NHDOT Bridge Program
Recommended Investment Strategy

Approved By: _____ Date: July 31, 2018
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Introduction

The NHDOT Bridge Management Committee (BMC) has developed Recommended Investment Strategies (RIS) for all five bridge types (girder, truss, moveable, timber, and culvert). The goal of these schedules is to maximize the service life and minimize the life cycle costs of New Hampshire bridges so they can continue to remain in service and provide an efficient transportation network.

Like most structures, bridges last longer when timely investments are made at prescribed intervals for needed maintenance, preservation, and rehabilitation activities. To appropriately apply these efforts, schedules have been developed for specific activities that, through experience, are shown to extend the service life of each type of bridge. Consequently, appropriate funding levels are required for these activities to be performed in accordance with the schedules developed for each type of bridge. These schedules were based on data compiled from past efforts, the issues or concerns associated with each activity, and the overall knowledge and experience of the BMC and supporting staff.

These strategies are used to develop estimated system-wide levels of investment for the overall Bridge Program and are not specific for individual bridge investments. Costs to perform these activities on individual bridges can vary considerably based on a number of site-specific factors. Thus, the information presented herein should only be used for system-wide funding recommendations. The RIS also assumes that the recommended actions have been made on all bridges to date, which is not the case, especially with the older bridges in the inventory. It also assumes that the ages of each type of bridge are distributed uniformly throughout the life cycle of each bridge type, which again is not the case. However, these are necessary assumptions for developing these recommended work schedules and funding levels.

As shown in the tables below (December 31, 2017 data), the girder bridge is the dominant structure type for all ownership groups, particularly State-owned bridges. Please note that this data includes only the NH-owned deck area of bridges that are shared with adjoining states.

Data for State (non-Turnpike) bridges by Bridge Type

Bridge Type	Count	Deck Area (sq. ft.)*	Percentage By Deck Area
Girder	1,147	6,528,490	83.6%
Truss	39	217,654	2.8%
Moveable	4	121,474	1.5%
Timber	38	52,714	0.7%
Culvert	762	888,320	11.4%
Totals:	**1,990**	**7,808,653**	**100%**

Data for State Turnpike bridges by Bridge Type

Bridge Type	Count	Deck Area (sq. ft.)*	Percentage By Deck Area
Girder	147	2,121,468	90.9%
Truss	2	118,781	5.1%
Moveable	0	0	0.0%
Timber	0	0	0.0%
Culvert	22	92,414	4.0%
Totals:	**171**	**2,332,663**	**100%**

Data for Municipally (and Other) bridges by Bridge Type

Bridge Type	Count	Deck Area (sq. ft.)*	Percentage By Deck Area
Girder	709	1,746,292	68.0%
Truss	37	172,051	6.7%
Moveable	0	0	0.0%
Timber	221	208,007	8.1%
Culvert	721	440,149	17.2%
Totals:	**1,688**	**2,566,499**	**100%**

Data for all bridges by Bridge Type

Bridge Type	Count	Deck Area (sq. ft.)*	Percentage By Deck Area
Girder	2,003	10,396,250	81.8%
Truss	78	508,486	4.0%
Moveable	4	121,474	1.0%
Timber	259	260,721	2.0%
Culvert	1,505	1,420,884	11.2%
Totals:	**3,849**	**12,707,815**	**100%**

* Includes NH portion only of bridge deck areas for bridges shared with adjoining states.

(I) Analysis

As can be seen from the above data, girder bridges represent the largest number of bridges throughout the state, and thus have the greatest effect on where the available bridge funds are applied. Investment strategies and schedules for recommended work activities to be performed on girder bridges were then developed for two life cycles: 80-years and 120-years. The costs for these activities over the different life cycles were then compared and evaluated. The results indicated that the schedule for the 120-year life cycle ($8.10 per year per sq. ft.) was about 15% more economical than the schedule for the 80-year life cycle ($9.60 per year per sq. sf.), with the difference being $1.50 per year per sq. ft. (See Appendix "A" and Appendix "B" for information on development of these life cycle schedules.)

It would be appropriate to review and update the Recommended Investment Strategy for each type of bridge every five (5) years to ensure that current data is used as the basis for Bridge Program funding recommendations. A comparison of the work activities and associated costs for the different investment schedules and life cycles could demonstrate whether the goals of cost savings and an overall increase in the longevity of the state's bridges are being attained.

(II) Typical Bridge Recommend Investment Strategy

The value of bridges in New Hampshire to our citizens, visitors, and economy cannot be overstated. The connectivity they provide to the local communities, as well as their contribution to the effectiveness of the transportation system could be considered irreplaceable on a statewide scale. The cost to replace every bridge in New Hampshire (state and municipal) would easily amount to billions of dollars. For this reason, the tremendous investment made in the past to construct these bridges must be protected so that they remain safe and available for use by the traveling public.

For the bridge owner (state or municipalities) to protect this investment and ensure that it can provide safe and continual service, a schedule for routine work activities should be followed for each bridge in their inventory. It is recognized that schedules for work activities for individual bridges will vary depending on the type of bridge and the site-specific factors, such as traffic volume, topography, streamflow, etc.

Tables 1 through 5 present the recommended schedule of work activities for each bridge type.

(A) Girder Bridges include the following classifications of bridges:

• BAIB – Bailey or similar bridge	• Jack – Jack Arch Concrete on I-Beams
• BGB – Beam Girder Bridge	• NEBT – Prestressed Bulb Tee
• CS – Concrete Slab	• NEXT – Northeast Extreme Tee
• CTB – Concrete Tee Beam	• PBB – Prestressed Butted Boxes
• DPG – Deck Plate Girder	• PIB – Prestressed I-Beams
• IB – I Beams without Deck	• PSB – Prestressed Spread Boxes
• IB-BP – I Beams with Bridge Plank	• PSC – Prestressed Concrete
• IB-C – I Beams with Concrete Deck	• PTB – Prestressed Tee Beams
• IB-G – I Beams with Steel Grid	• PVS – Prestressed Voided Slabs
• IB-S – I Beams with Steel Plate	• SRF – Steel Rigid Frame
• INVER – Inverset I-Beam/Concrete	• TPG – Thru Plate Girder

Table 1: Recommended Schedule of Work Activities for Girder Bridges

Year (Frequency)	Work Effort/Activity	Category of Work	Responsible Bureau
Annually	Clean and Seal; Clear Debris	Maintenance	Bridge Maintenance
5	Crack Seal Pavement	Preservation	Highway Design
10	Pavement Inlay	Preservation	Highway Design
15	Crack Seal Pavement	Preservation	Highway Design
20	Patch Deck and Substructure; Replace Membrane, Pavement, & Expansion Joints; Rehab Bearings; Touch Up Paint (if applicable)	Preservation	Bridge Design
25	Crack Seal Pavement	Preservation	Highway Design
30	Pavement Inlay	Preservation	Highway Design
35	Crack Seal Pavement	Preservation	Highway Design
40	Patch Deck and Substructure; Replace Membrane, Pavement, & Expansion Joints; Rehab Bearings; Touch Up Paint (if applicable)	Preservation	Bridge Design
45	Crack Seal Pavement	Preservation	Highway Design
50	Pavement Inlay	Preservation	Highway Design
55	Crack Seal Pavement	Preservation	Highway Design
60	Replace Deck, Membrane, Pavement, & Joints; Replace Bearings; Patch Substructure, New Paint (if applicable)	Rehabilitation	Bridge Design
65	Crack Seal Pavement	Preservation	Highway Design
70	Pavement Inlay	Preservation	Highway Design
75	Crack Seal Pavement	Preservation	Highway Design
80	Patch Deck and Substructure; Replace Membrane, Pavement, & Expansion Joints; Rehab Bearings; Touch Up Paint (if applicable)	Preservation	Bridge Design
85	Crack Seal Pavement	Preservation	Highway Design
90	Pavement Inlay	Preservation	Highway Design
95	Crack Seal Pavement	Preservation	Highway Design
100	Patch Deck and Substructure; Replace Membrane, Pavement, & Expansion Joints; Rehab Bearings; Touch Up Paint (if applicable)	Preservation	Bridge Design
105	Crack Seal Pavement	Preservation	Highway Design
110	Pavement Inlay	Preservation	Highway Design
115	Crack Seal Pavement	Preservation	Highway Design
120	Replace Bridge (or superstructure)	Replacement	Bridge Design

(B) Truss Bridges include the following classifications of bridges:

• DT – Deck Truss
• HT – High Truss
• LT – Low Truss
• SA – Steel Arch

Table 2: Recommended Schedule of Work Activities for Truss Bridges:

Year (Frequency)	Work Effort/Activity	Category of Work	Responsible Bureau
Annually	Clean and Seal; Clear Debris	Maintenance	Bridge Maintenance
5	Crack Seal Pavement	Preservation	Highway Design
10	Pavement Inlay	Preservation	Highway Design
15	Crack Seal Pavement	Preservation	Highway Design
20	Patch Deck and Substructure; Replace Membrane, Pavement, and Expansion Joints; Rehabilitate Bearings; Structural steel repairs; Touch Up Paint (if applicable)	Preservation	Bridge Design
25	Crack Seal Pavement	Preservation	Highway Design
30	Pavement Inlay	Preservation	Highway Design
35	Crack Seal Pavement	Preservation	Highway Design
40	Patch Deck and Substructure; Replace Membrane, Pavement, and Expansion Joints; Rehabilitate Bearings; Structural steel repairs; Touch Up Paint (if applicable)	Preservation	Bridge Design
45	Crack Seal Pavement	Preservation	Highway Design
50	Pavement Inlay	Preservation	Highway Design
55	Crack Seal Pavement	Preservation	Highway Design
60	Replace Deck; Patch Substructure; Replace Membrane, Pavement, and Expansion Joints; Replace Bearings; Structural steel repairs; New Paint (if applicable)	Rehabilitation	Bridge Design
65	Crack Seal Pavement	Preservation	Highway Design
70	Pavement Inlay	Preservation	Highway Design
75	Crack Seal Pavement	Preservation	Highway Design
80	Patch Deck and Substructure; Replace Membrane, Pavement, and Expansion Joints; Rehabilitate Bearings; Structural steel repairs; Touch Up Paint (if applicable)	Preservation	Bridge Design
85	Crack Seal Pavement	Preservation	Highway Design
90	Pavement Inlay	Preservation	Highway Design
95	Crack Seal Pavement	Preservation	Highway Design
100	Replace Bridge (or superstructure)	Replacement	Bridge Design

(C) Moveable Bridges include two very different types of moveable structures: bascule and vertical lift. These different moveable bridges require very different work tasks and treatments for their maintenance, preservation, and rehabilitation.

(C-1) Bascule Moveable Bridges include the following classification of bridges:

- BAS – Bascule Span

Table 3.1: Recommended Schedule of Work Activities for Bascule Moveable Bridges:

Year (Frequency)	Work Effort/Activity	Category of Work	Responsible Bureau
Annually	Clean & Seal Substructure; Clear Debris, Electrical & Mechanical Tasks	Maintenance	Bridge Maintenance
5	Crack Seal Pavement	Preservation	Highway Design
10	Pavement Inlay	Preservation	Highway Design
15	Crack Seal Pavement	Preservation	Highway Design
20	Pavement Inlay	Preservation	Highway Design
25	Patch Deck and Substructure; Replace Membrane, Pavement, & Expansion Joints; Structural steel repairs; Touch Up Paint (if applicable) Electrical & Mechanical R&R; Replace Gates; Rehabilitate Fenders;	Preservation	Bridge Design
30	Crack Seal Pavement	Preservation	Highway Design
35	Pavement Inlay	Preservation	Highway Design
40	Crack Seal Pavement	Preservation	Highway Design
45	Pavement Inlay	Preservation	Highway Design
45	Crack Seal Pavement	Preservation	Highway Design
50	Replace Deck; Patch Substructure; Replace Membrane, Pavement, & Expansion Joints; Structural steel repairs; Complete Paint Removal/Application (if applicable); Replace Bearings; Electrical & Mechanical R&R; Replace Gates; Rehabilitate Fenders;	Rehabilitation	Bridge Design
55	Crack Seal Pavement	Preservation	Highway Design
60	Pavement Inlay	Preservation	Highway Design
65	Crack Seal Pavement	Preservation	Highway Design
70	Pavement Inlay	Preservation	Highway Design
75	Patch Deck and Substructure; Replace Membrane, Pavement, & Expansion Joints; Structural steel repairs; Touch Up Paint (if applicable) Electrical & Mechanical R&R; Replace Gates; Rehabilitate Fenders;	Rehabilitation	Bridge Design
80	Crack Seal Pavement	Preservation	Highway Design
85	Pavement Inlay	Preservation	Highway Design
90	Crack Seal Pavement	Preservation	Highway Design
95	Pavement Inlay	Preservation	Highway Design
100	Replace Bridge (or superstructure)	Replacement	Bridge Design

(C-2) Vertical Lift Moveable Bridges include the following classification of bridges:

- LIFT – Vertical Lift

Table 3.2: Recommended Schedule of Work Activities for Moveable Bridges:

Year (Frequency)	Work Effort/Activity	Category of Work	Responsible Bureau
Annually	Clean & Seal Substructure; Clear Debris, Electrical & Mechanical Tasks	Maintenance	Bridge Maintenance
5	Crack Seal Pavement	Preservation	Highway Design
10	Pavement Inlay	Preservation	Highway Design
15	Crack Seal Pavement	Preservation	Highway Design
20	Pavement Inlay	Preservation	Highway Design
25	Patch Deck and Substructure; Replace Membrane, Pavement, & Expansion Joints; Structural steel repairs; Touch Up Paint (if applicable) Replace Lift Ropes; Replace Counterweight Ropes; Electrical & Mechanical R&R; Replace Gates; Rehabilitate Fenders;	Preservation	Bridge Design
30	Crack Seal Pavement	Preservation	Highway Design
35	Pavement Inlay	Preservation	Highway Design
40	Crack Seal Pavement	Preservation	Highway Design
45	Pavement Inlay	Preservation	Highway Design
45	Crack Seal Pavement	Preservation	Highway Design
50	Replace Deck; Patch Substructure; Replace Membrane, Pavement, & Expansion Joints; Structural steel repairs; Complete Paint (if applicable); Replace Bearings; Replace Lift Ropes; Replace Counterweight Ropes; Electrical & Mechanical R&R; Replace Gates; Rehabilitate Fenders;	Rehabilitation	Bridge Design
55	Crack Seal Pavement	Preservation	Highway Design
60	Pavement Inlay	Preservation	Highway Design
65	Crack Seal Pavement	Preservation	Highway Design
70	Pavement Inlay	Preservation	Highway Design
75	Patch Deck and Substructure; Replace Membrane, Pavement, & Expansion Joints; Structural steel repairs; Touch Up Paint (if applicable) Replace Lift Ropes; Replace Counterweight Ropes; Electrical & Mechanical R&R; Replace Gates; Rehabilitate Fenders;	Rehabilitation	Bridge Design
80	Crack Seal Pavement	Preservation	Highway Design
85	Pavement Inlay	Preservation	Highway Design
90	Crack Seal Pavement	Preservation	Highway Design
95	Pavement Inlay	Preservation	Highway Design
100	Replace Bridge (or superstructure)	Replacement	Bridge Design

(D) Timber Bridges include the following classifications of bridges:

• CTC – Concrete Timber Composite
• IB-W – I-Beams with Wood Deck
• TB – Timber Bridge
• TB-C – Covered Bridge
• TB-CS – Timber Bridge Concrete Slab
• TS – Timber Slab
• TS-P – Prestressed Timber Slab

Table 4: Recommended Schedule of Work Activities for Timber Bridges

Year (Frequency)	Work Effort/Activity	Category of Work	Responsible Bureau
Annually	Clean and Seal Substructure; Clear Debris	Maintenance	Bridge Maintenance
5	Crack Seal Pavement (Paved timber decks only)	Preservation	Highway Design
10	Pavement Inlay (Paved timber decks only) Patch/Repair Deck and Substructure;	Preservation	Highway Design Bridge Maintenance
15	Crack Seal Pavement (Paved timber decks only)	Preservation	Highway Design
20	Replace Timber Deck; Repair Substructure; Replace Membrane & Pavement; (Paved timber decks only) Repair Expansion Joints; Rehabilitate Bearings; Rehabilitate Timbers;	Preservation	Bridge Design
25	Crack Seal Pavement (Paved timber decks only)	Preservation	Highway Design
30	Pavement Inlay (Paved timber decks only) Patch/Repair Deck and Substructure;	Preservation	Highway Design Bridge Maintenance
35	Crack Seal Pavement (Paved timber decks only)	Preservation	Highway Design
40	Replace Timber Deck; Repair Substructure; Replace Membrane & Pavement; (Paved timber decks only) Replace Expansion Joints; (if applicable) Replace Bearings; Rehabilitate Timbers;	Preservation	Bridge Design
45	Crack Seal Pavement (Paved timber decks only)	Preservation	Highway Design
50	Pavement Inlay (Paved timber decks only) Patch/Repair Deck and Substructure;	Preservation	Highway Design Bridge Maintenance
55	Crack Seal Pavement (Paved timber decks only)	Preservation	Highway Design
60	Replace Timber Deck; Repair Substructure; Replace Membrane & Pavement; (Paved timber decks only) Repair Expansion Joints; Rehabilitate Bearings; Rehabilitate Timbers;	Preservation	Bridge Design
65	Crack Seal Pavement (Paved timber decks only)	Preservation	Highway Design
70	Pavement Inlay (Paved timber decks only) Patch/Repair Deck and Substructure;	Preservation	Highway Design Bridge Maintenance
75	Crack Seal Pavement (Paved timber decks only)	Preservation	Highway Design
80	Replace bridge (or superstructure)	Replacement	Bridge Design

It is recognized that there are 48 covered bridges in New Hampshire (7 state; 41 municipal), however, the activities and funds needed to address deficiencies in these historic structures present unique challenges as they are much more complex than other timber bridges.

It is also recognized that very few timber bridges have paved decks and even fewer also have waterproofing membrane applied. The anticipated costs needed to perform the membrane and pavement work indicated above represents a small portion of the total estimated costs presented for timber bridges.

(E) Culvert Bridges include two very different types of structures: reinforced concrete (including masonry) and metal (steel and aluminum). These different materials require very different work tasks and treatments for their maintenance, preservation, and rehabilitation.

Of the total number of state and municipal culverts (metal or concrete) in the inventory, the majority (90%±) cross waterways. For this reason, these culverts would likely require preservation work due to the wear on the culvert invert from water flow and any debris or cobbles carried through them over time. The remaining 10%± of the total number of culverts are for recreational or other uses, and thus do not cross a waterway, would not experience the same wear, and would not require the same maintenance and work activities.

In addition, concrete culverts that are set "at grade" and are not completely buried will also require maintenance work to crack seal the pavement or to install a pavement in-lay, similar to the maintenance work indicated for bridges with concrete decks.

It is further recognized that metal (steel or aluminum) culverts that cross waterways often have a much reduced life span, sometimes much less than the 60-year service life anticipated for other culverts. For this reason, Bridge Design no longer allows metal (steel) sections of culverts to be installed below anticipated high water levels for waterway crossings.

(E-1) Metal Culvert Bridges include the following classifications of bridges:

- MP – Metal Pipe
- MP-A – Metal Plate Arch
- MP-B – Metal Plate Box Culvert

Table 5.1: Recommended Schedule of Work Activities for Metal Culvert Bridges:

Year (Frequency)	Work Effort/Activity	Category of Work	Responsible Bureau
Annually	Clean and Seal Substructure, Clear Debris	Maintenance	Bridge Maintenance
10	Install or Repair Invert (Waterway culverts only)	Preservation	Bridge Maintenance
20	Repair Invert (Waterway culverts only)	Preservation	Bridge Maintenance
30	Repair Invert (Waterway culverts only)	Preservation	Bridge Maintenance
40	Repair Invert (Waterway culverts only)	Preservation	Bridge Maintenance
50	Repair Invert (Waterway culverts only)	Preservation	Bridge Maintenance
60	Replace Culvert	Replacement	Bridge Design

(E-2) Concrete and Masonry Culvert Bridges include the following classifications of bridges:

• CA – Concrete Arch	• CPP – Concrete Polymer Pipe
• CACUL – Concrete Arch Culvert	• CRF – Concrete Rigid Frame
• CAR – Concrete Arch Rib	• CRF-P – Concrete Rigid Frame-Precast
• CB – Concrete Box	• MA – Masonry Arch
• CB-P – Concrete Box - Precast	• MA-CA – Masonry and Conc. Arch
• CP – Concrete Pipe	• MS – Masonry Slab

Table 5.2: Recommended Schedule of Work Activities for Concrete and Masonry Culvert Bridges:

Year (Frequency)	Work Effort/Activity	Category of Work	Responsible Bureau
Annually	Clean and Seal Substructure, Clear Debris	Maintenance	Bridge Maintenance
5	Crack Seal Pavement (Required for at-grade structures only)	Preservation	Highway Design
10	Pavement Inlay (Required for at-grade structures only)	Preservation	Highway Design
15	Crack Seal Pavement (Required for at-grade structures only)	Preservation	Highway Design
20	Pavement Inlay (Required for at-grade structures only)	Preservation	Highway Design
25	Crack Seal Pavement (Required for at-grade structures only)	Preservation	Highway Design
30	Pavement Inlay (Required for at-grade structures only)	Preservation	Highway Design
35	Crack Seal Pavement (Required for at-grade structures only)	Preservation	Highway Design
40	Pavement Inlay (Required for at-grade structures only)	Preservation	Highway Design
45	Crack Seal Pavement (Required for at-grade structures only)	Preservation	Highway Design
50	Pavement Inlay (Required for at-grade structures only)	Preservation	Highway Design
55	Crack Seal Pavement (Required for at-grade structures only)	Preservation	Highway Design
60	Pavement Inlay (Required for at-grade structures only)	Preservation	Highway Design
65	Crack Seal Pavement (Required for at-grade structures only)	Preservation	Highway Design
70	Pavement Inlay (Required for at-grade structures only)	Preservation	Highway Design
75	Crack Seal Pavement (Required for at-grade structures only)	Preservation	Highway Design
80	Replace Culvert	Replacement	Bridge Design

(III) Summary Comparison

This report outlines the recommended activities and schedules to maintain, preserve, rehabilitate, or replace all bridge types (girder, truss, moveable, timber, and culvert) in New Hampshire. The information summarized in Appendices A & B presents a cost comparison, using cost data from 2017, of two different investment strategies for girder bridges.

Appendix "A" outlines the costs of only performing minimal bridge work resulting in an 80-year bridge service life, whereas Appendix "B" outlines the costs of performing all recommended bridge work resulting in a 120-year bridge service life:

- Appendix "A": Investment strategy resulting in an 80-year bridge service life = $9.61 per sq. ft.
- Appendix "B": Investment strategy resulting in a 120-year bridge service life = $8.10 per sq. ft.
  Savings = $1.51 per sq. ft.

The cost of obtaining the 120-year bridge service life is $1.51 per sq. ft. less than the cost for obtaining the 80-year bridge service life which also requires bridge replacement 40 years sooner. This data supports the Recommended Investment Strategy presented herein that performing scheduled maintenance and preservation activities results in a 50% longer bridge service life at a 15.7% lower cost over the 120-year projected service life of the bridge, when compared to only performing rehabilitation and replacement activities over an 80-year bridge service life.

Similar cost comparisons can be made for the four remaining types of bridges confirming that performing specific tasks at scheduled time intervals is the more economical approach to obtaining a longer bridge service life. The result of this strategy is that bridges that receive scheduled work activities will consistently be in better condition and have a much longer service life than bridges on which no maintenance or scheduled work activities are performed.

Appendix "A": Investment Strategy and Schedule for Girder Bridge resulting in 80-year service life

Frequency (Year)	Work Activity	Category	Maintenance Cost/Sq. Ft.	Preservation Cost/Sq. Ft.	Rehabilitation Cost/Sq. Ft.	Replacement Cost/Sq. Ft.
Annual	Clean and seal	Maintenance	$ 0.10	-	-	-
5	Crack seal	Preservation	-	$ 0.07	-	-
10	Replace pavement	Preservation	-	$ 1.60	-	-
15	Crack seal	Preservation	-	$ 0.07	-	-
20	Replace pavement	Preservation	-	$ 1.60	-	-
25	Crack seal	Preservation	-	$ 0.07	-	-
30	Replace pavement	Preservation	-	$ 1.60	-	-
35	Crack seal	Preservation	-	$ 0.07	-	-
40	Replace deck, etc.	Rehabilitation	-	-	$ 100.00	-
45	Crack seal	Preservation	-	$ 0.07	-	-
50	Replace pavement	Preservation	-	$ 1.60	-	-
55	Crack seal	Preservation	-	$ 0.07	-	-
60	Replace pavement	Preservation	-	$ 1.60		-
65	Crack seal	Preservation	-	$ 0.07	-	-
70	Replace pavement	Preservation	-	$ 1.60	-	-
75	Crack seal	Preservation	-	$ 0.07	-	-
80	Replace bridge	Replacement	-	-	-	$ 650.00

Deck service life = 40 years **Bridge service life = 80 years**	Cost / Sq. Ft. over 80-year bridge life	$ 8.00	$ 10.16	$ 100.00	$ 650.00
	Cost / Sq. Ft.	$ 0.10	$ 0.13	$ 1.25	$ 8.13
Costs per year	Cost/Sq. Ft. per year for 80-year bridge life: **$9.61 =**	Maintenance ($ 0.10) +	Preservation. ($ 0.13) +	Rehabilitation ($ 1.25) +	Replacement ($ 8.13)

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Appendix "B": Investment Strategy and Schedule for Girder Bridge resulting in 120-year service life

Frequency (Year)	Work Activity	Category	Maintenance Cost/Sq. Ft.	Preservation Cost/Sq. Ft.	Rehabilitation Cost/Sq. Ft.	Replacement Cost/Sq. Ft.
Annual	Clean and seal	Maintenance	$ 0.10	-	-	-
5	Crack seal	Preservation	-	$ 0.07	-	-
10	Replace pavement	Preservation	-	$ 1.60	-	-
15	Crack Seal	Preservation	-	$ 0.07	-	-
20	Patch deck; Replace pavement, membrane, and expansion joints	Preservation	-	$ 50.00	-	-
25	Crack Seal	Preservation	-	$ 0.07	-	-
30	Replace Pavement	Preservation	-	$ 1.60	-	-
35	Crack seal	Preservation	-	$ 0.07	-	-
40	Patch deck; Replace pavement, membrane, and expansion joints	Preservation	-	$ 50.00	-	-
45	Crack seal	Preservation	-	$ 0.07	-	-
50	Replace pavement	Preservation	-	$ 1.60	-	-
55	Crack Seal	Preservation	-	$ 0.07	-	-
60	Replace deck, etc.	Rehabilitation	-	-	$ 100.00	-
65	Crack Seal	Preservation	-	$ 0.07	-	-
70	Replace pavement	Preservation	-	$ 1.60	-	-
75	Crack seal	Preservation	-	$ 0.07	-	-
80	Patch deck; Replace pavement, membrane, and expansion joints	Preservation	-	$ 50.00	-	-
85	Crack Seal	Preservation	-	$ 0.07	-	-
90	Replace pavement	Preservation	-	$ 1.60	-	-
95	Crack seal	Preservation	-	$ 0.07	-	-
100	Patch deck; Replace pavement, membrane, and expansion joints	Preservation	-	$ 50.00	-	-
105	Crack Seal	Preservation	-	$ 0.07	-	-
110	Replace pavement	Preservation	-	$ 1.60	-	-
115	Crack seal	Preservation	-	$ 0.07	-	-
120	Replace bridge	Replacement	-	-	-	$ 650.00

Deck service life = 60 years **Bridge service life = 120 years**	Cost / Sq. Ft. over 120-year bridge life	$ 12.00	$ 210.44	$ 100.00	$ 650.00
	Cost / Sq. Ft.	$ 0.10	$ 1.75	$ 0.83	$ 5.42
Costs per year	Cost/Sq. Ft. per year for 120-year bridge life: **$8.10 =**	Maintenance ($ 0.10) +	Preservation. ($ 1.75) +	Rehabilitation ($ 0.83) +	Replacement ($ 5.42)