City of Grand Rapids
2020 Bridge Asset Management Plan

A plan describing the City of Grand Rapids’ transportation assets and conditions

Prepared by:
Rick DeVries, P.E.
Assistant City Engineer
300 Monroe Avenue N.W.
Grand Rapids, MI  49503
rdevries@grcity.us
(616) 456-3071
# CONTENTS

Table of Figures ........................................................................................................................................ ii
Table of Tables ....................................................................................................................................... iii
Executive Summary .............................................................................................................................. iv

**Introduction** .................................................................................................................................. 1

Bridge Primer ....................................................................................................................................... 2
  *Bridge Types* .................................................................................................................................. 2
  *Bridge Condition* .......................................................................................................................... 3
  *Bridge Treatments* ......................................................................................................................... 3

**1. Bridge Assets** .......................................................................................................................... 8

Inventory ............................................................................................................................................ 9
  *Types* ........................................................................................................................................... 9
  *Locations and Sizes* ..................................................................................................................... 9
  *Condition* .................................................................................................................................... 11

Goals................................................................................................................................................ 12

Prioritization, Programmed/Funded Projects, and Planned Projects .............................................. 13
  *Prioritization* ............................................................................................................................... 13
  *Programmed/Funded Projects* .................................................................................................... 19
  *Planned Projects* ......................................................................................................................... 19

Gap Analysis ................................................................................................................................... 19

**2. Financial Resources** ............................................................................................................... 21

Anticipated Revenues ....................................................................................................................... 21
Anticipated Expenses ....................................................................................................................... 21

**3. Risk Management** .................................................................................................................. 22

Appendix 1: City of Grand Rapids 2019 Bridge Inspection Report ...................................................... 24
Appendix 2: City of Grand Rapids 2019 Work Recommendations .................................................... 25-26
Appendix 3: City of Grand Rapids 2019 Follow-Up Work ................................................................. 27
Appendix 4: FY2021 – FY2028 Proposed Work .................................................................................. 28
TABLE OF FIGURES

Figure 1: Girder bridge .................................................................................................................................................. 2
Figure 2: Slab bridge ..................................................................................................................................................... 2
Figure 3: Truss bridge .................................................................................................................................................... 2
Figure 4: Three-sided box bridge ........................................................................................................................... 2
Figure 5: Examples of common bridge construction materials used in Michigan ......................................................... 3
Figure 6: Diagram of basic elements of a bridge ........................................................................................................... 4
Figure 7: Map illustrating locations Grand Rapids’ bridge assets ............................................................................... 10
Figure 8: Progress tracking graph indicating Grand Rapids’ historic and current bridge conditions, projected trends, and goals. ......................................................................................................................... 13
# TABLE OF TABLES

Table 1: Summary of the NBI Rating Scale  ..................................................................................................................3  
Table 2: Bridge Assets by Type: Inventory, Size, and Condition .................................................................12  
Table 3: Summary of Preservation Criteria .......................................................................................................14  
Table 4: Cost Projection Table ..........................................................................................................................20  
Table 5: Scour Critical Bridges ..........................................................................................................................22  
Table 6: Posted/Closed Bridges .........................................................................................................................23
EXECUTIVE SUMMARY

As conduits for commerce and connections to vital services, bridges are among the most important assets in any community along with other assets like roads, culverts, traffic signs, traffic signals, and utilities that support and affect the road network. The City of Grand Rapids' (Grand Rapids) bridges, other road-related assets, and support systems are some of the most valuable and extensive public assets, all of which are paid for with taxes collected from ordinary citizens and businesses. The cost of building and maintaining bridges, their importance to society, and the investment made by taxpayers all place a high level of responsibility on local agencies to plan, build, and maintain the road and bridge network in an efficient and effective manner. This asset management plan is intended to report on how Grand Rapids is meeting its obligations to maintain the bridges for which it is responsible.

This plan overviews Grand Rapids' bridge assets and conditions and explains how the City of Grand Rapids works to maintain and improve the overall condition of those assets. These explanations can help answer:

- What kinds of bridge assets Grand Rapids has in its jurisdiction and the different options for maintaining these assets.
- What tools and processes Grand Rapids uses to track and manage bridge assets and funds.
- What condition Grand Rapids’ bridge assets are in compared to statewide averages.
- Why some bridge assets are in better condition than others and the path to maintaining and improving bridge asset conditions through proper planning and maintenance.
- How agency bridge assets are funded and where those funds come from.
- How funds are used and the costs incurred during Grand Rapids' bridge assets’ normal life cycle.
- What condition Grand Rapids can expect of its bridge assets if those assets continue to be funded at the current funding levels.
- How changes in funding levels can affect the overall condition of all of Grand Rapids’ bridge assets.

Grand Rapids owns and/or manages 23 bridges. A summary of its historical and current bridge asset conditions, projected trends, and goals can be seen in the Figure, below.

It should be noted that there are a total of 47 bridges in the City of Grand Rapids right-of-way. 23 bridges are highway bridges that are included in this asset management plan, 4 bridges are railroad bridges over public right-of-way and 20 are pedestrian structures over the public right-of-way. Since the railroad and pedestrian bridges do not carry vehicular traffic, they are not part of this asset management plan. The railroad and pedestrian bridges are inspected by the City (or owner, if they so choose) on a biannual basis and the information and recommendation are communicated to the bridge owner. More serious concerns require the owner to provide a schedule and plan to address the concern. The pedestrian bridges are allowed through encroachment agreements with the City of Grand Rapids and include the requirements for the biannual inspections.
An asset management plan is required by Michigan Public Act 325 of 2018, and this document represents fulfillment of some of Grand Rapids’ obligations towards meeting these requirements. This asset management plan also helps demonstrate Grand Rapids’ responsible use of public funds by providing elected and appointed officials as well as the general public with inventory and condition information of Grand Rapids’ bridge assets, and gives taxpayers the information they need to make informed decisions about investing in essential transportation infrastructure.
INTRODUCTION

Asset management is defined by Public Act 325 of 2018 as “an ongoing process of maintaining, preserving, upgrading, and operating physical assets cost effectively, based on a continuous physical inventory and condition assessment and investment to achieve established performance goals”. In other words, asset management is a process that uses data to manage and track assets, like roads and bridges, in a cost-effective manner using a combination of engineering and business principles. This process is endorsed by leaders in municipal planning and transportation infrastructure, including the Michigan Municipal League, County Road Association of Michigan, the Michigan Department of Transportation (MDOT), and the Federal Highway Administration (FHWA). The City of Grand Rapids is supported in its use of asset management principles and processes by the Michigan Transportation Asset Management Council (TAMC), formed by the State of Michigan.

Asset management, in the context of this plan, ensures that public funds are spent as effectively as possible to maximize the condition of the bridges in City of Grand Rapids’ road network. Asset management also provides a transparent decision-making process that allows the public to understand the technical and financial challenges of managing infrastructure with a limited budget.

The City of Grand Rapids (Grand Rapids) has adopted an “asset management” business process to overcome the challenges presented by having limited financial, staffing, and other resources while needing to meet safety standards and bridge users’ expectations. Grand Rapids is responsible for maintaining and operating 23 bridges.

This 2020 plan outlines how Grand Rapids determines its strategy to maintain and upgrade bridge asset condition given agency goals, priorities of its bridge users, and resources provided. An updated plan is to be released approximately every three years to reflect changes in bridge conditions, finances, and priorities.

Questions regarding the use or content of this plan should be directed to Rick DeVries, P.E., Assistant City Engineer, 300 Monroe Avenue N.W., Grand Rapids, MI 49503, rdevries@grcity.us, (616) 456-3071. A copy of this plan can be accessed on our website at https://www.grandrapidsmi.gov/Government/Programs-and-Initiatives/Vital-Streets-Program?BestBetMatch=vital%20streetsid13b95b2-5146-4b00-9e3e-a80c73739a64|4f05f368-ecaa-4a93-b749-7ad6e4867c1f|en-US.
Key terms used in this plan are defined in Grand Rapids’ comprehensive transportation asset management plan (also known as the “compliance plan”) used for compliance with PA 325 or 2018.

Knowing the basic features of an asset class is a crucial starting point to understanding the rationale behind an asset management approach. The following primer provides an introduction to bridges.

**Bridge Primer**

**Bridge Types**

Bridges are structures that span 20 feet or more. These bridges can extend across one or multiple spans.

If culverts are placed side by side to form a span of 20 feet or more (for example, three 6-foot culverts with one-foot between each culvert), then this culvert system would be defined as a bridge. (Note: The Compliance Plan Appendix C contains a primer on culverts not defined as bridges.)

Bridge types are classified based on two features: design and material.

The most common bridge design is the **girder system** (Figure 1). With this design, the bridge deck transfers vehicle loads to girders (or beams) that, in turn, transfer the load to the piers or abutments (see Figure 6).

A similar design that lacks girders (or beams) is a **slab bridge** (Figure 2, and see Figure 6). A slab bridge transfers the vehicle load directly to the abutments and, if necessary, piers.

**Truss bridges** were once quite common and consist of a support structure that is created when structural members are connected at joints to form interconnected triangles (Figure 4). Structural members may consist of steel tubes or angles connected at joints with gusset plates.

Another common bridge design in Michigan is the three-sided pre-cast box or arch bridge (Figure 4).

Michigan is also home to several unique bridge designs.

Adding another layer of complexity to bridge typing is the primary construction materials used (Figure 5). Bridges are generally constructed from concrete, steel, pre-stressed concrete, or timber. Some historical bridges or bridge components in Michigan may be constructed from stone or masonry.
Bridge Condition

Michigan inspectors rate bridge condition on a 0-9 scale known as the National Bridge Inventory (NBI) rating scale (see Table for a summary of the NBI Rating scale). Elements of the bridge’s superstructure, deck, and substructure receive a 9 if they are in excellent condition down to a 0 if they are in failed condition. A complete guide for Michigan bridge condition rating according to the NBI can be found in the MDOT Bridge Field Services’ *Bridge Safety Inspection NBI Rating Guidelines* ([https://www.michigan.gov/documents/mdot/BIR_Ratings_Guide_Combined_2017-10-30_606610_7.pdf](https://www.michigan.gov/documents/mdot/BIR_Ratings_Guide_Combined_2017-10-30_606610_7.pdf)).

<table>
<thead>
<tr>
<th>NBI Rating</th>
<th>General Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-7</td>
<td>Like new/good</td>
</tr>
<tr>
<td>6-5</td>
<td>Fair</td>
</tr>
<tr>
<td>4-3</td>
<td>Poor/serious</td>
</tr>
<tr>
<td>2-0</td>
<td>Critical/failed</td>
</tr>
</tbody>
</table>

Bridge Treatments

Replacement

Replacement work is typically performed when a bridge is in poor condition (NBI rating of 4 or less) and will improve the bridge to good condition (NBI rating of 7 or more). The Local Bridge Program, a part of MDOT’s Local Agency Program, defines bridge replacement as full replacement, which removes the entire bridge (superstructure, deck, and substructure) before re-building a bridge at the same location (Figure 6). The decision to perform a total replacement over rehabilitation (see below) should be made based on a life-cycle cost analysis. Generally, replacement is selected if rehabilitation costs more than two-thirds of the cost of replacement. Replacement is generally the most expensive of the treatment options.
Rehabilitation
Rehabilitation involves repairs that improve the existing condition and extend the service life of the structure and the riding surface. Most often, rehabilitation options are associated with bridges that have degraded beyond what can be fixed with preventive maintenance. Rehabilitation is typically performed on poor-rated elements (NBI rating of 4 or less) to improve them to fair or good condition (NBI rating of 5 or more). Rehabilitation can include superstructure replacement (removal and replacement of beams and deck) or deck replacement. While typically more expensive than general maintenance, rehabilitation treatments may be more cost-effective than replacing the entire structure.

- **Railing retrofit/replacement:** A railing retrofit or replacement either reinforces the existing railing or replaces it entirely (Figure 6). This rehabilitation is driven by a need for safety improvements on poor-rated railings or barriers (NBI rating less than 5).

- **Beam repair:** Beam repair corrects damage that has reduced beam strength (Figure 6). In the case of steel beams, it is performed if there is 25 percent or more of section loss in an area of the beam that affects load-carrying capacity. In the case of concrete beams, this is performed if there is 50 percent or more spalling (i.e., loss of material) at the ends of beams.

- **Substructure concrete patching and repair:** Patching and repairing the substructure is essential to keep a bridge in service. These rehabilitation efforts are performed when the abutments or piers are fair or poor (NBI rating of 5 or 4), or if spalling and delamination affect less than 30 percent of the bridge surface.

Figure 6: Diagram of basic elements of a bridge
**Preventive Maintenance**

The Federal Highway Administration’s (FHWA) *Bridge Preservation Guide* (2018) defines preventive maintenance as “a strategy of extending service life by applying cost-effective treatments to bridge elements…[that] retard future deterioration and avoid large expenses in bridge rehabilitation or replacements.”

Preventive maintenance work is typically done on bridges rated fair (NBI rating of 5 or 6) in order to slow the rate of deterioration and keep them from falling into poor condition.

- **Concrete deck overlay:** A concrete deck overlay involves removing and replacing the driving surface. Typically, this is done when the deck surface is poor (NBI rating is less than 5) and the underneath portion of the deck is at least fair (NBI rating greater than 4). A shallow or deep concrete overlay may be performed depending on the condition of the bottom of the deck. The MDOT *Bridge Deck Preservation* matrices provide more detail on concrete deck overlays (see https://www.michigan.gov/mdot/0,4616,7-151-9625_24768_24773---,00.html).

- **Deck repairs:** Deck repairs include three common techniques: HMA overlay with or without waterproof membranes, concrete patching, deck sealing, crack sealing, and joint repair/replacement. An HMA overlay with an underlying waterproof membrane can be placed on bridge decks with a surface rating of fair or lower (NBI of 5 or less) and with deficiencies that cover between 15 and 30 percent of the deck surface and deck bottom. An HMA overlay without a waterproof membrane should be used on a bridge deck with a deck surface and deck bottom rating of serious condition or lower (NBI rating of 3 or less) and with deficiencies that cover greater than 30 percent of the deck surface and bottom; this is considered a temporary holdover to improve ride quality when a bridge deck is scheduled to undergo major rehabilitation within five years. All HMA overlays need to be accompanied by an updated load rating. Patching of the concrete on a bridge deck is done in response to an inspector’s work recommendation or when the deck surface is in good, satisfactory, or fair condition (NBI rating of 7, 6, or 5) with minor delamination and spalling. To preserve a good bridge deck in good condition, a deck sealer can be used.

  Deck sealing should only be done when the bridge deck has surface rating of fair or better (NBI of 5 or more). Concrete sealers should only be used when the top and bottom surfaces of the deck are free from major deficiencies, cracks, and spalling. An epoxy overlay may be used when between 2 and 5 percent of the deck surface has delaminations and spalls, but these deficiencies must be repaired prior to the overlay. An epoxy overlay may also be used to repair an existing epoxy overlay. Concrete crack sealing is an option to maintain concrete in otherwise good condition that has visible cracks with the potential of reaching the steel reinforcement. Crack sealing may be performed on concrete with a surface rating of good, satisfactory, or fair (NBIS rating of 7, 6, or 5) with minor surface spalling and delamination; it may also be performed in response to a work recommendation by an inspector who has determined that the frequency and size of the cracks require sealing.

- **Steel bearing repair/replacement:** Rather than sitting directly on the piers, a bridge superstructure is separated from the piers by bearings. Bearings allow for a certain degree of movement due to temperature changes or other forces. Repairing or replacing the bearings is considered preventive maintenance. Girders and a deck in at least fair condition (NBI of 5 or
higher) and bearings in poor condition (NBI rating of 4 or less) identifies candidates for this maintenance activity.

- **Painting:** Re-painting a bridge structure can either be done in totality or in part. Total re-painting is done in response to an inspector’s work recommendation or when the paint condition is in serious condition (NBI rating of 3 or less). Partial re-painting can either consist of zone re-painting, which is a preventive maintenance technique, or spot re-painting, which is scheduled maintenance (see below). Zone re-painting is done when less than 15 percent of the paint in a smaller area, or zone, has failed while the rest of the bridge is in good or fair condition. It is also done if the paint condition is fair or poor (NBI rating of 5 or 4).

- **Channel improvements:** Occasionally, it is necessary to make improvements to the waterway that flows underneath the bridge. Such channel improvements are driven by an inspector’s work recommendation based on a hydraulic analysis or to remove vegetation, debris, or sediment from the channel and banks (Figure 6).

- **Scour countermeasures:** An inspector’s work recommendations or a hydraulic analysis may require scour countermeasures (see the Risk Management section of this plan for more information on scour). This is done when a structure is categorized as scour critical and is not scheduled for replacement or when NBI comments in abutment and pier ratings indicate the presence of scour holes.

- **Approach repaving:** A bridge’s approach is the transition area between the roadway leading up to and away from the bridge and the bridge deck. Repaving the approach areas is performed in response to an inspector’s work recommendation, when the pavement surface is in poor condition (NBI rating of 4 or less), or when the bridge deck is replaced or rehabilitated (e.g., concrete overlay).

- **Guardrail repair/replacement:** A guardrail is a safety feature on many roads and bridges that prevents or minimizes the effects of lane departure incidents. Keeping bridge guardrails in good condition is important. Repair or replacement of bridge guardrail should be done when a guardrail is missing or damaged, or when it needs a safety improvement.

**Scheduled Maintenance**

Scheduled maintenance activities are those activities or treatments that are regularly scheduled and intend to maintain serviceability while reducing the rate of deterioration.

- **Superstructure washing:** Washing the superstructure, or the main structure supporting the bridge, typically occurs in response to an inspector’s work recommendation or when salt-contaminated dirt and debris collected on the superstructure is causing corrosion or deterioration by trapping moisture.

- **Drainage system cleanout/repair:** Keeping a bridge’s drainage system clean and in good working order allows the bridge to shed water effectively. An inspector’s work recommendation may indicate drainage system cleanout/repair. Signs that a drainage system needs cleaning or repair include clogs and broken, deteriorated, or damaged drainage elements.
- **Spot painting:** Spot painting is a form of partial bridge painting. This scheduled maintenance technique involves painting a small portion of a bridge. Generally, this is done in response to an inspector’s work recommendation and is used for zinc-based paint systems only.

- **Slope repair/reinforcement:** The terrain on either side of the bridge that slopes down toward the channel is called the slope. At times, it is necessary to repair the slope. Situations that call for slope repair include when the slope is degraded, when the slope has significant areas of distress or failure, when the slope has settled, or if the slope is in fair or poor condition (NBI rating of 5 or less). Other times, it is necessary to reinforce the slope. Reinforcement can be added by installing Riprap, which is a side-slope covering made of stones. Riprap protects the stability of side slopes of channel banks when erosion threatens the surface.

- **Vegetation control and debris removal:** Keeping the area around a bridge structure free of vegetation and debris safeguards the bridge structure from these potentially damaging forces. Removing or restricting vegetation around bridges prevents damage to the structure. Vegetation control is done in response to an inspector’s work recommendation or when vegetation traps moisture on structural elements or is growing from joints or cracks. Debris in the water channel or in the bridge can also cause damage to the structure. Removing this debris is typically done in response to an inspector’s work recommendation or when vegetation, debris, or sediment accumulates on the structure or channel.

- **Miscellaneous repairs:** These are uncategorized repairs in response to an inspector’s work recommendation.
1. BRIDGE ASSETS

Grand Rapids seeks to implement an asset management program for its bridge structures. This program balances the decision to perform reconstruction, rehabilitation, preventive maintenance, scheduled maintenance, or new construction, with Grand Rapids’ bridge funding in order to maximize the useful service life and to ensure the safety of the local bridges under its jurisdiction. In other words, Grand Rapids’ bridge asset management program aims to preserve and/or improve the condition of its local bridge network within the means of its financial resources.

Nonetheless, Grand Rapids recognizes that limited funds are available for improving the bridge network. Since preservation strategies like preventive maintenance are generally a more effective use of these funds than costly alternative management strategies like major rehabilitation or replacement, Grand Rapids seeks to identify those bridges that will benefit from a planned maintenance program while addressing those bridges that pose usability and/or safety concerns.

The three-fold goal of Grand Rapids’ asset management program is the preservation and safety of its bridge network, increase of its bridge assets’ useful service life by extending of the time that bridges remain in good and fair condition, and reduction of future maintenance costs. To quantify this goal, Grand Rapids specifically aims to have 100% or more of the agency's local bridges in fair to good condition and to have less than 0% classify as structurally deficient over its 10 years.

Thus, Grand Rapids’ asset management plan objectives are:

- To establish the current condition of the City’s bridges
- To develop a “mix of fixes” that will:
  - Program scheduled maintenance actions to impede deterioration of bridges in good condition
  - Implement selective corrective repairs or rehabilitation for degraded bridge elements order to restore functionality
  - Identify and program those eligible bridges in need of replacement
- To identify available funding sources, such as:
  - Dedicated City resources
  - City funding through Michigan’s Local Bridge Program
  - Opportunities to obtain other funding
- To prioritize the programmed actions within available funding limitations
• To preserve bridges currently rated fair (5) or higher in their current condition in order to extend their useful service life.

Inventory

Grand Rapids is responsible for 23 local bridges. Table 2 summarizes Grand Rapids’ bridge assets by type, sizes by bridge type, and condition by bridge type. Additional inventory data, condition ratings, and proposed preventive maintenance actions for each bridge are contained in the tables in Appendixes 1 - 5. The bridge inventory data was obtained from MDOT MiBRIDGE and other sources, and the 2019 condition data and maintenance actions are taken from the inspector’s summary report (see Appendix 2).

Types

Of the Grand Rapids’ 23 structures, 3 are concrete bridges, 7 are steel bridges, and 13 are pre-stressed concrete bridges.

Locations and Sizes

Figure 7 illustrates the locations of bridge assets owned by Grand Rapids. Details about the locations and sizes of each individual asset can be found in Grand Rapids’ MiBRIDGE database. For more information, please refer to the agency contact listed in the Introduction of this bridge asset management plan.
Figure 7: Map illustrating locations Grand Rapids' of bridge assets
**Condition**

Grand Rapids evaluates its bridges according to the National Bridge Inspection Standards rating scale, with a rating of 9 to 7 being like new to good condition, a rating of 6 and 5 being fair condition, and a rating of 4 or lower being poor or serious/critical condition. The current condition of Grand Rapids’ bridge network is 16 (69.57%) are good, 6 (26.08%) are fair, and 1 (4.35%) are poor or lower.

Another layer of classification of Grand Rapids’ bridge inventory classifies 1 (4.35%) bridges as structurally deficient, 1 (4.35%) bridges as posted, and no (0.00%) bridges as closed. Structurally deficient bridges are those with a deck, superstructure, substructure, and/or culvert rated as “poor” according to the NBI rating scale, with a load-carrying capacity significantly below design standards, or with a waterway that regularly overtops the bridge during floods. Posted bridges are those that have declined in condition to a point where a restriction is necessary for what would be considered a safe vehicular or traffic load passing over the bridge; designating a bridge as “posted” has no influence on its condition rating. Closed bridges are those that are closed to all traffic; closing a bridge is contingent upon its ability to carry a set minimum live load.
Table 2: Bridge Assets by Type: Inventory, Size, and Condition

<table>
<thead>
<tr>
<th>Bridge Type</th>
<th>Total Number of Bridges</th>
<th>Total Deck Area (sq ft)</th>
<th>Condition: Structurally Deficient, Posted, Closed</th>
<th>2019 Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Struct. Defic</td>
<td>Posted</td>
</tr>
<tr>
<td>Concrete – Culvert</td>
<td>1</td>
<td>4,976</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Concrete – Tee beam</td>
<td>1</td>
<td>898</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Concrete continuous – Multistringer</td>
<td>1</td>
<td>8,808</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Prestressed concrete – Box beam/girders—multiple</td>
<td>7</td>
<td>32,173</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Prestressed concrete – Box beam/girders—single/spread</td>
<td>1</td>
<td>5,894</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Prestressed concrete – Multistringer</td>
<td>5</td>
<td>123,415</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Steel – Multistringer</td>
<td>4</td>
<td>43,309</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Steel – Truss—thru and pony</td>
<td>1</td>
<td>19,010</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Steel continuous – Multistringer</td>
<td>2</td>
<td>80,249</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total SD/Posted/Closed</td>
<td>23</td>
<td>318,732</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td></td>
<td></td>
<td>4.35</td>
<td>4.35</td>
</tr>
</tbody>
</table>

Statewide, MDOT’s statistics for local agency bridges show that 14% are poor and 86% are good/fair, indicating that the Grand Rapids has a lesser percentage of poor bridges compared to the statewide average for local agencies. Correspondingly, Grand Rapids has 96% of its bridges in fair/good condition versus the statewide average of 86% for local agency bridges. Statewide, 8% of local agency bridge deck area classifies as structurally deficient compared to 4% of Grand Rapids’ bridge deck area.

**Goals**

The goal of Grand Rapids’ asset management program is the preservation and safety of its bridge network; it also aims to extend the period of time that bridges remain in good and fair condition, thereby increasing their useful service life and reducing future maintenance costs.

Specifically, this goal translates into long-range goals of having 100% of its bridges rated fair/good and having 0% classify as structurally deficient within 10 years. These goals are juxtaposed with the historic and current condition and the projected trend in Figure 8.

Several metrics will be used to assess the effectiveness of this asset management program. Grand Rapids will monitor and report the annual change in the number of its bridges rated fair/good (5 or higher) and the annual change in the number of its bridges classified as structurally deficient.
Based on past inspection records and condition ratings, Grand Rapids will establish a baseline of past performance by determining the average period of time that a bridge remains in good or fair condition. The performance measure will be the increased average amount of time a bridge is in the good or fair condition status after implementation of the asset management strategy when compared to the baseline time before implementation.

**Prioritization, Programmed/Funded Projects, and Planned Projects**

**Prioritization**

Grand Rapids’ asset management program aims to address the structures of critical concern by targeting elements rated as being in poor condition and to improve and maintain the overall condition of the bridge network to good or fair condition through a “mix of fixes” strategy that is made up of preventative maintenance and scheduled maintenance. Therefore, Grand Rapids prioritizes bridges for projects by evaluating five factors and weighting them as follows: condition –20%, load capacity –25%, traffic –25%, safety –25%, and detour –5%. There are several components within each factor that are used to arrive at its score. Each project under consideration is scored, and its total score is then compared with other proposed project to establish a priority order.

Grand Rapids biennially reviews the current condition of each of the its bridges using the NBIS inspection data contained in the *MDOT Bridge Safety Inspection Report* and the inspector’s work recommendations contained in MDOT’s *Bridge Inspection Report*. The inspection inventory and condition data are consolidated in spreadsheet format for Grand Rapids’ bridges in Appendix 1. Grand
Rapids then determines management and preservation needs and corresponding actions for each bridge (2019 Work Recommendations (Appendix 2) and 2019 Follow-up Work (Appendix 3)), as well as FY2021 – FY2031 Proposed Work (Appendix 4). The management and preservation actions are selected in accordance with criteria contained in the *Summary of Preservation Criteria* table (below) and adapted to Grand Rapids’ specific bridge network.

<table>
<thead>
<tr>
<th>Preservation Action</th>
<th>Bridge Selection Criteria</th>
<th>Expected Service Life</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Replacement</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Total Replacement   | - NBI rating of 3 or less [1] [2]  
- OR Cost of rehabilitation exceeds cost of replacement [1]  
- OR Bridge is scour critical with no counter-measures available [1] | 70 years |
| **Rehabilitation**  |                            |                       |
| Superstructure      | - NBI rating of 4 or less for the superstructure [1] [2]  
- OR Cost of superstructure and deck rehabilitation exceeds cost of replacement [1] | 40 years [1] |
- NBI rating of 4 or less for the deck surface and deck bottom [1] [2]  
- Deck bottom has more than 25% total area with deficiencies [1]  
- OR Replacement cost of deck is competitive with rehabilitation [1] | 60+ years [3][4] |
| Epoxy Coated Steel  |                            |                       |
| Black Steel         |                            |                       |
| Substructure        | - NBI rating of 4 or less for abutments, piers, or pier cap [1] [2]  
- Has open vertical cracks, signs of differential settlement, or active movement [1]  
- Pontis rating of 3 or 5 for more than 30 percent of the substructure [1] [5]  
- OR Bridge is scour critical with no counter-measures available | 40 years [1] |
| (Full or Partial)   |                            |                       |
| Steel Beam Repair   | - More than 25% section loss in an area of the beam that affects load carrying capacity [1]  
- OR To correct impact damage that impairs beam strength [1] | 40 years [1] |
| Prestressed Concrete Beam Repair | - More than 5% spalling at ends of prestressed I-beams [1]  
- OR Impact damage that impairs beam strength or exposes prestressing strands [1] | 40 years [1] |
| Substructure        | - NBI rating of 5 or 4 for abutments or piers, and surface has less than 30% area spalled and delaminated [1] [2]  
- OR Pontis rating of 3 or 4 for the column or pile extension, pier wall, and/or abutment wall and surface has between 2% and 30% area with deficiencies [1] [5]  
- OR In response to inspector’s work recommendation for substructure patching [1] |                       |
| Patching and Repair |                            |                       |
| Abutment Repair/Replacement | - NBI rating of 4 or less for the abutment [1] [2]  
- OR Has open vertical cracks, signs of differential settlement, or active movement |                       |
| Railing/Barrier     | - NBI rating greater than 5 for the deck [1] [2]  
- NBI rating less than 5 for the railing with more than 30% total area having deficiencies [1] [2]  
- OR Pontis rating is 4 for railing [1] [5]  
- OR Safety improvement is needed [1] |                       |
<table>
<thead>
<tr>
<th>Preservation Action</th>
<th>Bridge Selection Criteria</th>
<th>Expected Service Life</th>
</tr>
</thead>
</table>
| **Culvert Repair/Replacement** | - NBI rating of 4 or less for culvert or drainage outlet structure  
- OR Has open vertical cracks, signs of deformation, movement, or differential settlement | |
| **Preventive Maintenance** | |
| Shallow Concrete Deck Overlay | - NBI rating is 5 or less for deck surface, and deck surface has more than 15% area with deficiencies [1] [2]  
- NBI rating of 4 or 5 for deck bottom, and deck bottom has between 5% and 30% area with deficiencies [1] [2]  
- OR In response to inspector’s work recommendation [1] | 12 years |
| Deep Concrete Deck Overlay | - NBI rating of 5 or less for deck surface, and deck surface has more than 15% area with deficiencies [1] [2]  
- NBI deck bottom rating is 5 or 6, and deck bottom has less than 10% area with deficiencies [1] [2]  
- OR In response to inspector’s work recommendation | 25 years |
| HMA Overlay with Waterproofing Membrane | - NBI rating of 5 or less for deck surface, and both deck surface and bottom have between 15% and 30% area with deficiencies [1] [2]  
- OR Bridge is in poor condition and will be replaced in the near future and the most cost-effective fix is HMA overlay [1] | |
| HMA Overlay Cap without Membrane | Note: All HMA caps should have membranes unless scheduled for replacement within five years.  
- NBI rating of 3 or less for deck surface and deck bottom, and deck surface and deck bottom have more than 30% area with deficiencies. Temporary holdover to improve ride quality for a bridge in the five-year plan for rehab/replacement. [1] [2] | 3 years |
| Concrete Deck Patching | - NBI rating of 5, 6, or 7 for deck surface, and deck surface has between 2% and 5% area with delamination and spalling [1] [2]  
- OR In response to inspector’s work recommendation [1] | 5 years |
| Steel Bearing Repair/Replacement | - NBI rating of 5 or more for superstructure and deck, and NBI rating 4 or less for bearing [2] | |
| Deck Joint Replacement | - Always include when doing deep or shallow concrete overlays [1]  
- NBI rating of 4 or less for joints [1] [2]  
- OR Joint leaking heavily [1]  
- OR In response to inspector’s work recommendation for replacement [1] | |
| Pin and Hanger Replacement | - NBI rating of 4 or less for superstructure for pins and hangers [1] [2]  
- Pontis rating of 1, 2, or 3 for a frozen or deformed pin and hanger [1] [5]  
- OR Presence of excessive section loss, severe pack rust, or out-of-plane distortion [1] | 15 years |
| Zone Repainting | - NBI rating of 5 or 4 for paint condition, and paint has 3% to 15% total area failing [1] [2]  
- OR During routine maintenance on beam ends or pins and hangers [1]  
- OR less than 15% of existing paint area has failed and remainder of paint system is in good or fair condition [1] | 10 years |
<p>| Complete Repainting | - NBI rating of 3 or less for paint condition [1] [2] | |</p>
<table>
<thead>
<tr>
<th>Preservation Action</th>
<th>Bridge Selection Criteria</th>
<th>Expected Service Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial Repainting</td>
<td>• OR Painted steel beams that have greater than 15% of the existing paint area failing [1]</td>
<td></td>
</tr>
</tbody>
</table>
| Channel Improvements| • Removal of vegetation, debris, or sediment from channel and banks to improve channel flow  
• OR in response to inspector's work recommendation |  |
| Scour Countermeasures | • Pontis scour rating of 2 or 3 and is not scheduled for replacement [1]  
• OR NBI comments in abutment and pier ratings indicate presence of scour holes [1] [2] |  |
| Approach Repaving   | • Approach pavement relief joints should be included in all projects that contain a significant amount of concrete roadway (in excess of 1000’ adjacent to the structure). The purpose is to alleviate the effects of pavement growth that may cause distress to the structure. Signs of pavement growth include:  
  o Abutment spalling under bearings [1]  
  o Beam end contact [1]  
  o Closed expansion joints and/or pin and hangers [1]  
  o Damaged railing and deck fascia at joints [1]  
  o Cracking in deck at reference line (45 degree angle) [1] |  |
| Guard Rail Repair/Replacement | • Guard rail missing or damaged [2]\(^*\)  
• OR Safety improvement is needed [2]\(^*\) |  |
| **Scheduled Maintenance** | |  |
| Superstructure Washing | • When salt contaminated dirt and debris collected on superstructure is causing corrosion or deterioration by trapping moisture [1]  
• OR Expansion or construction joints are to be replaced and the steel is not to be repainted [1]  
• OR Prior to a detailed replacement [1]  
• OR In response to inspector's work recommendation [1] | 2 years |
| Drainage System Clean-Out/Repair | • When drainage system is clogged with debris [1]  
• OR Drainage elements are broken, deteriorated, or damaged [1]  
• OR NBI rating comments for drainage system indicate need for cleaning or repair [1] [2] | 2 years |
| Spot Repainting | • For zinc-based paint systems only. Do not spot paint with lead-based paints.  
• Less than 5% of paint area has failed in isolated areas [1]  
• OR In response to inspector's work recommendation [1] | 5 years |
| Slope Paving Repair | • NBI rating is 5 or less for slope protection [1] [2]  
• OR Slope is degraded or sloughed  
• OR Slope paving has significant areas of distress, failure, or has settled [1] |  |
| Riprap Installation | • To protect surface when erosion threatens the stability of side slopes of channel banks |  |
| Vegetation Control | • When vegetation traps moisture on structural elements [1]  
• OR Vegetation is growing from joints or cracks [1]  
• OR In response to inspector's work recommendation for brush cut [1] | 1 year |
<table>
<thead>
<tr>
<th>Preservation Action</th>
<th>Bridge Selection Criteria</th>
<th>Expected Service Life</th>
</tr>
</thead>
</table>
| Debris Removal              | • When vegetation, debris, or sediment accumulates on the structure or in the channel  
• OR In response to inspectors work recommendation                                                                                                                        | 1 year                |
| Deck Joint Repair           | • Do not repair compression joint seals, assembly joint seals, steel armor expansions joints, and block out expansion joints; these should always be replaced. [1]  
• NBI rating is 5 for joint [1] [2]  
• OR In response to inspector’s work recommendation for repair [1]                                                                                               |                       |
| Concrete Sealing            | • Top surface of pier or abutments are below deck joints and, when contaminated with salt, salt can collect on the surface [1]  
• OR Surface of the concrete has heavy salt exposure. Horizontal surfaces of substructure elements are directly below expansion joints [1]                                                                 |                       |
| Concrete Crack Sealing      | • Concrete is in good or fair condition, and cracks extend to the depth of the steel reinforcement [1]  
• OR NBI rating of 5, 6, or 7 for deck surface, and deck surface has between 2% and 5% area with deficiencies [1] [2]  
• OR Unsealed cracks exist that are narrow and/or less than 1/8” wide and spaced more than 8’ apart [1]  
• OR In response to inspector’s work recommendation [1]                                                                                                                  | 5 years               |
| Minor Concrete Patching     | • Repair minor delaminations and spalling that cover less than 30% of the concrete substructure [1]  
• OR NBI rating of 5 or 4 for abutments or piers, and comments indicate that their surface has less than 30% spalling or delamination [1] [2]  
• OR Pontis rating of 3 or 4 for the column or pile extension, pier wall and/or abutment wall, and surface has between 2% and 30% area with deficiencies [1] [5]  
• OR In response to inspector’s work recommendation [1]                                                                                                               |                       |
| HMA Surface Repair/Replacement | • HMA surface is in poor condition  
• OR In response to inspector’s work recommendation                                                                                                                                                                                  |                       |
| Seal HMA Cracks/Joints      | • HMA surface is in good or fair condition, and cracks extend to the surface of the underlying slab or sub course  
• OR In response to inspector’s work recommendation                                                                                                                                                                             |                       |
| Timber Repair               | • NBI rating of 4 or less for substructure for timber members  
• OR To repair extensive rot, checking, or insect infestation                                                                                                              |                       |
| Miscellaneous Repair        | • Uncategorized repairs in response to inspector’s work recommendation                                                                                                                                                                     |                       |

This table was produced by TransSystems and includes information from the following sources:  
* From source with interpretation added.
In terms of management and preservation actions, Grand Rapids’ asset management program uses a “mix of fixes” strategy that is made up of preventative maintenance and scheduled maintenance.

**Replacement** involves substantial changes to the existing structure, such as bridge deck replacement, superstructure replacement, or complete structure replacement, and is intended to improve critical or closed bridges to a good condition rating.

**Rehabilitation** is undertaken to extend the service life of existing bridges. The work will restore deficient bridges to a condition of structural or functional adequacy, and may include upgrading geometric features. Rehabilitation actions are intended to improve the poor or fair condition bridges to fair or good condition.

**Preventive maintenance** work will improve and extend the service life of fair bridges, and will be performed with the understanding that future rehabilitation or replacement projects will contain appropriate safety and geometric enhancements. Preventive maintenance projects are directed at limited bridge elements that are rated in fair condition with the intent of improving these elements to a good rating. Most preventive maintenance projects will be one-time actions in response to the biannual inspection.

Grand Rapids’ **scheduled maintenance** program is an integral part of the preservation plan, and is intended to extend the service life of fair and good structures by preserving the bridges in their current condition for a longer period of time. Scheduled maintenance is proactive and not necessarily condition driven. In-house maintenance crews or contracted forces will perform this work.

Certain of the severely degraded and structurally deficient bridges require replacement or major rehabilitation. Several of the remaining bridges require one-time preventive maintenance actions to repair defects and restore the structure to a higher condition rating. Most bridges are included in a scheduled maintenance plan with appropriate maintenance actions programmed for groups of bridges of similar material and type, bundled by location.

The replacement, rehabilitation, and preventive maintenance projects are generally eligible for funding under the local bridge program, and any requests for funding will be submitted with City of Grand Rapids annual applications.

To achieve its goals, a primary objective of Grand Rapids’ asset management program is improvement of one bridge rated poor (4 or lower) to a rating of fair (5) or higher within a five-year time period through management and/or preservation activities. The primary work activities that will be used to meet this improvement objective include the physical removal of the bridge or to work to have the bridge (Riverside Park Drive (#13059)) removed from the City’s bridge inventory or schedule rehabilitation work. The remaining work has been prioritized by considering each individual bridge’s needs, its importance, the present costs of improvements, and the impact of deferral (i.e., cost increase due to increased degradation). Additionally, Grand Rapids’ asset management program incorporates preservation of bridges currently rated fair (5) or higher in their current condition in order to extend their useful service life. A bridge-by-bridge preservation—or maintenance—plan is presented in the Appendix 4.
**Programmed/Funded Projects**

Grand Rapids received $75,000 in total funding per year for the fiscal years 2021 - 2025. To achieve its goals, Grand Rapids plans to spend $60,000 per year on preventive maintenance of bridges. Grand Rapids does not plan to replace any bridges in the next five years. By performing the aforementioned preventive maintenance and removal of one bridge structures (or remove from the bridge from the Local Bridge system), Grand Rapids will meet its overall bridge network condition goals.

Grand Rapids computes the estimated cost of each typical management and/or preservation action using unit prices in the latest *Bridge Repair Cost Estimate* spreadsheet contained in MDOT’s *Local Bridge Program Call for Projects*. The cost of items of varying complexity, such as maintenance of traffic, staged construction, scour counter-measures, and so forth, are computed on a bridge-by-bridge basis. The cost estimates are reviewed and updated annually. A summary of the programmed/funded projects and investments can be found in Table 4, the Cost Projection table, below.

**Planned Projects**

Grand Rapids identifies additional priority projects that remain unfunded. These are identified according to high, medium, and low priority in Table 4.

**Gap Analysis**

When Grand Rapids compares its funding and its programmed/funded projects with all of its prioritized projects as shown in Table 4, Grand Rapids believes it should be able to achieve all of its asset management goals for the period of this plan. This assumes that Grand Rapids is successful in securing Local Bridge Program grants for the projects. There is dedicated funding for the local share (or if it is funded with only local funds) through Vital Streets.
<table>
<thead>
<tr>
<th>Strategy</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
<th>2028</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Replacement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Rehabilitation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Scheduled Maintenance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Preventive Maintenance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5093</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$74,550</td>
<td></td>
</tr>
<tr>
<td>5094</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$87,150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5098</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$64,050</td>
<td></td>
<td>$140,700</td>
<td></td>
</tr>
<tr>
<td>5217</td>
<td>$270,900</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5193</td>
<td></td>
<td></td>
<td></td>
<td>$75,600</td>
<td></td>
<td>$235,200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5197</td>
<td>$75,600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5198</td>
<td>$235,200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5201</td>
<td>$66,150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5211</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$12,495</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5213</td>
<td>$343,350</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5204</td>
<td>$75,600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5205</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$115,500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5186</td>
<td>$218,400</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$19,950</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5188</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$372,750</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5192</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$40,950</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$133,350</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12677</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$67,200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>$488,250</td>
<td>$343,250</td>
<td>$235,200</td>
<td>$438,900</td>
<td>$372,750</td>
<td>$124,950</td>
<td>$190,050</td>
<td>$220,395</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13059</td>
<td>$145,000</td>
<td>$327,600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>$0</td>
<td>$145,000</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>$488,250</td>
<td>$478,250</td>
<td>$235,200</td>
<td>$766,500</td>
<td>$372,750</td>
<td>$124,950</td>
<td>$190,050</td>
<td>$220,395</td>
</tr>
</tbody>
</table>

Note: the amount shown is the total (2020 dollars) amount. It is anticipated that the City will successfully secure Local Bridge Program grants for this work (or defer the work until such time as a grant is received). The grants typically fund 95% of the eligible costs. The City may increase their share to 20%.

* Removal estimated costs
** Superstructure/scour repair costs
2. FINANCIAL RESOURCES

Anticipated Revenues

Grand Rapids has programmed projects and/or has been granted funding from several sources including, but not limited to MDOT Local Bridge Program, a City appropriation of monies through the Vital Streets Program for bridge preservation, and federal programs, for the purpose(s) of replacement, rehabilitation, preventive maintenance, and scheduled maintenance for the following bridge(s): 5217 (Leffingwell Avenue). This funding is intended for use in the following fiscal year: 2022.

Grand Rapids applied for funding from several sources including, but not limited to MDOT Local Bridge Program, a City appropriation of monies through the Vital Streets Program for bridge preservation, and federal programs, in 2020 for the purpose(s) of preventive maintenance and scheduled maintenance for the following bridge(s): 5213 (Oxford Street), 5197 (Division Avenue), 5201 (Alpine Avenue), and 5204 (College Avenue). This funding would be intended for use in the following fiscal year: 2023.

Grand Rapids plans to prepare and submit applications for MDOT Local Bridge Program for the purpose of removal for the following bridge: 13059 (Riverside Park Drive). This funding would be intended for use in the following fiscal year: 2022.

In future years, Grand Rapids plans to prepare and submit applications for MDOT Local Bridge Program for the purpose(s) of preventive maintenance and scheduled maintenance for the following bridge(s): 5186 (Pearl Street), 5192 (Sixth Street), 5198 (Wealthy Street), 5210 (Hall Street), 5094 (Burton Street), 5211 (Alger Street), 5098 (Kalamazoo Avenue), 5188 (Market Avenue), 5200 (Walker Avenue), 5093 (Burton Street), 5205 (Eastern Avenue), 5193 (Ann Street), 5211 (Alger Street) and 12677 (Madison Avenue). This funding would be intended for use in the following funding year(s): 2024 - 2028.

Any projects submitted to the Local Bridge Program that are not selected for funding may be funded with the City’s Vital Street funds only.

Anticipated Expenses

Scheduled maintenance activities and minor repairs that are not affiliated with any applications, grants, or other funded projects will be performed by the agency’s in-house maintenance forces or contracted for and funded through the agency’s annual operating budget.
3. RISK MANAGEMENT

Grand Rapids recognizes that the potential risks associated with bridges generally fall into several categories:

- Personal injury and property damage resulting from a bridge collapse or partial failure;
- Loss of access to a region or individual properties resulting from bridge closures, restricted load postings, or extended outages for rehabilitation and repair activities; and
- Delays, congestion, and inconvenience due to serviceability issues, such as poor quality riding surface, loose expansion joints, or missing expansion joints.

Grand Rapids addresses these risks by implementing regular bridge inspections and a preservation strategy consisting of preventive maintenance.

Grand Rapids administers the biennial inspection of its bridges in accordance with NBIS and MDOT requirements. The inspection reports document the condition of Grand Rapids’ bridges and evaluates them in order to identify new defects and monitor advancing deterioration. The summary inspection report identifies items needing follow-up, special inspection actions, and recommended bridge-by-bridge maintenance activities.

Bridges that are considered “scour critical” pose a risk to Grand Rapids’ road and bridge network. Scour is the depletion of sediment from around the foundation elements of a bridge commonly caused by fast-moving water. According to MDOT’s *Michigan Structure Inventory and Appraisal Coding Guide*, a scour critical bridge is one that has unstable abutment(s) and/or pier(s) due to observed or potential (based on an evaluation study) scour. Bridges receiving a scour rating of 3 or less are considered scour critical. Grand Rapids has scour critical bridges, which are listed in Table 5.

Table 5
Grand Rapids has posted or closed bridges that are critical to accessing entire areas or individual properties within its jurisdiction. These bridges are listed in Table 6.

**Table 6**

<table>
<thead>
<tr>
<th>Posted/Closed Bridges that are Critical Links</th>
<th>P/K</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridge Structure Number</td>
<td>P/K</td>
<td>Comments</td>
</tr>
<tr>
<td>5192 P</td>
<td>Historic (Sixth Street) bridge</td>
<td></td>
</tr>
</tbody>
</table>

The preservation strategy identifies actions in the operations and maintenance plan that are preventive or are responsive to specific bridge conditions. The actions are prioritized to correct critical structural safety and traffic issues first, and then to address other needs based on the operational importance of each bridge and the long-term preservation of the network. The inspection results serve as a basis for modifying and updating the operations and maintenance plan annually.
Appendix 1
City of Grand Rapids 2019 Bridge Inspection Report
## Appendix 2

### City of Grand Rapids 2019 Work Recommendations

NOTE: This summary report was generated by MDOT’s MiBridge application. Not all work recommendation categories can be displayed in this report. Please refer to the individual Work Recommendation reports for a comprehensive listing of the work.

<table>
<thead>
<tr>
<th>STR. NO.</th>
<th>FACILITY CARRIED</th>
<th>FEATURES INTERSECTED</th>
<th>WORK  RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4708</td>
<td>MICHIGAN ST</td>
<td>US-131 (DIVISION AVE)</td>
<td>Deck cracks in deck surface. Repair small spall in one panel.</td>
</tr>
<tr>
<td>5093</td>
<td>BURTON STREET</td>
<td>PLASTER CREEK</td>
<td>Clean and seal joint.</td>
</tr>
<tr>
<td>5095</td>
<td>BURTON STREET</td>
<td>CONIBRA</td>
<td>Joint repair.</td>
</tr>
<tr>
<td>5098</td>
<td>TURNER AVENUE</td>
<td>INDIA WALL CREEK</td>
<td>Rail repair.</td>
</tr>
<tr>
<td>5119</td>
<td>PEARL STREET</td>
<td>GROUNDS RIVER</td>
<td>Detailed inspection.</td>
</tr>
<tr>
<td>5138</td>
<td>MARSH AVENUE</td>
<td>PLASTER CREEK</td>
<td>Substructure repair.</td>
</tr>
<tr>
<td>5150</td>
<td>STH STREET</td>
<td>GROUNDS RIVER</td>
<td>Approach pavement.</td>
</tr>
<tr>
<td>5154</td>
<td>JOHN STREET</td>
<td>GROUNDS RIVER</td>
<td>Extensive crack repair.</td>
</tr>
<tr>
<td>5158</td>
<td>NORTH PARK STREET</td>
<td>GROUNDS RIVER</td>
<td>Superstructure repair.</td>
</tr>
<tr>
<td>5167</td>
<td>JORDON AVENUE</td>
<td>PLASTER CREEK</td>
<td>Deck overlay.</td>
</tr>
<tr>
<td>5168</td>
<td>WEIGHT STREET</td>
<td>GROUNDS RIVER</td>
<td>Paint.</td>
</tr>
<tr>
<td>5169</td>
<td>BRIDGE STREET</td>
<td>GROUNDS RIVER</td>
<td>Deck overlay.</td>
</tr>
<tr>
<td>5170</td>
<td>WILDER AVENUE</td>
<td>INDIA WALL CREEK</td>
<td>Joint repair.</td>
</tr>
<tr>
<td>5176</td>
<td>ALPINE AVENUE</td>
<td>INDIA WALL CREEK</td>
<td>Seal cracks in deck surface.</td>
</tr>
<tr>
<td>5179</td>
<td>COLLEGE AVENUE</td>
<td>GRAND TRUNK RR</td>
<td>Clean out joint.</td>
</tr>
<tr>
<td>5180</td>
<td>EAST AVENUE</td>
<td>PLASTER CREEK</td>
<td>Repair West abutment slope paving.</td>
</tr>
<tr>
<td>5183</td>
<td>HOLL STREET</td>
<td>PS &amp; SIBLEY AVENUE</td>
<td>Clean out joint.</td>
</tr>
<tr>
<td>5185</td>
<td>JULIUS STREET</td>
<td>CHESEAPEAKE AND OHIO RR</td>
<td>Clean out joint.</td>
</tr>
<tr>
<td>5187</td>
<td>OFFINGHAM AVENUE</td>
<td>CRIB RAILROAD</td>
<td>Seal cracks in trestle.</td>
</tr>
<tr>
<td>5188</td>
<td>OXNORD AVENUE</td>
<td>CRIB RAILROAD</td>
<td>Replace joints.</td>
</tr>
</tbody>
</table>

---

Page 1 of 2
### Appendix 2

#### City of Grand Rapids 2019 Work Recommendations

<table>
<thead>
<tr>
<th>NO.</th>
<th>FACILITY CARRIED</th>
<th>FEATURES INTERSECTED</th>
<th>DECK PATCHING</th>
<th>APPROACH PAVEMENT</th>
<th>JOINT REPAIR</th>
<th>NAIL REPAIR</th>
<th>DETAILD INSPI</th>
<th>SUBSTR. REPAIR</th>
<th>SLOPE REPAIR</th>
<th>BRUSH CUT</th>
<th>REPLACE BRIDGE</th>
<th>SUPERSTR. REPAIR</th>
<th>DECK OVERLAY</th>
<th>PAINT</th>
<th>ZONE PAINT</th>
<th>OTHER WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>12677</td>
<td>MADISON AVENUE</td>
<td>PLASTER CROSS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13059</td>
<td>RIVERSIDE PARK DR</td>
<td>GRAND RIVER LAGOON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **12677 MADISON AVENUE**
  - **PLASTER CROSS**
  - Deck of embankment securing behind sidewalk and guardrail in NW quad. Fill Sheeting gap.

- **13059 RIVERSIDE PARK DR**
  - **GRAND RIVER LAGOON**
  - Determine extent of scour.
  - Budget for replacement.
  - Patch sides, remove Paint rusted.
## Appendix 3

### City of Grand Rapids 2019 Follow-Up Work

<table>
<thead>
<tr>
<th>Bridge Type</th>
<th>Structure Number</th>
<th>Bridge ID</th>
<th>Facility Carried</th>
<th>Features Intersected</th>
<th>Structure Type</th>
<th>Total MSI Length (Item 5)</th>
<th>Total MSI Str (sq ft) (Item 6)</th>
<th>In-Depth Steel Inspection</th>
<th>Type and Ranger Inspection</th>
<th>Criticality Review</th>
<th>Monitoring</th>
<th>Provide</th>
<th>Inspection Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel - Prestressed</td>
<td>3508</td>
<td>1116001205000537</td>
<td>NORTH STREET</td>
<td>SHELTERED PLACE</td>
<td>CANAL BR</td>
<td>62.4</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete - Continuous</td>
<td>3509</td>
<td>1116001205000543</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>59.4</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Box Beam/Girders</td>
<td>3510</td>
<td>1116001205000546</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3511</td>
<td>1116001205000561</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete - Multistringer</td>
<td>3512</td>
<td>1116001205000563</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3513</td>
<td>1116001205000564</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3514</td>
<td>1116001205000565</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3515</td>
<td>1116001205000566</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3516</td>
<td>1116001205000567</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3517</td>
<td>1116001205000568</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3518</td>
<td>1116001205000569</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3519</td>
<td>1116001205000570</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3520</td>
<td>1116001205000571</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3521</td>
<td>1116001205000572</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3522</td>
<td>1116001205000573</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3523</td>
<td>1116001205000574</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3524</td>
<td>1116001205000575</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3525</td>
<td>1116001205000576</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3526</td>
<td>1116001205000577</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3527</td>
<td>1116001205000578</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3528</td>
<td>1116001205000579</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3529</td>
<td>1116001205000580</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3530</td>
<td>1116001205000581</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3531</td>
<td>1116001205000582</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3532</td>
<td>1116001205000583</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3533</td>
<td>1116001205000584</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel - Continuous</td>
<td>3534</td>
<td>1116001205000585</td>
<td>BOWMAN STREET</td>
<td>CANAL BR</td>
<td>BOX BEAM</td>
<td>58.7</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Appendix 4: FY2021 – FY2031 Proposed Work

<table>
<thead>
<tr>
<th>EN</th>
<th>ROAD NAME</th>
<th>STREET</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
<th>2028</th>
<th>2029</th>
<th>2030</th>
<th>2031</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WINTER STREET</td>
<td>PAINTER CREEK</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>2</td>
<td>SUMMER STREET</td>
<td>PAINTER CREEK</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>3</td>
<td>SPRING STREET</td>
<td>PAINTER CREEK</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>4</td>
<td>SUMMER STREET</td>
<td>PAINTER CREEK</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>5</td>
<td>SPRING STREET</td>
<td>PAINTER CREEK</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

### Estimated Annual Budget

<table>
<thead>
<tr>
<th>Year</th>
<th>Project</th>
<th>Cost (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>City of Grand Rapids</td>
<td>$100.00</td>
</tr>
<tr>
<td>2021</td>
<td>Grand River</td>
<td>$50.00</td>
</tr>
<tr>
<td>2022</td>
<td>PAINTER CREEK</td>
<td>$20.00</td>
</tr>
<tr>
<td>2023</td>
<td>$10.00</td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td>$5.00</td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td>$2.50</td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td>$1.25</td>
<td></td>
</tr>
<tr>
<td>2027</td>
<td>$0.63</td>
<td></td>
</tr>
<tr>
<td>2028</td>
<td>$0.31</td>
<td></td>
</tr>
<tr>
<td>2029</td>
<td>$0.16</td>
<td></td>
</tr>
<tr>
<td>2030</td>
<td>$0.08</td>
<td></td>
</tr>
<tr>
<td>2031</td>
<td>$0.04</td>
<td></td>
</tr>
</tbody>
</table>

**Total Estimated Cost:** $490.00 million