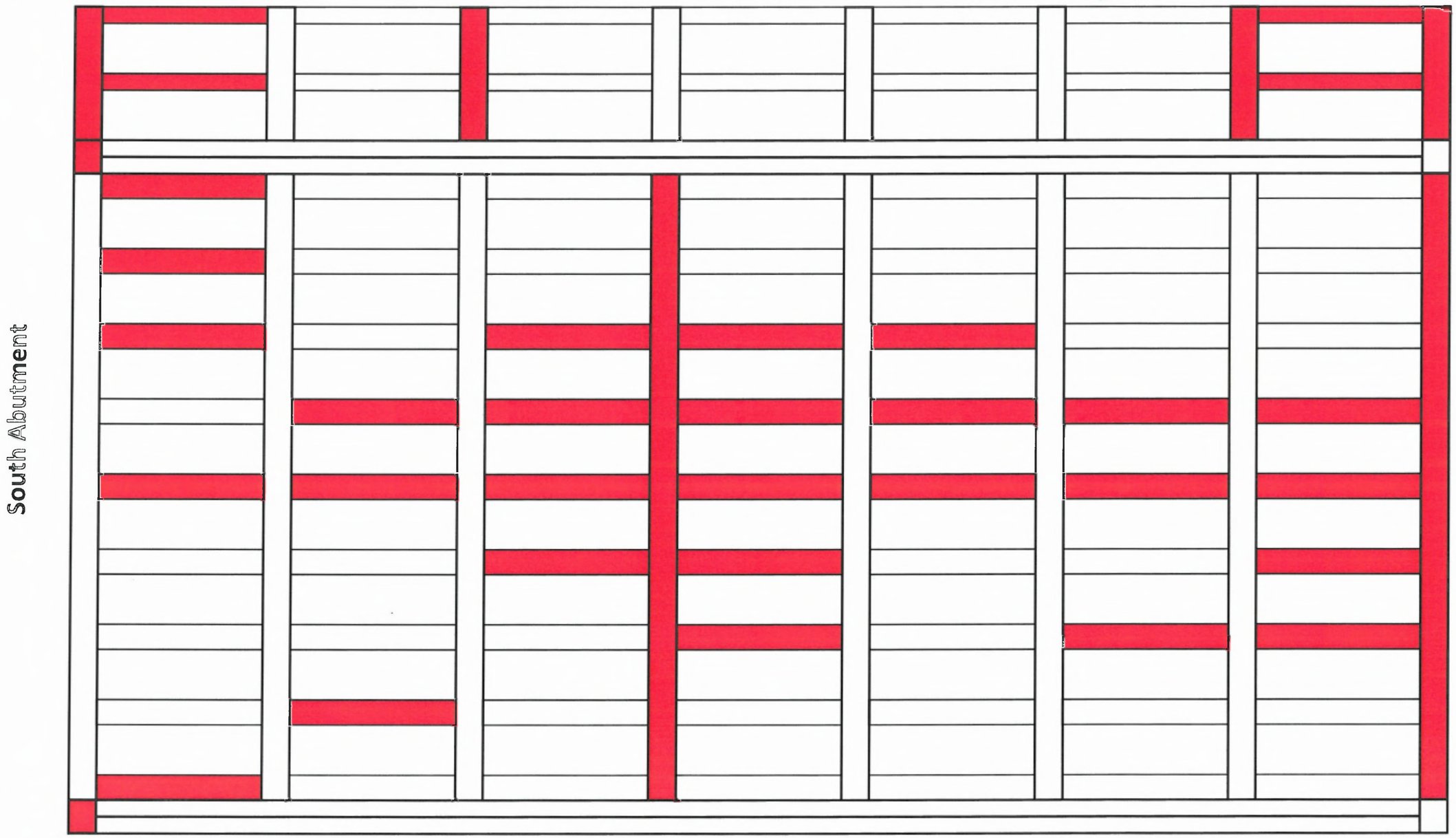
North Truss

North Pier

North Abutment

Plan view of truss floor system showing NBI Condition Ratings

South Truss



Plan view of truss floor system showing elements to be replaced to achieve 5-year lifespan repair

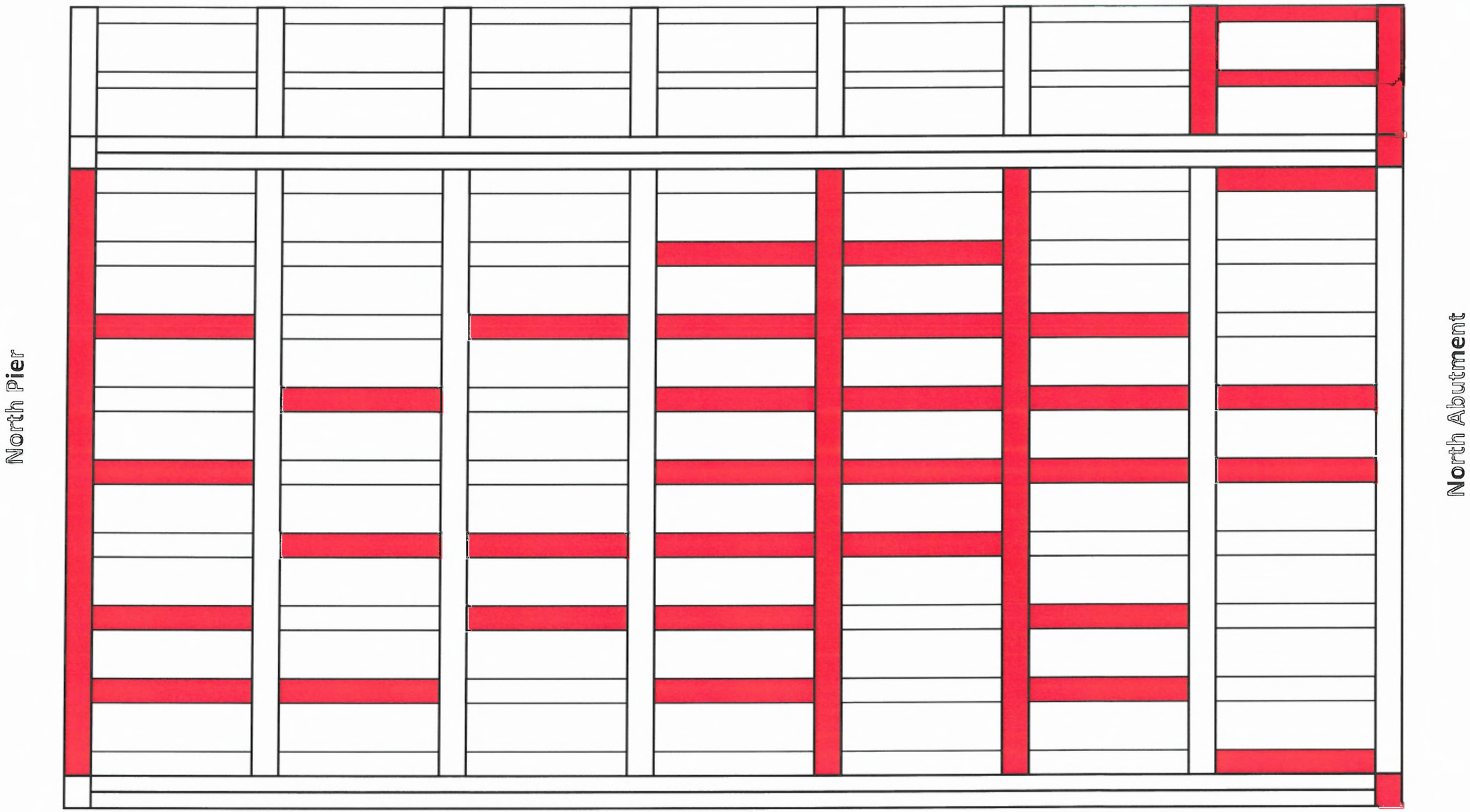
Center Truss

South Pier

North Pier

Plan view of truss floor system showing elements to be replaced to achieve 5-year lifespan repair

North Truss



Plan view of truss floor system showing elements to be replaced to achieve 5-year lifespan repair

	Alternative	Bridge Width (ft)	Bridge Length (ft)	Roadway Length (ft)	Lifespan (years)	Initial Cost
1	Do Nothing	n/a	n/a	n/a	n/a	$0
2	Remove Existing Bridge	26'	360'	n/a	n/a	$165,000
3	Raise Existing Bridge	26'	360'	290'	n/a	$565,000
4	5 Year Lifespan Repair	26'	360'	n/a	5	$585,000
5	20 Year Lifespan Repair	26'	360'	n/a	20	$2,395,000
6	Retrofit Conversion of Existing Bridge for Pedestrian and Bike Use	26'	360'	n/a	20	$1,800,000
7	Construct New Truss Bridge on 3rd Street SE	40'	360'	290'	75	$5,410,000
8	Construct New One-Lane PPCB Bridge on 3rd Street SE	34'	360'	290'	75	$2,265,000
9	Construct New Two-Lane PPCB Bridge on 3rd Street SE	51'	360'	290'	75	$3,170,000
10	Construct New Two-Lane Steel Bridge on 3rd Street SE	51'	360'	290'	75	$3,310,000
11	Construct New Two-Lane PPCB Bridge at 2nd Street SE	51'	360'	240'	75	$2,970,000
12	Construct New Two-Lane PPCB Bridge At 4th Street SE	44'	360'	1040'	75	$3,355,000
13a	Construct New 490' Two-Lane PPCB Bridge at 8th Street SE	51'	490'	2110'	75	$5,670,000
13b	Construct New 630' Two-Lane PPCB Bridge at 8th Street SE	51'	630'	2470'	75	$7,050,000
13c	Construct New 2100' Two-Lane PPCB Bridge at 8th Street SE	51'	2100'	500'	75	$16,375,000
14	Construct New PPCB Bridge at 10th Avenue	50'	800'	3300'	75	$8,960,000
	Alternatives from 2015 VJ Engineering Feasibility Study					
1	Do Nothing	n/a	n/a	n/a	n/a	$0
2	Rehabilitate Existing Bridge for Pedestrian Use	26'	360'	unknown	20	$1,045,000
3	Rehabilitate Existing Bridge for Vehicular and Pedestrian Use	26'	360'	unknown	20	$1,730,000
4	Construct Pedestrian Truss Bridge on 3rd Street SE	14'	360'	unknown	75	$1,711,000
5	Construct New Truss Bridge on 3rd Street SE	40'	360'	unknown	75	$2,961,000
6	Construct New PPCB Bridge on 3rd Street SE	40'	360'	unknown	75	$2,446,000

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