Submitted to:

OHIO AUDITOR OF STATE
KEITH FABER

PERFORMANCE AUDIT OF THE OHIO DEPARTMENT OF TRANSPORTATION

RFP Reference Number: AOS 2019-002

Bridge Inspection Final Report

February 23, 2021

Submitted by:

The Kercher Group, Inc.

and supported by

pfm

CONTENTS

GLOSSARY

AASHTO ..... American Association of State Highway Transportation Officials

AOS ..... Auditor of State

BMS ..... Bridge Management System

CPA ..... Capital Programs Administrator

CAGR ..... Compound Annual Growth Rate

CS ..... Element Condition State

CSF ..... Critical Success Factors

DO ..... Division of Operations

DOT ..... Department of Transportation

DQMP ..... Data Quality Management Plan

ELLIS ..... ODOT designed web-based project management application

FC ..... Floor Condition

FHWA ..... Federal Highway Administration

FY ..... Fiscal Year

GA ..... General Appraisal

GARVEE ..... Grant Anticipation Revenue Vehicle

GCR ..... General Condition Rating

GIS ..... Geographic Information Mapping

HCAP ..... Highway Capital Improvement

HPMS ..... Highway Performance Monitoring System

LTPP ..... Long-Term Pavement Performance

MBI ..... Manual for Bridge Inspection

MFT ..... Motor Fuel Tax

NBIS ..... National Bridge Inspection Standards

NBI ..... National Bridge Inventory

NCHRP ..... National Cooperative Highway Research Project

NHS ..... National Highway System

ODOT ..... Ohio Department of Transportation

OPE ..... Office of Pavement Engineering

OCR ..... Ohio Revised Code

OSE ..... Office of Structural Engineering

PCR ..... Pavement Condition Rating

PCS ..... Protective Coating System

PM ..... Program Management

PMS..... Pavement Management System

STIP ..... State Transportation Improvement Program

TAM ..... Transportation Asset Management

TAMP ..... Transportation Asset Management Plan

TP ..... Transportation Policy Division

TPM.....Transition Probability Matrices

VMT ..... Vehicle Miles Traveled

WGA..... Weighted General Appraisal

BRIDGES INSPECTIONS

Executive Summary

The Kercher/PFM consulting team (Kercher) is pleased to provide this focus area report on bridge inspections. This document is provided in support of the Auditor of State's (AOS) comprehensive performance audit of ODOT, which is being performed in compliance with HB 62 of the 133rd General Assembly of Ohio.

The bridge inspections review area has been separated from the other bridge topic areas because the projected impacts and benefits of these recommendations extend beyond ODOT. Accordingly, this topic was viewed as warranting a separate document.

Bridge inspections are just one of many areas that ODOT oversees as part of its overall bridge management responsibilities. In the main body of the bridge report, Kercher describes the other areas that were reviewed along with results of our benchmarking efforts and associated recommendations

Major Findings

Kercher's analysis of the ODOT Bridge program found the following:

- Ohio Revised Code § 5501.47 defines "bridges" more stringently than the National Bridge Inspection Standards (NBIS).
- Ohio Revised Code § 5501.47 mandates annual routine inspection all structures meeting the Ohio definition of 'bridges". No other US state mandates annual routine bridge inspections.
- The impact of these findings is that the State of Ohio devotes a disproportionate amount of resources to performing routine bridge inspections when compared to other states.

However,

- Ohio has "best practice" information compared to peer states on the condition of bridges and culvert exceeding the Ohio standard yet under the NBIS standard.
- As described in main bridge report, Ohio bridges are in better condition than most of its peers. However, this condition cannot be directly attributed to Ohio's annual inspection requirement.

Major Recommendations

1. ***Consider repealing Ohio Revised Code* § 5501.47.**

   Benefit:

   - Would support aligning Ohio with the bridge practice practices of nearly every other state.
   - Conservative estimate of nearly $10M in annual resource savings by ODOT and local agency resources that could be repurposed to other agency needs.
   - Would place bridge asset management decisions clearly in the hands of professionals.

Inspection Procedures, and Performance Measures

Overview

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Topic Introduction

During testimony to the US House of Representatives in 2007, an FHWA representative stated that the 1967 collapse of the Silver Bridge over the Ohio River between West Virginia and Ohio was the event that lead to the creation of the National Bridge Inspection Program (NBIS).[1] In this same testimony, the FHWA representative indicated that approximately 83 percent of all bridges that are subject to NBIS requirements are inspected every 24 months, 12 percent are inspected annually and 5 percent are inspected on a 48 month basis.[2]

The Federal Highway Administration (FHWA) defines bridge inspection standards in 23 CFR Part 650.[3] These regulations define a National Bridge Inventory (NBI) qualifying bridge (or culvert) as a highway structure having a total span length greater than 20 feet measured along the centerline of the roadway.[4] Subpart 311 of 23 CFR Part 650[5] further defines routine inspection frequency requirements as follows:

> "650.311 Inspection frequency.
>
> (a) Routine inspections.
>
> (1) Inspect each bridge at regular intervals not to exceed twenty-four months.
>
> (2) Certain bridges require inspection at less than twenty-four-month intervals. Establish criteria to determine the level and frequency to which these bridges are inspected considering such factors as age, traffic characteristics, and known deficiencies.

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[1] https://www.transportation.gov/testimony/highway-bridge-inspections

[2] Ibid.

[3] https://www.govinfo.gov/content/pkg/FR-2004-12-14/pdf/04-27355.pdf

[4] FHWA, Recording and Coding Guide for the Structure Inventory and Appraisal of the Nations Bridges, Report Number FHWA-PD-96-001, December 1995, Page 28.

[5] https://www.law.cornell.edu/cfr/text/23/650.311

> (3) Certain bridges may be inspected at greater than twenty-four month intervals, not to exceed forty-eight-months, with written FHWA approval. This may be appropriate when past inspection findings and analysis justifies the increased inspection interval."

Of note, these standards were developed in full cooperation of FHWA professional engineers and the State DOT community. As described in the referenced 2007 testimony, these standards have been revisited and updated over time. [6]

Ohio Revised Code (OCR) § 5501.47[7] differs from the federal definition in defining bridges as structures that that are greater than 10 feet total span length measured along the centerline of the roadway.[8] This legislation, which was effective in 1973, further directs the ODOT Director to ensure that bridges meeting the OCR 5501.47 standard be inspected on an annual basis as indicated below:

> "Such inspection shall be made annually by a professional engineer or other qualified person under the supervision of a professional engineer, or more frequently if required by the director, in accordance with the manual of bridge inspection described in division (B) of this section."

Using the Ohio definition, the 2019 bridge data snapshot showed ODOT was managing 14,248 bridges, and 164 of these structures were considered "Major Structures", which have a separate management program.[9] The "Major Bridge program" is discussed in the main bridge management report.

Bridge Inspection Procedures

Bridge Inspections are entered into ODOT's Bridge Inspection System (BIS) software (*AssetWise*, which was formerly called *InspectTech*). The BIS software also is used to aid quality control, with a professional engineer reviewing and sealing all inspection reports. ODOT's Bridge Inspection webpage[10] provides relevant links, resources, quality assurance documents, bridge inspection field reports, and the Manual for Bridge Inspection.

Bridge Condition Rating Systems

ODOT's bridge condition rating methodology currently is transitioning to better align with the General Condition Rating (GCR) system shown in the National Bridge Inventory (NBI) and the AASHTO Bridge Element Inspection Manual (BEIM). During this transition, ODOT is using three (3) condition rating systems:

1. ODOT Bridge Condition 1-4 Rating System (legacy system)

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[6] https://www.transportation.gov/testimony/highway-bridge-inspections

[7] http://codes.ohio.gov/orc/5501.47, effective Date: 09-28-1973

[8] Ohio Revised Code, Title 55 LV Roads – Highways – Bridges, Chapter 5501.47 Bridge Inspections. http://codes.ohio.gov/orc/5501.47

[9] 2019 Snapshot of bridge database. Data provided by ODOT

[10] ODOT Bridge Inspection Webpage; http://www.dot.state.oh.us/Divisions/Engineering/Structures/bridge%20operations%20and%20maintenance/Pages/default.aspx

2. National Bridge Inventory (NBI) 9-0 General Condition Rating (GCR) System
3. AASHTO Element Condition State Rating System

Each of these systems are used in ODOT's bridge management approach and in the trend-analysis completed by the Kercher team. Accordingly, it is necessary to understand each condition rating system and how each relates to the others.

ODOT Bridge Condition 1-4 Rating System

The ODOT Bridge Condition 1-4 rating system provides an overall condition assessment of certain bridge elements as defined in the ODOT Manual for Bridge Inspection (MBI).[11] ODOT has nearly 100 agency defined elements. Three (3) of these elements are used as ODOT performance measures as indicated below:

1. Wearing surface
2. Floor condition
3. Protective Coating System (PCS)

As shown in Table 1, a condition rating of 1 is good, 2 is fair, 3 is poor, and 4 is critical. The ODOT MBI provides detailed rating guidance and condition descriptions for each.

Table 1: ODOT Bridge Condition 1-4 Rating System

Rating Number	General Condition Description	Detailed Condition Description
1	Good	Element limited to only minor problems; no repairs necessary
2	Fair	All primary elements are sound but have minor section loss, deterioration, cracking, spalling or scour, minor repairs etc.
3	Poor	Advanced section loss, deterioration, spalling or scour, item is no longer functioning as designed (load path is significantly redistributed, fatigue cracks, wide shear cracks, local failures possible)
4	Critical	Support removed, corrective action or close monitoring necessary, consider partial or full closure, negative response (ex. crushing, bending) to the primary element due to structural loads

National Bridge Inventory (NBI) 9-0 General Condition Rating (GCR) System

The FHWA requires that all public road bridge owners inspect their bridges in accordance with the NBIS[12] and provide GCRs for the structure's major components:

- Deck
- Superstructure
- Substructure

[11] Ohio Department of Transportation, Manual of Bridge Inspection, ORC 5501.47 Published 1973. Revised 2014 (v.8)

[12] National Bridge Inspection Standards; https://www.fhwa.dot.gov/bridge/nbis.cfm

- Culvert (if the NBI length structure is a culvert type structure)

The GCR rating is based upon a 9 to 0 rating scale, with 9 being a major component in excellent condition and a 0 (zero) being a major component that is failed, resulting in closure to vehicular traffic. Table 2 shows the NBI ratings with descriptors.

Table 2: NBI General Condition Ratings and National Performance Measures[13]

Rating Number	NBI Descriptor	Performance Measure Classification (23 CFR 490)
9	Excellent Condition	Good
8	Very Good Condition	
7	Good Condition	
6	Satisfactory Condition	Fair
5	Fair Condition	
4	Poor Condition	Poor
3	Serious Condition	
2	Critical Condition	
1	"Imminent" Failure Condition	
0	Failed Condition	

ODOT refers to the NBI GCR ratings as "Summary" ratings, and the ODOT MBI provides additional policy and instruction for bridge inspection and accurate condition assessment. The manual includes tables that provide a direct relationship of the ODOT Bridge Condition 1-4 Ratings to the Federal NBI GCR summary ratings. ODOT uses the NBI GCR for superstructure, substructure, and culvert as their highest-level General Appraisal (GA) performance measure. The right column of Table 2 shows the FHWA's national performance measures, which are based upon the NBI GCRs.[14]

Like the ODOT GA performance measure, the FHWA National Performance Measures take the lowest rating of the major components (deck, superstructure, substructure, culvert) as the overall bridge rating. This measure is used by all state DOTs when preparing their TAMPs and reporting the condition of the National Highway System (NHS) bridges. Because the NBI GCR rating system and the FHWA national performance measures are common among all state DOT's, it is a useful way to compare state DOT bridge performance, and many states use this measure, or a close variation of it, for all their highway bridges.

AASHTO Element Condition State Rating System

In recent years, ODOT transitioned to the American Association of Highway Transportation Officials (AASHTO) Element Condition State (CS) rating system. As shown in Table 3, the AASHTO Element Condition State rating system has four (4) condition states:

[13] United States Code of Federal Regulations, Title 23, Part 490, National Performance Management Measures

[14] 23 CFR § 490.409 - Calculation of National performance management measures for assessing bridge condition. https://www.law.cornell.edu/cfr/text/23/490.409

- CS1 = Good
- CS2 = Fair
- CS3 = Poor
- CS4 = Severe

In this rating system, a bridge is divided into elements based upon material and design type. There are over 90 elements available to describe and rate a bridge. These elements specifically were created to work within the analysis frameworks of modern Bridge Management Systems (BMS).

The AASHTO Element Condition State 1-4 rating system differs from the ODOT 1-4 system and the NBI GCR 9-0 system. The AASHTO Element Condition States provide a quantity of the element in each of the 1-4 condition states, while the ODOT 1-4 and NBI GCR rating systems provide a single overall rating for the element or component.

Table 3: AASHTO Element Condition State Descriptions

Rating Number	General Condition Description	Detailed Condition Description
1	Good	Element limited to only minor problems; no repairs necessary
2	Fair	All primary elements are sound but have minor section loss, deterioration, cracking, spalling or scour, minor repairs etc.
3	Poor	Advanced section loss, deterioration, spalling or scour, item is no longer functioning as designed (load path is significantly redistributed, fatigue cracks, wide shear cracks, local failures possible)
4	Severe	Support removed, corrective action or close monitoring necessary, consider partial or full closure, negative response (ex. crushing, bending) to the primary element due to structural loads

In 2014, ODOT began collecting (and submitting to the FHWA) AASHTO element condition state data , in accordance with Section 1111[15] of the *Moving Ahead for Progress in the 21st Century Act* (MAP-21) for their bridges carrying the NHS.[16] In 2019 ODOT began collecting the AASHTO Elements for all their highway bridges. The first round of collection of the AASHTO elements is ongoing and expected to be completed by the end of calendar year 2021.

Peer States / Best Practice Findings

Peer states have various policies as to the bridges and culverts that are included in their respective bridge programs. This is a state DOT decision/preference.

[15] https://www.fhwa.dot.gov/map21/summaryinfo.cfm

[16] Ohio Department of Transportation, Manual of Bridge Inspection, ORC 5501.47 Published 1973. Revised 2014 (v.8). Page 157

With the exception of Indiana, all peer states use a combination of National Bridge Inventory (NBI), General Condition Ratings (GCRs) and elements to manage their bridges. Indiana uses a "Bridge Quality Index" (BQI), which is based on using just GCR scores.

All of the peer state's follow the National Bridge Inspection Standards (NBIS) routine inspection frequency of 24 months for bridges in good or fair condition; all have guidelines that determine whether routine bridge inspections are done more often when the bridge is in poor or worse condition, or if there is a defect that needs monitoring.

In 2018, the FHWA issued an informational memorandum, "Risk-Based Interval Determination for Routine Bridge Inspections".[17] This document identifies situations where routine inspection frequencies are appropriate to extending the 24-month inspection frequency, based on bridge condition and risk level. Some peer states are beginning to use this guidance to extend the time between routine bridge inspections on structures considered to meet these criteria.

Highlights of relevant peer state practices include the following:

Illinois

Illinois DOT inventories and manages bridge and culvert type structures with span lengths of 6 feet and greater as part of the DOT bridge program. The *Illinois DOT Structural Services Manual - 2017*[18], Section 3.4 provides guidance for setting bridge inspection frequencies. The base-rate for routine bridge inspection is 24 months (consistent with NBIS guidance) and the manual provides guidelines for extended risk-based inspection intervals. Illinois DOT has a new *Bridge Preservation Guide*[19] that provides goals, measures, and strategies for the preservation of bridges. Performance measures use the FHWA National performance measures of good, fair, poor based upon the GCRs. The guide also provides recommended work schedules to preserve bridges over their lifecycle.

Indiana

Indiana DOT uses the NBI definition for defining bridges (20 feet and greater span length). The Indiana DOT provides a Bridge Inspection Memorandum that sets Bridge Inspection Extended Frequency Policy.[20] Their base-rate for routine bridge inspection interval is 24 months and the time can be reduced or extended following the policy. The Indiana Bridge Quality Index (BQI) incorporates six (6) components: 1) deck, 2) super, 3) sub, 4) culvert, 5) load posting, and 6) Functionally Obsolete (FO) (i.e., planning to remove). This combination of the assessments provides an overall index rating for the structure.

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[17] https://www.fhwa.dot.gov/bridge/nbis/180608.pdf

[18] Illinois DOT Structural Services Manual – 2017; https://idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Bridges/Inspection/Structural%20Services%20Manual.pdf

[19] Illinois Bridge Preservation Guide; http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Specialty-Lists/Highways/Bridges/Bridge%20Preservation%20Guide.pdf

[20] Indiana DOT Bridge Inspection Memorandum No. 18-02; https://www.in.gov/dot/div/contracts/standards/bridge/memos/2018/BI1802.pdf

Kentucky

Kentucky Transportation Cabinet uses the NBI definition (20 feet and greater span length) for definition of bridges. In accordance with the Kentucky Transportation Cabinet *Bridge Inspection Procedures Manual*[21], routine bridge inspection intervals shall not exceed 24 months, and "substandard inspections" shall be done every 12 months. Kentucky uses the FHWA national performance measures.

Michigan

Michigan DOT inventories and manages bridge and culvert type structures with span lengths of 10 feet and greater as part of the DOT bridge program. The Michigan *Structure Inspection Manual*[22] and *Guidelines for Bridge Inspection Frequency*[23] provide inspection intervals for routine bridge inspections which shall not exceed 24 months, which historically has been required by law in Michigan.

In 2015, an audit of the Bridge Inspection Program[24] recommended "MDOT should consider seeking amendatory legislation to establish risk-based inspection frequencies." The legislation passed in 2016[25] and the Michigan DOT has requested authorization from the FHWA to use risk-based inspection frequencies for culvert type structures. Michigan uses performance measures very similar to the FHWA National Performance Measures except they count by "each" structure, not by deck area.

Minnesota

Minnesota DOT inventories and manages bridge and culvert type structures with span lengths of 10 feet and greater as part of the DOT bridge program. The *State of Minnesota Bridge and Structure Inspection Program Manual*[26] sets routine bridge inspections at 24 months; for culvert and frame type structures, the inspection frequency can be extended if it meets the rules set in the manual. Minnesota uses performance measures similar to the FHWA national performance measures.

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[21] Kentucky Transportation Cabinet Bridge Inspection Procedures Manual; https://transportation.ky.gov/Maintenance/Documents/2017%20Bridge%20Inspection%20Procedures%20Manual.pdf

[22] Michigan DOT structure Inspection Manual; https://www.michigan.gov/mdot/0,4616,7-151-9625_24768_24773-326737--,00.html

[23] Michigan Department of Transportation, Guidelines for Bridge Inspection Frequency; https://www.michigan.gov/documents/mdot/BridgeInspectionFrequencies_COMBINED_2017-11-15_606650_7.pdf

[24] AOS Audit – MDOT Bridge Inspection Program; https://audgen.michigan.gov/finalpdfs/14_15/r591016914.pdf

[25] Michigan Compiled Law Section 254.19a, Federally Compliant and Risk-Based inspection Plan; http://www.legislature.mi.gov/(S(vru5izvzjnuusm41qgufo2d4))/mileg.aspx?page=getObject&objectname=mcl-254-19a

[26] State of Minnesota Bridge and Structure Inspection Program Manual; http://dotapp7.dot.state.mn.us/eDIGS_guest/DMResultSet/download?docId=8726526

Wisconsin

Wisconsin DOT uses the NBI definition (20 feet and greater span length) for identification of structures. Wisconsin DOT bridge inspection frequency policy is set in the WisDOT *Structure Inspection Manual.*[27] The base-rate is 24 months and reductions to interval being applied when condition or risk warrants. Wisconsin performance measures are similar to the FHWA national performance measures, and they add additional measures for decks, expansion joints, coated steel surfaces, bearings, and decks sealed[28].

Analysis

Table 4 compares Ohio with the peer states used for benchmarking in terms of inventory and inspection procedures:

Table 4: Inventory and Inspection Procedures

	Ohio	Illinois	Indiana	Kentucky	Michigan	Minnesota	Wisconsin
Minimum Span Length of Structures managed as Part of the Bridge Program	10 Feet	6 Feet	20 Feet	20 Feet	10 Feet	10 Feet	20 Feet
Maximum Time Frame Between Routine Bridge Inspections	12 Months	24 Months	24 Months	24 Months	24 Months	24 Months	24 Months
Agency Collects Bridge Element Condition States	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The definition of a "bridge" is an agency prerogative as to how certain types of structures are managed. While Ohio DOT policy includes managing structures with span lengths less than the NBI standard, several other peer states also exceed FHWA guidelines including Illinois, Michigan, and Minnesota.

As indicated, all the peer states follow the NBIS standard for maximum interval of routine bridge inspection of 24 months, making Ohio the exception in this comparison.

As described, some peer states are beginning to use risk-based interval determination for routine bridge inspections for certain types of structures to extend inspection intervals beyond 24 months. Based on FHWA guidance, this risk-based inspection approach is designed to reduce the resources required to collect NBIS data with little/no practical impact on the safety of the relevant bridges to the traveling public.

ODOT Bridge Inspection Frequency Analysis

Based on the Kercher team's benchmarking analysis, the consulting team perceived that both ODOT and other State of Ohio entities that owned and managed bridges could potentially save significant resources by adopting the NBIS routine inspection cycle for certain bridges, consistent with state and national peers. Accordingly, in this section, Kercher examines the existing legislative constraints to ODOT's current bridge

[27] Wisconsin DOT Structure Inspection manual; https://wisconsindot.gov/dtsdManuals/strct/inspection/insp-sm.pdf

[28] WisDOT Bridge Manual page, 42.4-1; https://wisconsindot.gov/dtsdManuals/strct/manuals/bridge/ch42.pdf

inspection practices, identifies ODOT-recommended standard changes, and estimates the impacts of these changes.

Ohio Revised Code, Title LV, Roads – Highways – Bridges, Chapter 5501.47: Department of Transportation reads as follows.

> *"The director of transportation is responsible for inspection of all bridges on the state highway system inside and outside of municipalities, all bridges connecting Ohio with another state for which the department of transportation has inspection authority, and all other bridges or portions of bridges for which responsibility for inspection is by law or agreement assigned to the department.*
>
> *Such inspection shall be made **annually** by a professional engineer or other qualified person under the supervision of a professional engineer, or more frequently if required by the director, in accordance with the manual of bridge inspection described in division (B) of this section."*

In recent years, including this year, ODOT wrote proposed legislative position papers justifying recommended change to the Ohio Revised Code (ORC) to allow a "Reliability-Based Bridge Inspection Cycle" that would modify the current requirement of 12-month frequency for routine bridge inspections. ODOT pointed out,

> "A calendar-based inspection interval applied uniformly across the bridge inventory results in the same inspection interval for new bridges as for aging and deteriorated bridges. Such a uniform inspection practice does not recognize that a newly constructed bridge, with improved durability characteristics and a few years of exposure to the environment, is less likely to develop serious damage over a given time period than an older bridge that has been in service for many years. As such, inspection needs are less for newer bridges and greater for aging bridges. Further, bridges that are known to possess good characteristics or details are treated the same as those with less desirable characteristics or details. A reliability-based bridge inspection practice that considers the design, materials, and condition of the bridge is proposed.[29]"

With respect to ODOT bridges, the ODOT recommended change to the ORC is as follows:

> *ORC 5501.47, ODOT bridge inspection responsibility; Such inspection shall be made on a cycle as determined by the Director but not more than 24 months by a professional engineer or other qualified person under the supervision of a professional engineer in accordance with the manual of bridge inspection described in division (B) of this section.*

ODOT proposed that the change would be applied to all highway bridge owners in the State, and the proposed change would place a maximum bridge inspection interval at 24 months. This will only apply to bridges that are in good condition which is defined as having a General Appraisal (superstructure and substructure GCR) or deck GCR rating of 7 or greater. Bridges that meet any one of the following criteria must continue to receive an annual routine inspection.

1. Bridges that have fracture critical members
2. Scour critical bridges
3. Bridges with live load restrictions (Posted bridges)

[29]Draft ODOT White Paper, "ODOT Proposed Legislation Initiative: Reliability Based Bridge Inspection Cycle"

4. Bridges with a general appraisal or deck summary code lower than "7-Good"
5. Bridges determined to be at risk the by the local program manager

ODOT proposed placing the identified inspection cycle criteria in the ODOT Bridge Inspection manual, which is incorporated into the ORC in section 5501.47.

Adopting the above, reliability-based inspection frequency guidelines would have considerable resource and financial benefits. ODOT estimates the cost to perform a typical highway bridge routine inspection is between $800 to $1,200 per bridge depending upon size and location.[30] These estimates are consistent with the direct experience of the consulting team and conversations with other state DOTs both in conjunction with this project and in other industry exchanges.

While these estimates are expressed in dollars, it is important to note that most bridge inspections performed under the direction of ODOT are performed with ODOT personnel, although some contractors are used. Similarly bridge inspections performed by counties and municipalities are mostly performed by a combination of public sector employees and contractors. ODOT covers the inspection costs for bridges owned by cities with a population less than 50,000 , otherwise the city or county is responsible for funding the bridge inspections.

Table 5 shows ODOT's estimated number of structures that would qualify for 24-month inspections under ODOT's proposed routine inspection criteria. This information was used to estimate cost savings per year for ODOT, counties, and municipalities if the proposed legislation is passed. ODOT indicates that these savings mostly represent the time and expense of having ODOT personnel perform these inspections. These resources would be available to support other portions of the bridge program that require additional resources such as development of their Bridge Management System and the Culvert Inspection Program.

Table 5: Estimated Annual Cost Savings if Adopted

Public Entity	24-Month Eligible Bridges	Reduced Inspections Per Year	Estimated Cost per Inspection[31]	Estimated Cost Savings
Ohio DOT	8,365	4,183	$1,000	$4,183,000
Turnpike	297	148	1000	$148,000
Counties	12,400	6,200	$ 800	$4,960,000
Municipalities	1,196	598	$ 800	$478,000
	Reduced Inspections	**10,981**	**Annual Savings**	**$9,769,000**

Additional Resource Saving Potential

[30] ODOT 09/21/2020 Interview

[31] ODOT 09/21/2020 Interview

The identified annual saving estimates in Table 5 are limited to direct costs only. Additional, indirect administrative cost/time savings also can reasonably be anticipated as fewer inspections would need to be processed and recorded.

Importantly, the estimates identified in Table 5 also do not consider any additional cost savings possible with expanding ODOT's recommended criteria to what is allocable under NBIS. Potential changes that could further increase the potential cost savings include the following:

- Adopt the NBIS definition for bridges (20 feet or greater rather than 10 feet and above)
- Explore extending bridge inspections for some bridges that could support an inspection frequency beyond 24 months, up to the 48-months that is allowable with 1FHWA approval[32]

As indicated previously, the FHWA indicates that approximately 83 percent of all bridges that are subject to NBIS requirements are inspected every 24 months, 12 percent are inspected annually and 5 percent are inspected on a 48 month basis.[33] This suggests that potential resource saving available over time reasonably could surpass the projections identified in Table 5.

City/County Interviews and Feedback

Kercher personnel contacted several Ohio cities and counties to gather benchmarking information on local costs and practices related to performing the annual routine inspections. Not surprisingly, public sector entities were reluctant to divulge this kind of information to private consultants without direction by local officials. However, Kercher did manage to conduct four (4) interviews with Ohio city/counties. While this sample was not sufficient to provide any statistically meaningful information, it generally confirmed and was consistent with comments received from ODOT, which include the following:

- Cities/counties typically perform routine, annual bridge inspections through a combination of in-house forces and contractors.
- Estimates of the amount of time/costs for performing routing bridge inspection varied but generally were supportive of the $800-$1,000 estimates used in Table 5.

The following concerns also were identified with the idea of moving to a biannual inspection of qualifying bridges:

- Additional administrative complexity would be added in trying to track bridges requiring annual versus biannual inspections.
- Having annual bridge inspections provided local agencies a greater comfort level that bridge problems requiring rapid maintenance actions would be addressed more rapidly and consistently.

In combination, these concerns suggest that local agencies might be slow to adapt any potential changes that would provide them the flexibility to adopt a biannual bridge routine inspection schedule for qualifying bridges. However, this does not mean that over time, the entities would not perceive a benefit to having the flexibility to consider and adopt available NBIS bridge inspection guidelines.

Recommendations and Benefits

***1. Consider repealing Ohio Revised Code* § 5501.47.**

[32] https://www.law.cornell.edu/cfr/text/23/650.311

[33] Ibid.

- As described in the benchmarking section of this report, no peer states perform routine annual inspections on all bridges.
- Most of ODOT's state peers use the NBIS bridge definitions for determining what structures require NBIS reporting.

Benefit:

- Would support aligning Ohio with the bridge practice practices of nearly every other state.
- Conservative estimate of nearly $10M in annual resource savings by ODOT and local agency resources that could be repurposed to other agency needs.
- Would place bridge asset management decisions clearly in the hands of professionals and national guidance.
- Avoids the need to revisit this issue should national standards change.