

## **APPENDIX D**

Bridge Condition and Needs

Exhibit 2 – General Bridge Information Summary

## BRIDGE CONDITION AND NEEDS

The bridges involved in the US 52 Southbound Reconstruction project have structural and functional issues. The following is a description of the bridges involved in the project and associated needs. A summary of general bridge information, including the National Bridge Inventory (NBI) condition and appraisal ratings, is provided in Exhibit 2. The Minnesota Structure Inventory Report and Bridge Inspection Reports are available upon request.

### **Bridge 4762 (US 52 over stream)**

Constructed in 1928, this double concrete box culvert is rated “adequate” structurally, meaning its capacity to carry anticipated loads is acceptable. Portions of this 92-year-old structure are showing conditions of its age, including cracks and leaching in the walls, some of which extend across the top of the box, and exposed reinforcing steel exhibiting deterioration.

### **Bridge 9414 (Southbound US 52 over North Fork of Zumbro River)**

Constructed in 1962, this bridge is rated “adequate” structurally, meaning its capacity to carry anticipated loads is acceptable. However, the following bridge components do not meet current standards:

- The roadway width of the bridge is 30-ft, accommodating two 12-ft travel lanes and 3-ft shoulders. The travel lane width meets current standards, but the shoulders do not meet the current standard of 6 to 8-ft wide shoulders. The function of the shoulder on bridges includes providing a recovery area to regain control of a vehicle, emergency parking and passage, and an area for deck drainage and snow storage.
- The original bridge barrier remains in place and does not meet the 10-kip design standard design load requirement established in the American Association of State Highway Transportation Officials (AASHTO) Standard Specification (1964 edition and later). In addition, the curb projects out 1.5 feet from the front edge of the barrier, which creates an elevated risk of vehicular vaulting.

Portions of this 58-year-old bridge are showing conditions of its age, such as concrete cracking in the bridge deck, prestressed concrete beams, piers, and abutments common for a bridge nearing the end of its service life. See the respective Bridge Inspection Report for more detailed information.

### **Bridge 9483 (US 52 over Butler Creek)**

Constructed in 1966, this double concrete box culvert is rated “adequate” structurally, meaning its capacity to carry anticipated loads is acceptable. Portions of this 54-year-old structure are showing conditions of its age, including vertical cracks with staining and leaching in the walls, some of which extend across the top of the box.

### **Bridge 9659 (Southbound US 52 over TH 60)**

Constructed in 1960, this bridge is structurally adequate but rated “functionally obsolete”. This means its capacity to carry anticipated loads is acceptable, but an element of the bridge geometrics is substandard. In this case, the functionally obsolete rating is due to its deck geometry appraisal rating of “3”. The following is a summary of bridge elements that do not meet current standards:

- The roadway width of the bridge is 39-ft, accommodating two 12-ft travel lanes, one 12-ft auxiliary lane, and only one 3-ft shoulder. The lane widths meets current standards, but the shoulder widths do not meet the current standard of 6 to 8-ft wide shoulders. The function of the shoulder on bridges includes providing a recovery area to regain control of a vehicle, emergency parking and passage, and an area for deck drainage and snow storage.
- Vertical clearance of the bridge over TH 60 is 14.9-ft, which does not meet current standard of 16.0-ft.
- Bridge contains three spans, with the piers 6-ft from the edge of the adjacent traffic lane. Current State bridge standards place a preference on structure configurations that do not utilize side piers and provide a 20-ft minimum clear distance from the edge of traveled lane beneath the bridge.
- The original bridge barrier remains in place and does not meet the 10-kip design standard design load requirement established in the American Association of State Highway Transportation Officials (AASHTO) Standard Specification (1964 edition and later). In addition, the curb projects out 1.5 feet from the front edge of the barrier, which creates an elevated risk of vehicular vaulting.

Additionally, portions of this 60-year-old bridge are showing conditions of its age, such as concrete cracking with efflorescence and delamination in the bridge deck, cracking in the piers and abutments, and minor section loss in the steel beams. In addition, the abutments appear to be rotating inward and settling. See the respective Bridge Inspection Report for more detailed information.

### **Bridge 9660 (Northbound US 52 over TH 60)**

Constructed in 1960, this bridge is rated “adequate” structurally, meaning its capacity to carry anticipated loads is acceptable. However, the following bridge components do not meet current standards:

- The roadway width of the bridge is 30-ft, accommodating two 12-ft travel lanes and 3-ft shoulders. The lane widths meets current standards, but the shoulder widths do not meet the current standard of 6 to 8-ft wide shoulders. The function of the shoulder on bridges includes providing a recovery area to regain control of a vehicle, emergency parking and passage, and an area for deck drainage and snow storage.
- The bridge contains three spans, with the piers 6-ft from the edge of the adjacent traffic lane. Current State bridge standards place a preference on structure configurations that do not utilize side piers and provide a 20-ft minimum clear distance from the edge of traveled lane beneath the bridge.
- The original bridge barrier remains in place and does not meet the 10-kip design standard design load requirement established in the American Association of State Highway Transportation Officials (AASHTO) Standard Specification (1964 edition and later). In addition, the curb projects out 1.5 feet from the front edge of the barrier, which creates an elevated risk of vehicular vaulting.
- The bridge is directly adjacent to Bridge 9659 and exhibiting similar conditions to the structure described above. See the respective Bridge Inspection Report for more detailed information.

### **Bridge 9662 (TH 60 over US 52)**

Constructed in 1959, this bridge is rated “adequate” structurally, meaning its capacity to carry anticipated loads is acceptable. However, the following bridge components do not meet current standards:

- The roadway width of the bridge is 30-ft, accommodating two 12-ft travel lanes and 3-ft shoulders. The lane widths meets current standards, but the shoulder widths do not meet the current standard of 6 to 8-ft wide shoulders. The function of the shoulder on bridges includes providing a recovery area to regain control of a vehicle, emergency parking and passage, and an area for deck drainage and snow storage.
- Vertical clearance of the bridge over TH 52 is 14.9-ft, which does not meet current standard of 16.0-ft.
- The bridge contains three spans with the piers 10.42-ft from the edge of the adjacent traffic lane. Current State bridge standards place a preference on structure configurations that do not utilize side piers and provide a 30-ft wide clear zone beneath the bridge.
- The original bridge barrier remains in place and does not meet the 10-kip design standard design load requirement established in the American Association of State Highway Transportation Officials (AASHTO) Standard Specification (1964 edition and later). In addition, the curb projects out 1.5 feet from the front edge of the barrier, which creates an elevated risk of vehicular vaulting.

Portions of this 61-year-old bridge are showing conditions of its age, such as concrete cracking, delamination, and efflorescence in the bridge deck, abutments, and piers common for a bridge nearing the end of its service life. In addition, the steel fascia beams have small areas of active corrosion and have been hit a number of times over the easterly northbound traffic lane. In 2019, the bridge sustained significant structural damage after being hit by a truck, forcing the closure of the eastbound shoulder. Furthermore, the protective paint coating is peeling. See the respective Bridge Inspection Report for more detailed information.

### **Bridge 25009 (Northbound US 52 over North Fork of Zumbro River)**

Constructed in 1983, this 37-year-old bridge is rated “adequate” structurally, meaning its capacity to carry anticipated loads is acceptable. The hydraulic characteristics of the bridge are adequate. The bridge substructure and superstructure is exhibiting cracking typical of bridges of this type and age. The overlay for the bridge deck is the original surfacing.

### **Bridge 91048 (US 52 over stream)**

Constructed in 1959, this steel pipe culvert is rated “adequate” structurally, meaning its capacity to carry anticipated loads is acceptable. However the culvert is deficient hydraulically. The MnDOT *Drainage Manual* requires gravity flow design frequency of a 50-year storm for centerline culverts such as this. Additionally, the 100-year headwater is limited to be within 1.5 times the diameter of the structure to limit inlet scour. The culvert has a 50-year headwater of 1.5-feet above the crown of the pipe which does not meet gravity flow requirements. The 100-year headwater-to-diameter ratio is 2.02, which exceeds the maximum of 1.5.

## Exhibit 2 – General Bridge Information Summary

Bridge Number	4762	9414	9483	9659
Facility Carried	US 52	US 52 SB	US 52	US 52 SB
Feature Crossed	Stream	N Fork Zumbro River	Stream	TH 60
Reference Point	080+00.869	080+00.466	094+00.015	075+00.853
ADT (Year)	20,800 (2017)	9050 (2011)	18,400 (2012)	12,750 (2011)
Span Type	Concrete Box Culvert	Prestressed Concrete Beam	Concrete Box Culvert	Continuous Steel Beam
Bridge Length (number of spans)	171.0 ft. (2)	204.0 ft. (3)	188.0 ft. (2)	132.9 ft. (3)
Bridge Roadway Width	48.0 NB, 38.0 ft. SB	30.0 ft.	38.0 ft.	39.0 ft.
Year Constructed (last remodeled)	1928 (1962)	1962 (1988)	1966 (N/A)	1960 (1984)
Deficiency Status	Adequate	Adequate	Adequate	Functionally Obsolete
Sufficiency Rating	57.3	74.5	67.7	76.6
<b>NBI Structure Ratings</b>				
Deck	N/A	6	N/A	6
Superstructure	N/A	6	N/A	7
Substructure	N/A	6	N/A	6
<b>NBI Appraisal Ratings</b>				
<b>Structure Evaluation</b>	5	6	6	6
Deck Geometry	N/A	4	N/A	3
Underclearance	N/A	N/A	N/A	4
Waterway Adequacy	8	8	8	N/A
Approach Alignment	8	8	8	8

### Table Notes:

National Bridge Inventory (NBI) data is derived from the bridge's Structural Inventory.

NBI condition ratings range from 0 to 9, with 0 being a failed condition, and 9 being an excellent condition (such as newly constructed). Further detail of the NBI condition ratings are:

- 5 (fair condition) or less implies that repairs are recommended and reduces the bridge sufficiency rating.
- 4 (poor condition) or less may impact the required inspection frequency.
- 3 (serious condition) or less implies that immediate repairs or a new load rating may be necessary.
- 2 (critical condition) typically indicates a critical finding.
- N/A indicates the condition is not applicable to this bridge.

- Deficiency status is classified as "Adequate", "Functionally Obsolete", or "Structurally Deficient".
- Additional information on condition ratings can be found in MnDOT's [Bridge Inspection Manual](#).

**Exhibit 2 – General Bridge Information Summary (continued)**

Bridge Number	9660	9662	25009	91048
Facility Carried	US 52 NB	MN 60	US 52 NB	US 52
Feature Crossed	TH 60	US 52	N Fork Zumbro River	Stream
Reference Point	075+00.852	179+00.351	080+00.465	086+00.469
ADT (Year)	12,750 (2011)	3300 (2011)	10,400 (2017)	17,600 (2012)
Span Type	Continuous Steel Beam	Continuous Steel Beam	Prestressed Concrete Beam	Steel Pipe Culvert
Bridge Length (number of spans)	133.2 ft. (3)	223.9 ft. (4)	206.9 ft. (3)	10.0 ft. (1)
Bridge Roadway Width	30.0 ft.	30.0 ft.	40.8 ft.	249.0 ft.
Year Constructed (last remodeled)	1962 (1984)	1959 (N/A)	1983 (N/A)	1959 (N/A)
Deficiency Status	Adequate	Adequate	Adequate	Adequate
Sufficiency Rating	78.7	81.6	92.2	76.8
<b>NBI Condition Ratings</b>				
Deck	7	6	7	N/A
Superstructure	7	7	8	N/A
Substructure	6	6	6	N/A
<b>NBI Appraisal Ratings</b>				
Structure Evaluation	6	6	6	6
Deck Geometry	4	4	7	N/A
Underclearance	4	5	N/A	N/A
Waterway Adequacy	N/A	N/A	8	8
Approach Alignment	8	8	8	8

Table Notes:

National Bridge Inventory (NBI) data is derived from the bridge's Structure Inventory Report.

NBI condition ratings range from 0 to 9, with 0 being a failed condition, and 9 being an excellent condition (such as newly constructed). Further detail of the NBI condition ratings are:

- 5 (fair condition) or less implies that repairs are recommended and reduces the bridge sufficiency rating.
- 4 (poor condition) or less may impact the required inspection frequency.
- 3 (serious condition) or less implies that immediate repairs or a new load rating may be necessary.
- 2 (critical condition) typically indicates a critical finding.
- N/A indicates the condition is not applicable to this bridge.

- Deficiency status is classified as "Adequate", "Functionally Obsolete", or "Structurally Deficient".
- Additional information on condition ratings can be found in MnDOT's [Bridge Inspection Manual](#).