Transportation Asset Management Webinar Series

Webinar 83

Recent Research Roundtable

Sponsored by FHWA and AASHTO



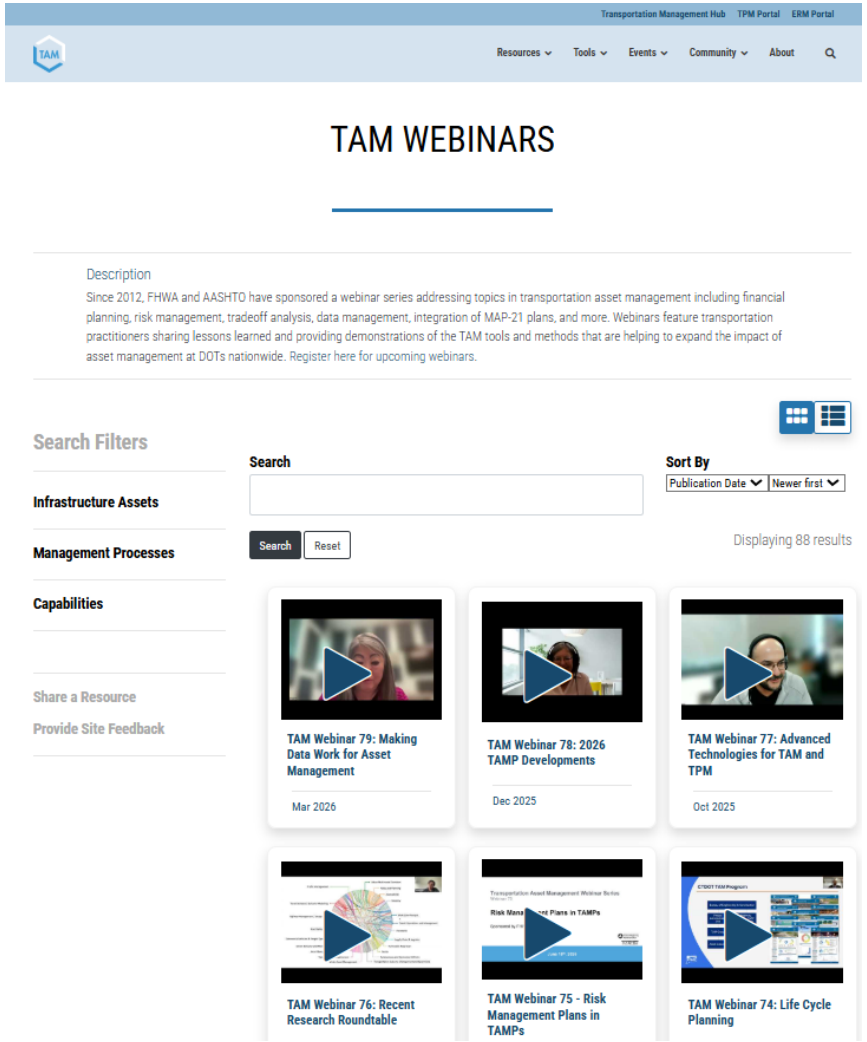




November 18, 2026

Welcome!

- Today is the **83rd** webinar in our bimonthly series, held on Wednesdays at 2:00 PM ET
- Webinars cover a variety of topics with a performance management focus
  - You will be able to find the materials from this webinar on the TAM Portal: https://www.tam-portal.com/event-directory/tam-webinars/
- We are always welcoming ideas for webinar topics and presentations!
- Use the webinar chat to submit questions for today's presenters and ideas for future webinars



Webinar Objectives

- **Explore** cross-disciplinary research recommendations to advance intra-agency collaboration on asset management initiatives
- **Identify** opportunities to utilize recently completed research for building awareness of the value of TAM
- **Consider** how these findings can support embedding asset management into agency-wide practices
- **And as always, share** lessons learned, ideas, and knowledge

Webinar Agenda

2:00 **Welcome and Agenda Overview**
Anna McLaughlin, AASHTO
Tashia Clemons, FHWA
William Johnson, Spy Pond Partners

2:15 **NCHRP Research Report 1182: Integrating Transportation System Management and Operations into Transportation Asset Management – A Guide**
Reno Giordano, WSP

2:30 **NCHRP Projects 23-06 and 20-44(46): Asset Valuation Guidance for Transportation Asset Management**
William Robert, Spy Pond Partners

2:45 **NCHRP Synthesis 20-05 · Topic 56-07: Practices for Identifying and Incorporating Risk into Bridge Asset Management Planning**
Dr. Başak Bektaş, Ph. D., Minnesota State University, Mankato, and InfraFortis Consulting LLC

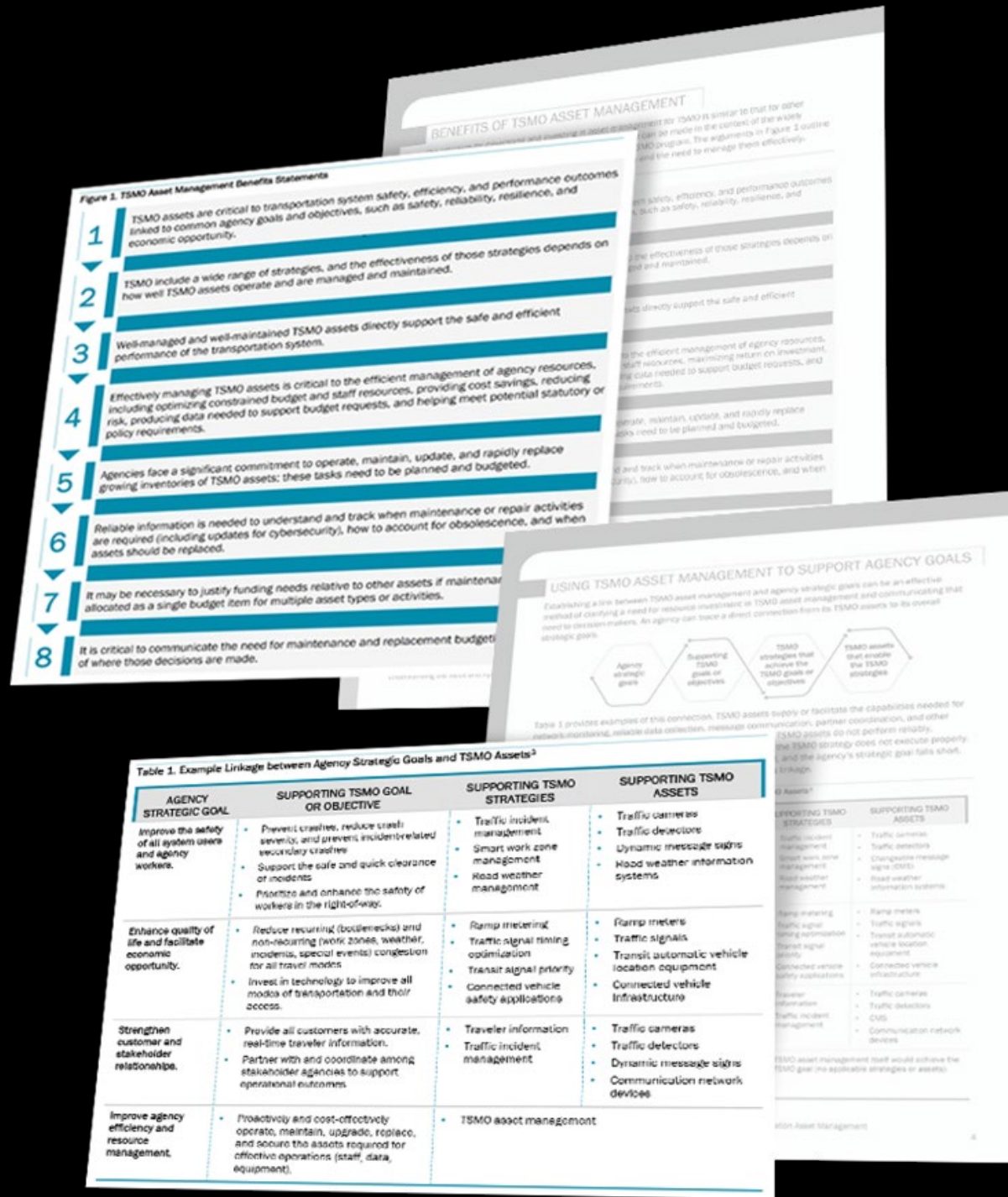
3:00 **Developing a Framework for Establishing a Risk-Based Geotechnical Asset Management Program in Illinois**
Dr. Ahmad Alhasan, Ph.D., P.E., Ingios Geotechnics, Inc. and HNTB

3:15 **Q&A Discussion and Wrap Up**
William Johnson, Spy Pond Partners

NCHRP RESEARCH REPORT 1182

INTEGRATING TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS INTO TRANSPORTATION ASSET MANAGEMENT: A GUIDE

AASHTO TAM Webinar #83 | November 18, 2026



Current Practice

TSMO Maturity

- Understanding
- Planning
- Deployments
- Devices

Roadway Assets

- More visible
  - Pavement cracks and potholes
  - Concrete spalling
  - Bridge structure rust
- Less “visible”
  - Camera malfunction
  - Electronic sign failure
  - Communication network outage

Asset Management Practices

- Reactive
- Basic or informal processes
- Limited tools
- Lack of guidance
- Underdefined effective practices

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Constraints

TSMO Assets

- Lack of uniform definitions.
- Identifying and quantifying condition.
- Measuring function and condition against intended performance outcomes.
- Identifying and quantifying life cycles.
- Understanding reliability and criticality.
- Tools and business processes that are less developed, or that have distinct requirements.

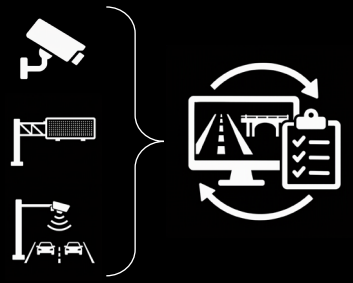
Context and Considerations

Integration

1. Integrating TSMO into an asset management process generally



2. Integrating TSMO asset management into agency enterprise asset management (EAM)



Approaches That Offer Flexibility

- Agencies are not starting from scratch
- Agencies are all different
- Value of EAM integration may not be universal

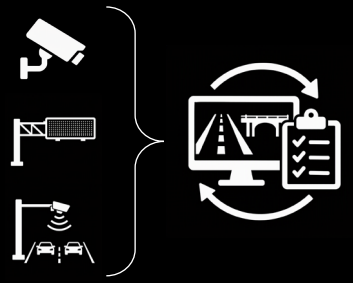
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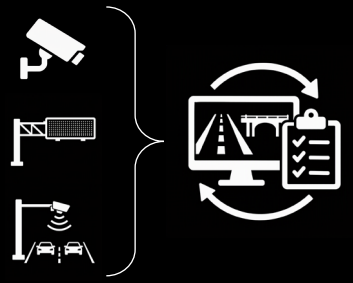
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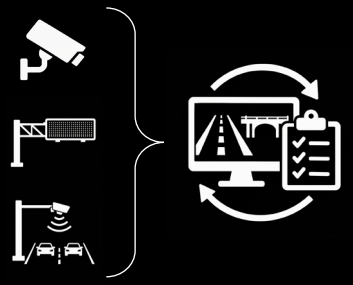
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Value and Approaches to Integration

- Understand two forms of integrating TSMO into TAM.
- Articulate the value of integrating TSMO into TAM.
- Overcome challenges to advancing TSMO asset management.
- Formulate an approach to TSMO asset management integration that aligns with agency capabilities, contexts, and goals.

Table 4. Approach 1 to Integrating TSMO into Transportation Asset Management

APPROACH 1	ASSET DATA/INFORMATION	PROCESSES	TOOLS*	EAM INTEGRATION
Inventory	▪ Assets and locations at the device level ▪ Essential static asset data (e.g., install date, location, manufacturer, supporting infrastructure)	▪ Inventory data recorded once, typically at installation ▪ Process to collect historical data (if necessary)	▪ Spreadsheet ▪ Geographic information systems (GIS) or linear referencing systems (LRS) ▪ Traffic management system (TMS)	▪ TSMO asset inventory and data collection processes separate from EAM
Condition and Performance	▪ Manufacturer's recommended service life ▪ Asset age ▪ Warranty status ▪ Vendor-provided notifications regarding obsolescence ▪ Operational status (power/communications) for select assets	▪ Targeted/select condition assessment based on age (percent expected life remaining) at the device level ▪ Availability informally or selectively monitored by tracking uptime based on power/communications	▪ Spreadsheet or similar ▪ Device-specific monitoring software; optionally network monitoring software	▪ Distinct TSMO asset condition and functional performance assessment methods ▪ Condition ratings separate from other transportation assets
Life-Cycle Planning	▪ Maintenance activity and unit costs at the device level ▪ New devices added to inventory ▪ Updated components among existing devices ▪ Manufacturer support period (obsolescence trigger)	▪ Condition forecasting uses static service life estimates from manufacturers ▪ No analysis of historical records to understand changes in condition, failures, or treatment effectiveness ▪ Maintenance activity based on basic device health indicators including warranty status and manufacturer guidelines ▪ Maintenance activity, other than inspection, routine, and some preventive treatments, is generally reactive ▪ Select planned asset replacement based on expected life (manufacturer guidance and/or agency judgment)	▪ Maintenance Management System ▪ TMS ▪ Spreadsheet or similar	▪ TSMO asset life-cycle analyses separate from EAM ▪ Life cycles of related roadway assets considered on an as-needed basis when analyzing asset replacements ▪ Generally separate TSMO asset maintenance activities and tools ▪ Structural components may be inspected and/or maintained by other staff depending on type (e.g., gantries) and location (e.g., bridges)
Investment Planning	▪ Maintenance needs volume and costs	▪ TSMO maintenance and replacement needs budget established using maintenance activity outcomes and analysis above ▪ Basic analysis of future maintenance costs using historical data	▪ Spreadsheet or similar	▪ TSMO budgets determined independently from other asset classes

* Tool options provided; not all must be used.

Inventory

- See examples of TSMO assets and determine which ones to manage.
- Review a framework for developing a TSMO asset inventory.
- Understand and assess TSMO asset inventory tools.
- Consider options for asset classification.

Table 2. Example TSMO Assets[1]

	CATEGORY	EXAMPLES	
	FIXED FIELD DEVICES	▪ Traffic cameras ▪ License plate readers ▪ Connected vehicle roadside units ▪ Connected vehicle antennas ▪ Emergency call boxes ▪ Toll tag readers ▪ Commercial vehicle electronic screening ▪ Highway advisory radio ▪ CMS ▪ Blank-out signs ▪ Traffic detectors	▪ Traffic counters ▪ Weigh-in-motion systems ▪ Roadway intersection conflict warning systems ▪ Weather stations ▪ Traffic signals ▪ Traffic gates ▪ Lane use control signs ▪ Ramp meters ▪ Reversible lane systems ▪ Variable speed limit signs ▪ Warning flashers ▪ Traffic management system / traffic signal system cabinet
	COMMUNICATIONS AND NETWORKING	▪ Fiber optic cable ▪ Copper cable ▪ Wireless hardware	▪ Networking hardware ▪ Video equipment ▪ Communications shelter
	HARDWARE/ SOFTWARE	▪ Cloud hosting services ▪ On-site servers ▪ Workstations ▪ Asset management software ▪ Connected vehicle software	▪ GIS and LRS ▪ Maintenance decision support systems ▪ TMS ▪ Advanced traveler information system (ATIS) ▪ Video management

Table 4. TSMO Asset Inventory Tools

TOOL TYPE	POTENTIAL ADVANTAGES	POTENTIAL DISADVANTAGES
Spreadsheet	▪ Simple ▪ Low cost	▪ Limited data quality control ▪ Limited ability to store attributes ▪ May be difficult to interface with other data sources ▪ Limited reporting and analysis capabilities
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Maintenance Management System	▪ Documents maintenance history ▪ Links to work orders	▪ Focused on asset maintenance, not asset management ▪ May not inventory all TSMO assets (e.g., fiber optic)
Advanced Traffic Management System	▪ Interfaces with field devices ▪ Spatially views TSMO assets in relationship to the roadway and other assets ▪ Collects and stores real-time information related to device health	▪ May not inventory all TSMO assets (e.g., fiber optic) or attributes ▪ May collect data but not store them ▪ Limited asset management reporting and analysis

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- Understand how TSMO asset condition and functional performance differ from traditional highway infrastructure assets.
- Identify the factors for selecting condition assessment methods.
- Establish appropriate measures of asset functional performance (e.g., asset availability or uptime).

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- Hardware, software, internal components
- Unpredictable degradation or failure
- Overall condition may depend on just one of many components
- Obsolescence (standards, cybersecurity, software, spare parts)

Condition and Functional Performance

- Understand how TSMO asset condition and functional performance differ from traditional highway infrastructure assets.
- Identify the factors for selecting condition assessment methods.
- Establish appropriate measures of asset functional performance (e.g., asset availability or uptime).

- Age relative to expected life
- Plus potentially warranty, experience, environment, obsolescence
- Age may not be enough
- Consider functional performance, maintenance health, physical condition

Condition and Functional Performance

- Understand how TSMO asset condition and functional performance differ from traditional highway infrastructure assets.
- Identify the factors for selecting condition assessment methods.
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- Data quality
- Performance monitoring (remote tools, device self-reporting, frequency, monitoring multiple components)

Condition and Functional Performance

TSMO Device Health Index (DHI)

- Consider formalizing a TSMO asset condition assessment approach using a proposed TSMO DHI.

Table 3. TSMO Device Health Index Indicators and Assessment Factors

	HEALTH INDICATOR	ASSESSMENT FACTOR	
	REMAINING SERVICE LIFE	▪ Percentage of expected life remaining ▪ Estimated time until replacement or major repair ▪ Technological relevance *(Obsolescence)*	▪ Spare parts availability *(Obsolescence)* ▪ Vendor support availability *(Obsolescence)* ▪ Internal component wear
	FUNCTIONAL PERFORMANCE	▪ Uptime/downtime metrics ▪ Quality of data collection or information display (accuracy, completeness, timeliness) ▪ Response rates to system inputs or commands ▪ Power/communication reliability ▪ Frequency and duration of unplanned outages	▪ Software/firmware compatibility and security status *(Obsolescence)* ▪ Hardware integration capabilities with newer systems *(Obsolescence)* ▪ Conduit, power, and communication cable integrity ▪ Quality degradation due to device malfunction ▪ Sensor or display element condition
	MAINTENANCE HEALTH	▪ Recovery time after failures ▪ Frequency of unscheduled repairs ▪ Cost of repairs accrued to date	▪ Time between maintenance activities ▪ Visible physical damage

Table 6. Health Indicator Assessment: Remaining Service Life

CONDITION DESCRIPTION	ASSIGNED RATING	CONDITION TYPICALLY ALIGNS WITH THIS COMMON ACTION	ILLUSTRATIVE RATING DESCRIPTION INCORPORATING SELECT ASSESSMENT FACTORS
Excellent	5	Under Warranty/Routine/ Preventive Maintenance	Device is new, with at least 80% of its service life remaining. It is under warranty for all or some of this timeframe.
Good	4	Routine/Preventive Maintenance	Device has 20-80% of its service life remaining. Obsolescence is not a concern.
Fair	3	Minor Repairs	Device has 0-20% of its service life remaining. Sourcing of spare parts may be increasingly challenging. Newer or alternate technology is starting to emerge.
Poor	2	Major Repairs/Component Replacement	Device has exceeded its estimated service life by up to 25%. Parts may be difficult to find or expensive. Software support is limited or could be ending soon. Newer or alternate technology is available. Replacement should be considered.

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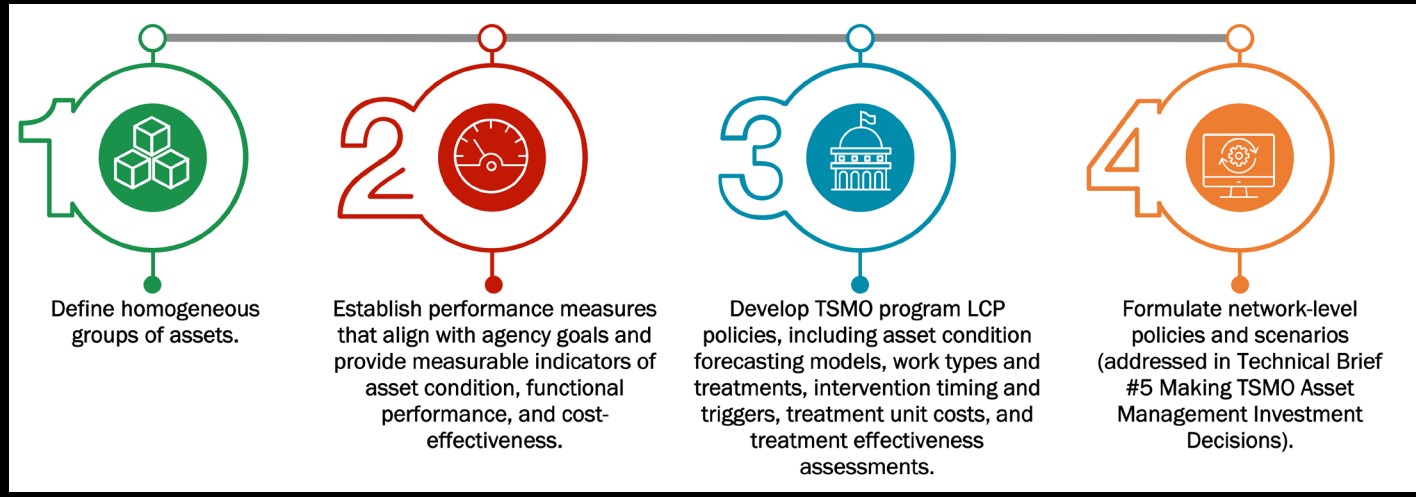
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Life-Cycle Planning

- Understand how applying LCP to TSMO assets differs from traditional highway infrastructure assets.
- Outline the steps for applying LCP to TSMO.
- Incorporate the proposed TSMO DHI into asset-level condition forecasting and determining intervention needs.
- Review an illustrative example.



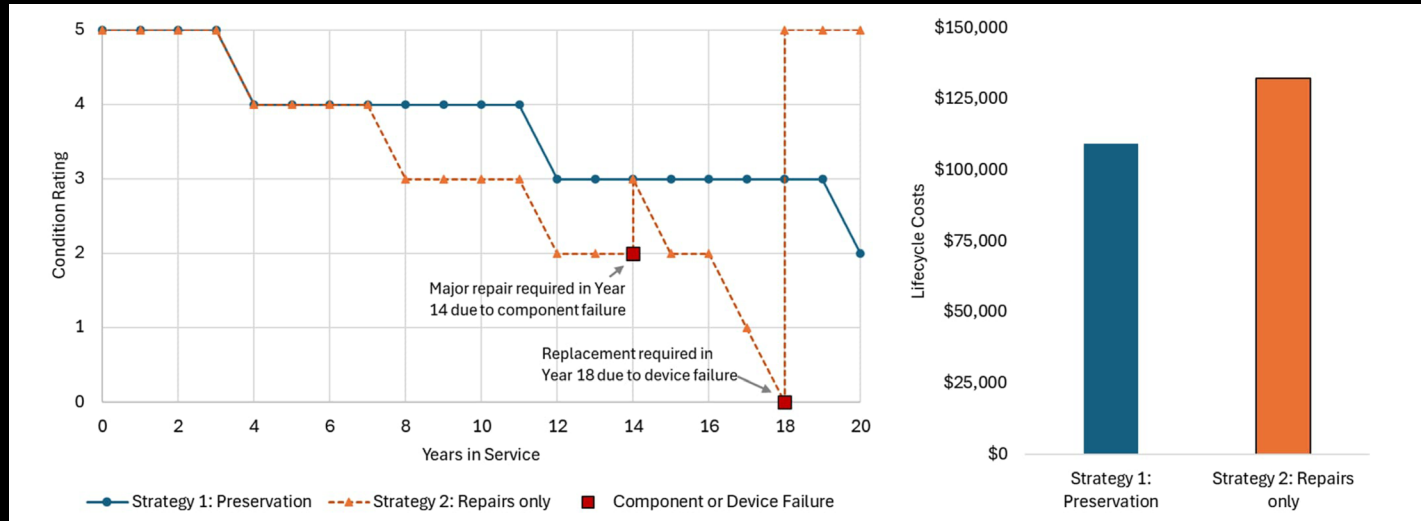
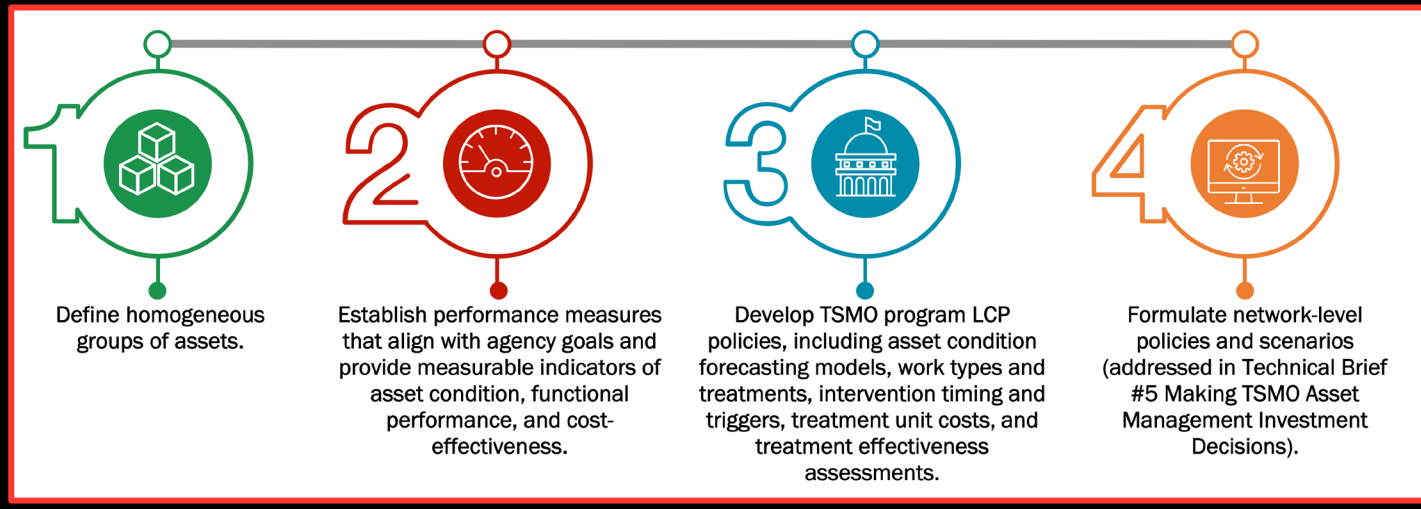


Figure 2. Example RWIS Asset Condition Progression Over Time and Life-Cycle Costs

Life-Cycle Planning

- Understand how applying LCP to TSMO assets differs from traditional highway infrastructure assets.
- Outline the steps for applying LCP to TSMO.
- Incorporate the proposed TSMO DHI into asset-level condition forecasting and determining intervention needs.
- Review an illustrative example.



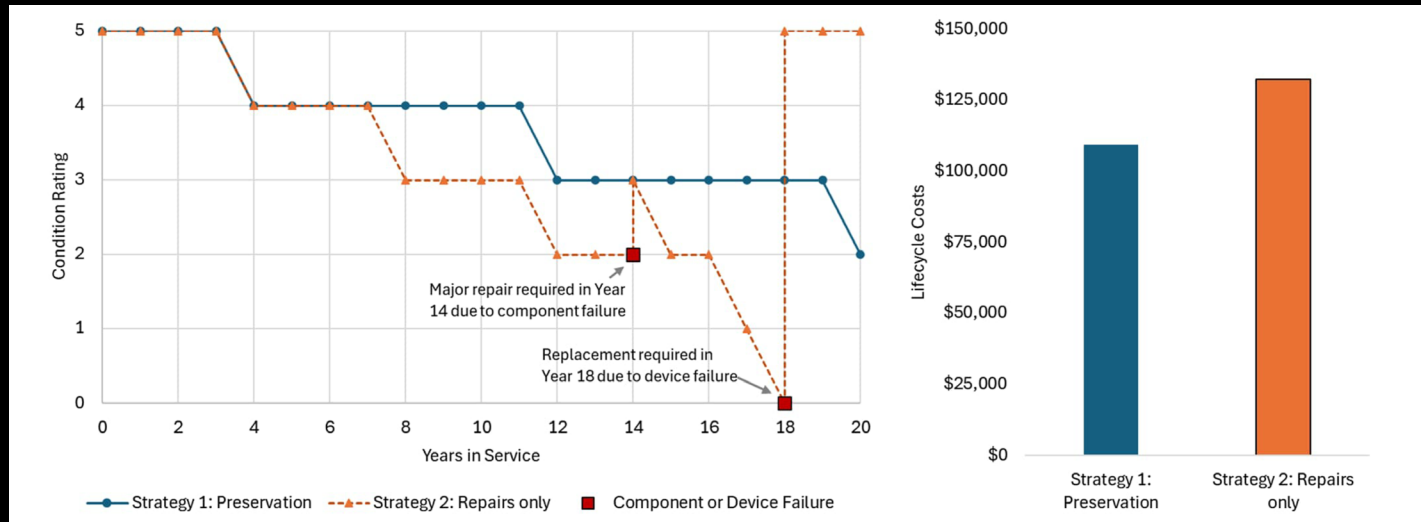
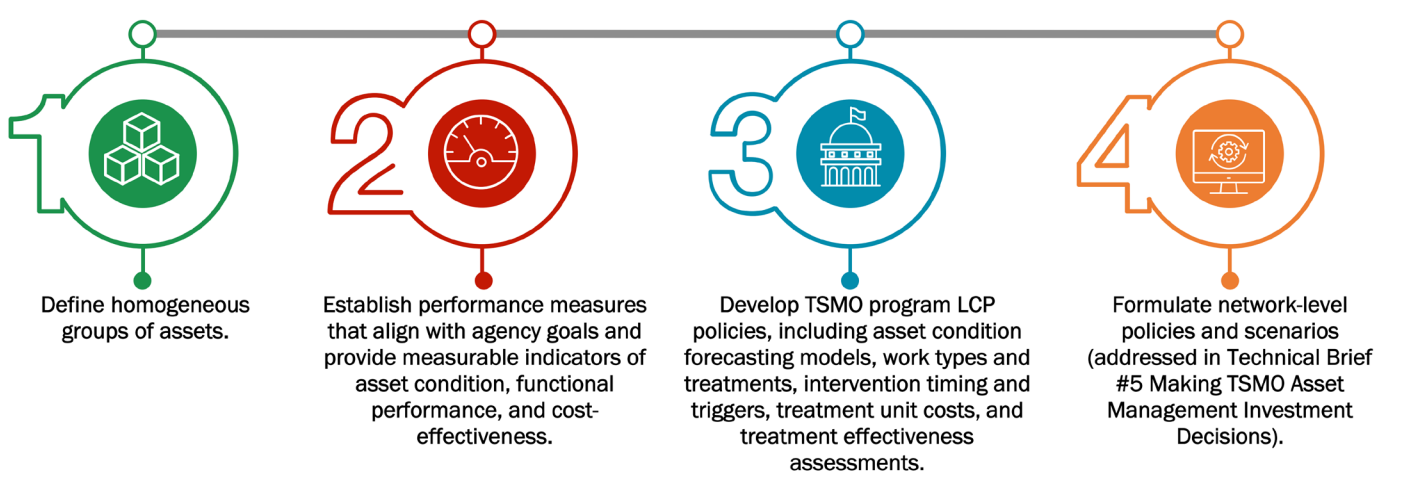


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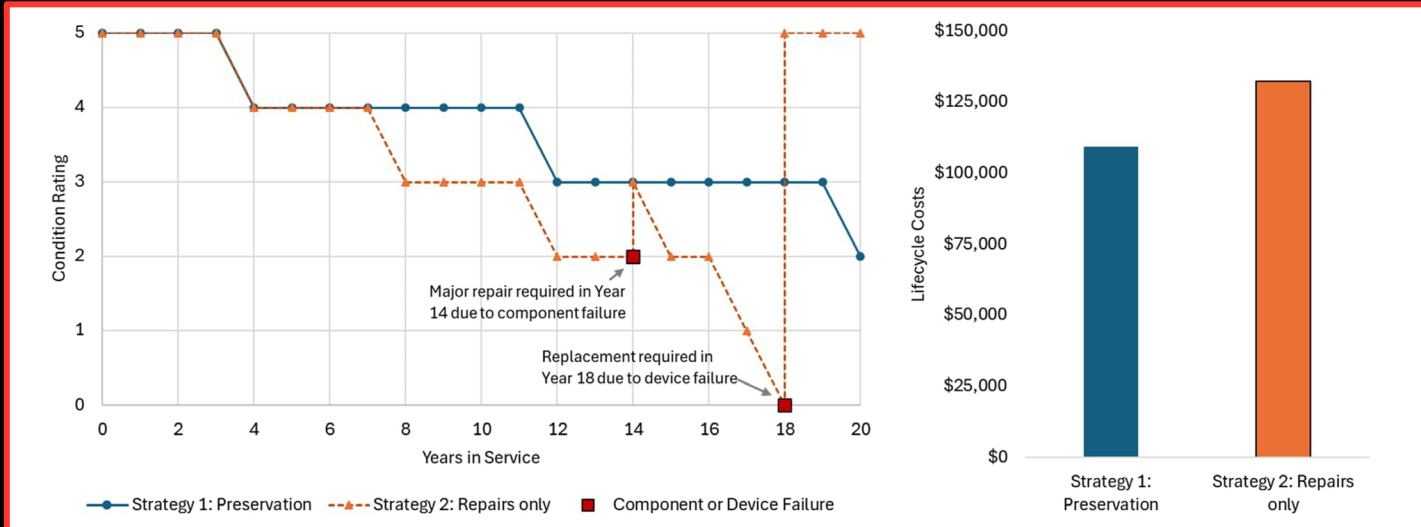


Figure 2. Example RWIS Asset Condition Progression Over Time and Life-Cycle Costs

Investment Decision Making

- Understand the interrelationship between investment analysis and LCP.
- Link TSMO asset level of service (LOS) to investment analysis.
- Apply investment analysis to TSMO assets.

Table 1. Relationship between TSMO Asset Level of Service and Investment Analysis

LEVEL OF SERVICE (LOS)	DEFINITION	HOW INVESTMENT ANALYSIS RELATES TO LOS
Maintenance LOS	Measures how well maintenance activities are executed and service disruptions minimized.	Identifies when and how much to invest in maintenance to sustain performance.
Preservation LOS	Assesses whether assets are preserved or replaced at optimal life-cycle cost.	Supports planning for the lowest-cost interventions and timing of replacements.
Operational LOS	Evaluates whether assets support intended operational outcomes like safety and reliability.	Helps target investments that restore, sustain, or improve functional performance.



BUDGET-CONSTRAINED SCENARIOS

SCENARIO	Illustrates outcomes from...
Current Funding Level	No major changes to the current budget.
Reasonably Available Funding	Expected future funding using budget forecasts, economic trends, and policy direction.
Alternative Funding Levels	Reduced or increased funding, depending on budget constraints or new investment opportunities.



PERFORMANCE-DRIVEN SCENARIOS



STRATEGIC FOCUS SCENARIOS

Business Processes and Resources

- Revisit approaches to integrating TSMO asset management into TAM to identify required business processes and resources.
- Evaluate an appropriate degree of EAM integration.
- Consider incorporating TSMO into Transportation Asset Management Plan (TAMP).
- Assess TSMO asset management staffing requirements and how to secure funding.

Table 2. Approaches to Integrating TSMO Condition and Functional Performance into Asset Management

	APPROACH 1	APPROACH 2	APPROACH 3
Asset Data/ Information	▪ Manufacturer's recommended service life ▪ Asset age ▪ Warranty status ▪ Vendor-provided notifications regarding obsolescence ▪ Operational status (power/communications) for select devices	Approach 1 AND: ▪ Select physical inspection data ▪ Maintenance history ▪ Documented agency experience at the device or component level by type or location ▪ Comprehensive device-level operational status (power/ communications)	Approach 2 AND: ▪ TSMO device-specific functional performance data or activity output ▪ Comprehensive operational status at the component level
Processes	▪ Targeted/select condition assessment based on age (% expected life remaining) at the device level ▪ Availability informally or selectively monitored by tracking uptime based on power/ communications	▪ Condition assessment based on age (% expected life remaining) at the select device or component level, with possible adjustments for environment, maintenance history, security risk, and other factors based on agency experience ▪ Functional performance measured as availability or uptime as a function of power/ communications relative to targets; availability may factor into condition	▪ Condition assessment incorporates a range of relevant assessment factors including functional performance and maintenance health ▪ Functional performance includes data quality, obsolescence, and device-specific considerations ▪ Maintenance health optionally incorporates reliability measures such as mean time between failures
Tools	Options: ▪ Spreadsheet or similar ▪ Device-specific monitoring software; optionally network monitoring software	Options: ▪ Network monitoring software ▪ Asset management software ▪ TMS ▪ Data exchange	Options: ▪ Same as Approach 2 ▪ Database management system
Enterprise Asset Management (EAM) Integration	▪ Distinct TSMO asset condition and functional performance assessment methods ▪ Condition ratings separate from other transportation assets	Approach 1 AND: ▪ Condition ratings reported consistent with those for other transportation assets	Approach 2 AND: ▪ Condition ratings compared to those for other transportation assets (and used to make tradeoffs)

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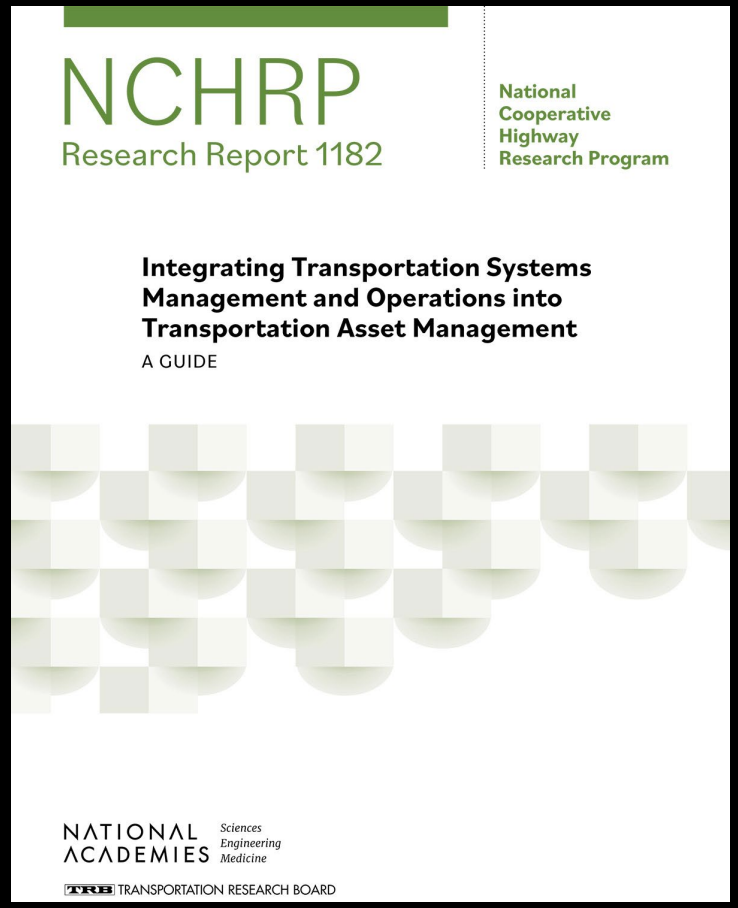
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THANK YOU

RENO GIORDANO

VICE PRESIDENT, TRANSPORTATION OPERATIONS STRATEGIES

reno.giordano@wsp.com



https://www.nationalacademies.org/read/29446

AASHTO TAM Webinar

NCHRP Projects 23-06 and 20-44(46)

Asset Valuation Guidance for Transportation Asset Management

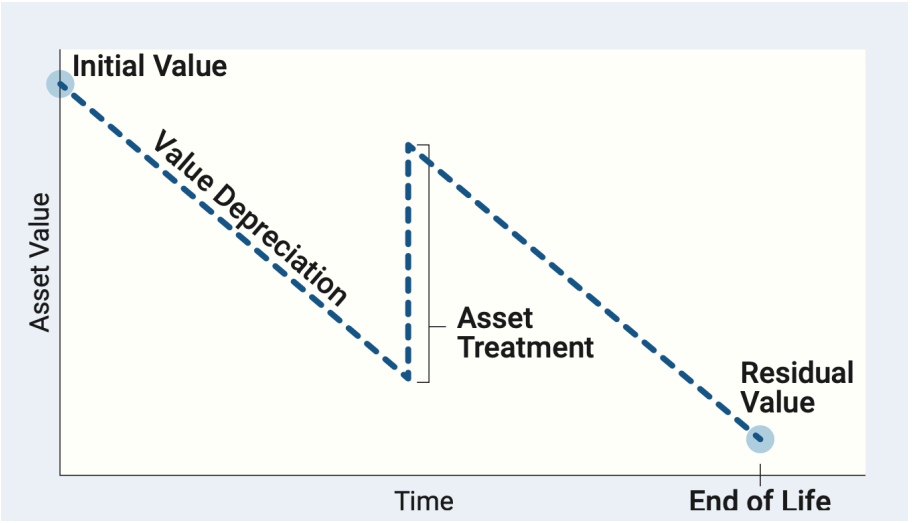
Bill Robert, Spy Pond Partners

November 2026

spy pond partners, llc

Asset Valuation for Asset Management

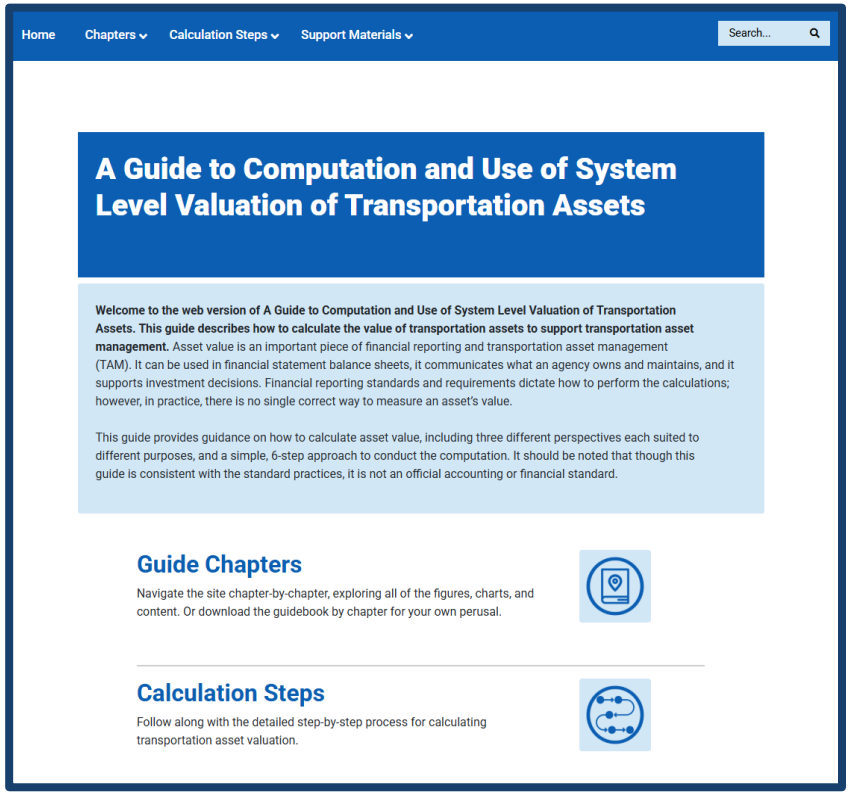
- **NCHRP project summary**
- **Asset valuation overview**
- **Supplemental materials developed through NCHRP Project 20-44(46)**



- **GASB 34 Infrastructure Assets Exposure Draft**
  - What is it?
  - Implications for asset mangers

NCHRP Project Summary

- **Initial guidance developed in 2022 through NCHRP Project 23-06**
- **Supplemental materials prepared in 2025 through Project 20-44(46)**
- **Results available through:**
  - www.assetvalueguide.com
  - NCHRP WOD 335
  - NCHRP WOD 448
- **Project team included SPP, HDR and KPMG**



Motivation for the Guidance

- Asset value can be used to help communicate what assets a transportation agency owns and the costs involved in building and maintaining them
- Agencies need to determine the current value their physical assets to prepare financial reports and to support various asset management (TAM) functions
- Needs for TAM are different from those of financial reporting and may require different valuation approaches that build on relevant international guidance
- Project was initiated to develop guidance for asset valuation specific to use for TAM



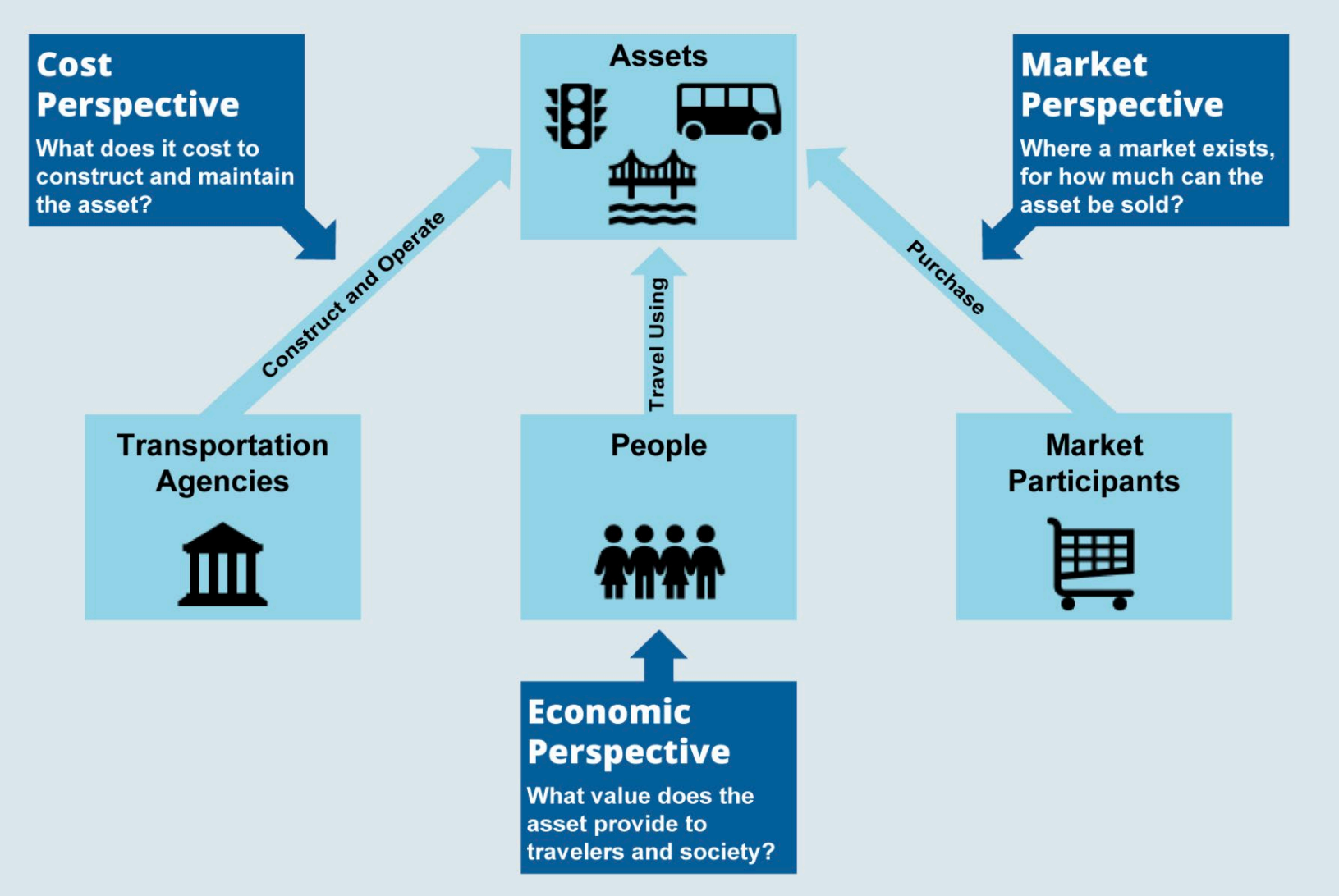
Questions Asset Value Can Help Answer

1. What is the overall value of the asset inventory?
2. What is the cost to maintain current asset value?
3. How much should we spend on our existing assets?
4. How should funds be allocated between different assets or networks?
5. What's the best life cycle strategy for our assets?
6. What is the value generated by the asset?



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Perspectives on Asset Valuation



Asset Valuation Calculation Steps

1. Define the Analysis Scope
2. Establish Initial Value
3. Determine Treatment Effects
4. Calculate Depreciation
5. Calculate Value and Supporting Measures
6. Communicate and Apply the Results



Asset Valuation Case Studies

- **Pavement**
  - Northern Agency
  - Midwestern Agency
  - Southwestern Agency
  - Metropolitan Agency
- **Bridge**
  - Northern Agency
  - Northwestern Agency
  - Generic Bridge Deterioration Curves
- **Economic Perspective**
  - Eastern Agency
  - Midwestern Agency
  - Western Agency
- **Other**
  - Ancillary Assets
  - Transit Assets
  - Vehicles
  - International



Supplemental Materials from NCHRP 20-44(46)

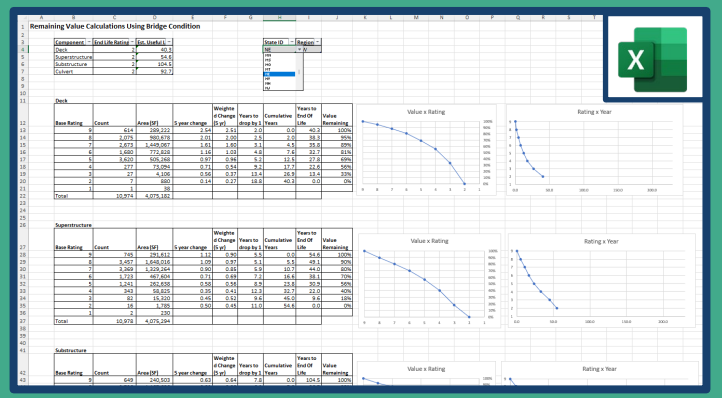
New Case Studies

- Anonymized case studies were developed through a pilot program intended to help volunteer transportation agencies improve/expand their asset valuation practices.
- The case studies illustrate the application of different approaches described in the asset valuation guidance, including different perspectives on what value represents, different approaches for calculating initial value, and different approaches for calculating depreciation.
- The case studies are intended to provide helpful context to an external audience, describing the asset valuation practices used in the pilots in sufficient detail to support learning by other agencies.

Supplemental Case Studies	Assets
Calculating Asset Value for Pavement Base and Surface in a Midwestern State	Pavement
Comparing Pavement Valuation Based on Condition vs. Age in a Southwestern State	Pavement
Calculating Asset Value for Assets with Varying Levels of Data Availability in a Western State	Multiple asset types
Comparing Bridge Valuation Using Three Depreciation Approaches in a Northwestern State	Bridge
Using FHWA BIP Tool Data to Develop Bridge Deterioration Curves	Bridge
Bridge Economic Valuation in an Eastern State	Bridge
Pavement Valuation Based on Condition in a Metropolitan Agency	Pavement
Calculating Vehicle Asset Value Using the Market Perspective	Cutaway Bus
Highway Economic Valuation in a Western State	Pavement

Calculation Templates

- Two Excel-based calculation templates were developed from anonymized tools developed through the pilot program.
- Templates are downloadable from the guide and intended to be used by readers to assist in their own Asset Value Calculations.
- Ancillary Asset Value Calculation Template
  - For calculating ancillary asset value using inventory and age data and parameters defined by the calculating agency. This template is intended to be used with assets with limited available data.
- Bridge Asset Value Calculation Template
  - For calculating bridge asset value using bridge inventory and condition data and parameters defined by the user.

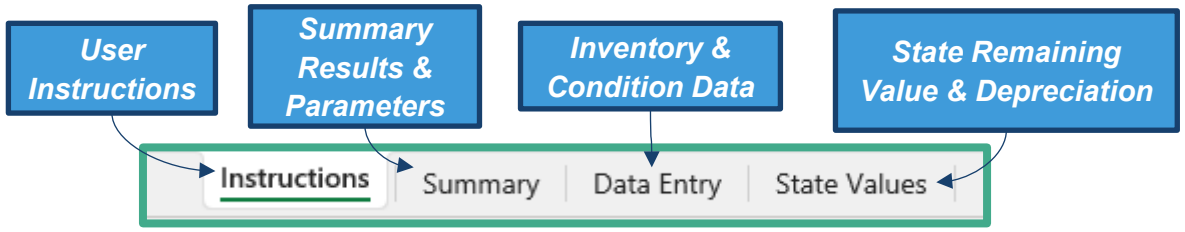


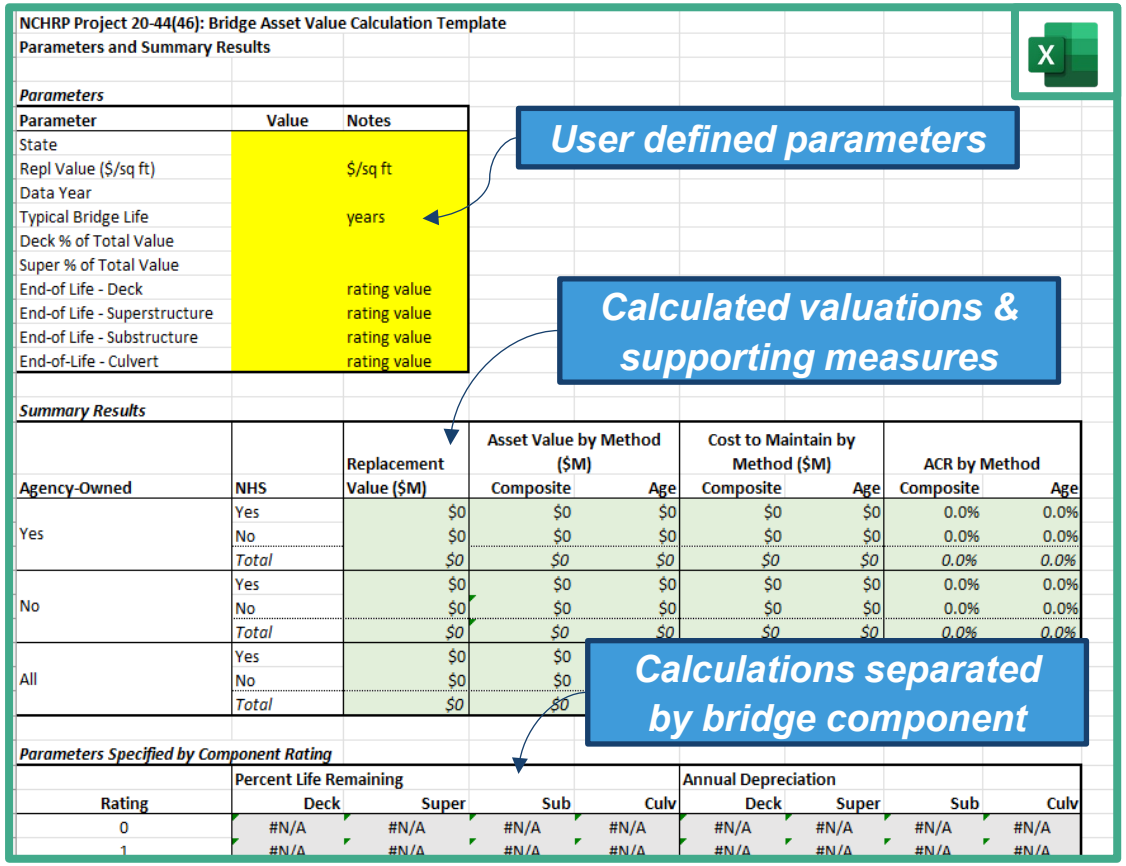
Website Improvements

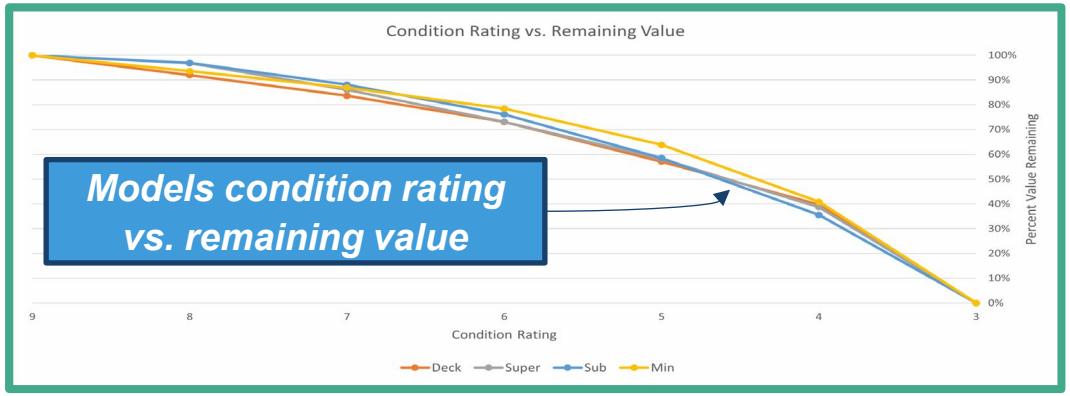
- As part of NCHRP Project 20-44(46), the research team implemented a series of content updates, bug fixes, and new features intended to improve the digital version of the Asset Value Guide's accessibility and user experience.

Bridge Value Calculation Template

- The spreadsheet is a template for calculating bridge asset value using bridge inventory and condition data and parameters defined by the calculating agency.
- Used to calculate replacement value & remaining (current) asset value using two approaches:
  - Composite rating
  - Age-based
- The template also yields supplemental calculations for each of the three approaches, including:
  - Cost to maintain value
  - Asset consumption ratio (ACR)

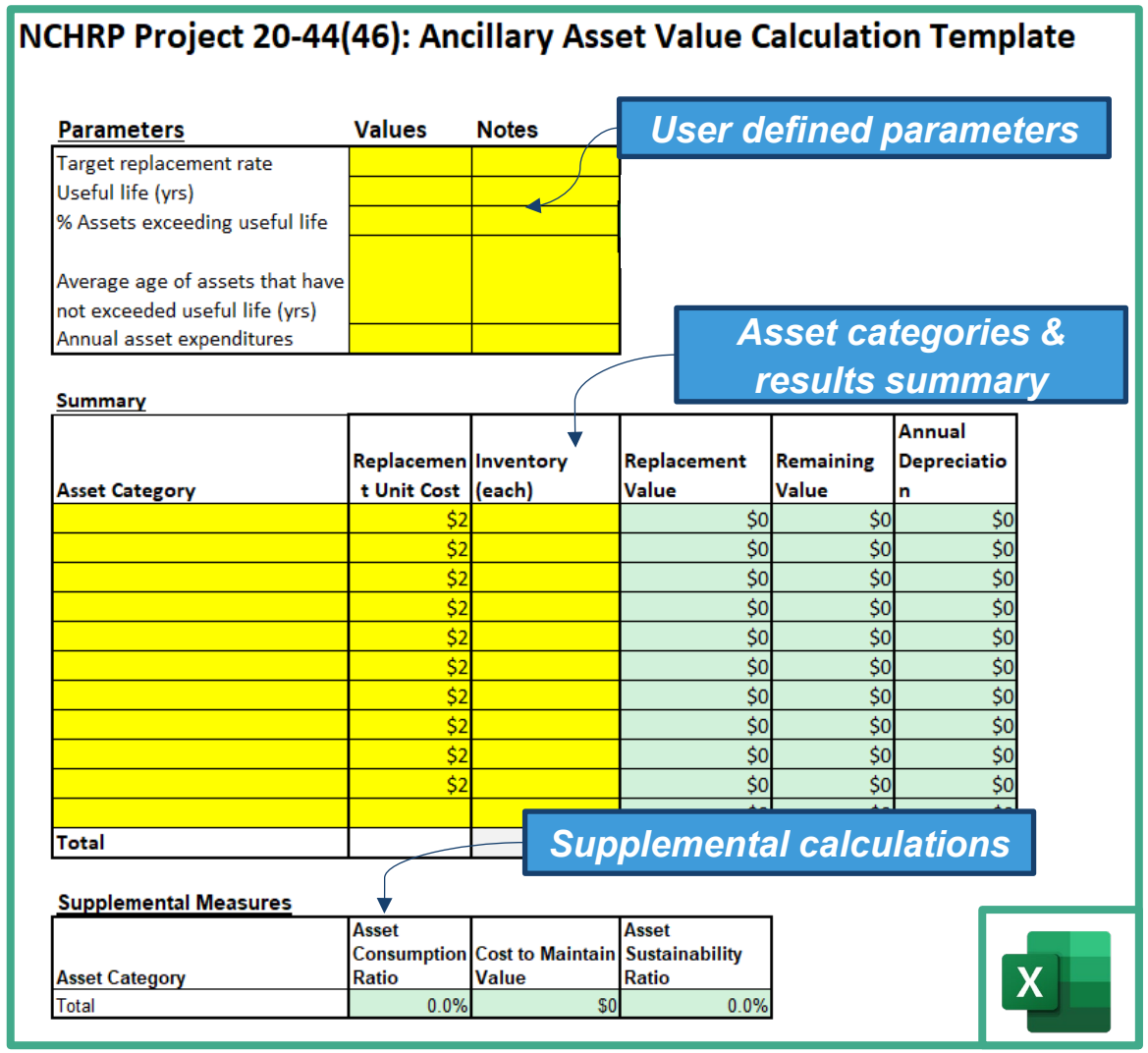






Ancillary Asset Calculation Template

- This spreadsheet is a template for calculating ancillary asset value using inventory and age data and parameters defined by the calculating agency.
- The template is intended to be used with assets with limited available data.
- The tool is used to calculate:
  - Replacement value
  - Remaining (current) value
  - Cost to maintain value
  - Asset consumption ratio (ACR)
  - Asset sustainability ratio (ASR)



Other Web Site Improvements



Added a text-to-speech audio version of the guide

- Web player & downloadable MP3 versions.



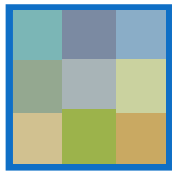
Added an "Update Overview" page to highlight new content



Added a download link for all figures, tables, and tools



Glossary of key terms



Add color theming to differentiate sections



Updated references to relevant regs and the law



Revamped site-wide search feature



Redesigned menu system for navigating the site



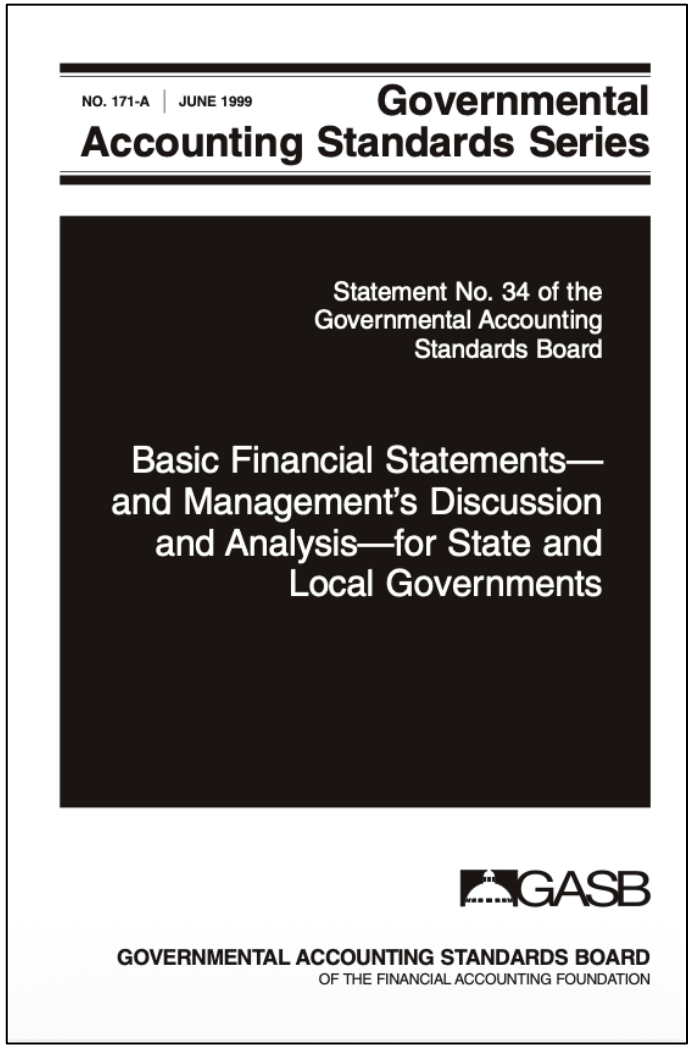
Implemented Bug Fixes



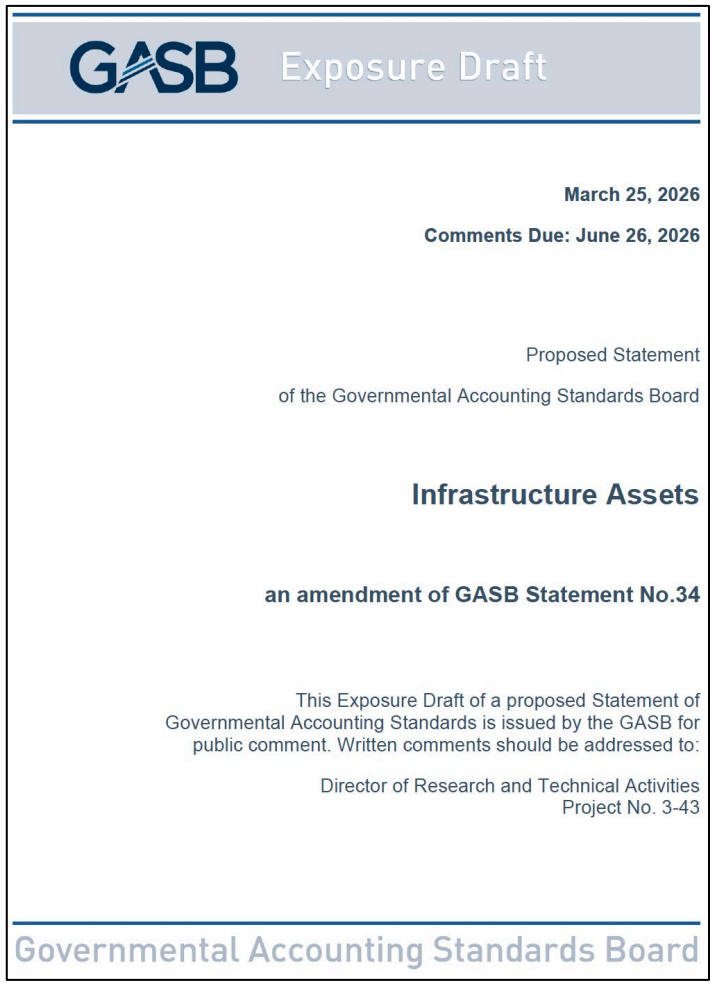
Updated external resources and broken website links

What is GASB 34?

- **Set of accounting requirements for public agencies to use for preparing financial reports (e.g., ACFRs)**
- **Established in 1999**
- **Includes requirements for reporting the value of capital assets using one of two alternative approaches**
  - Historical cost net of depreciation approach
  - "Modified Approach" in which assets are not depreciated provided they are preserved at an established condition level



What is the GASB 34 Exposure Draft?



GASB Exposure Draft

March 25, 2026

Comments Due: June 26, 2026

Proposed Statement

of the Governmental Accounting Standards Board

Infrastructure Assets

an amendment of GASB Statement No.34

This Exposure Draft of a proposed Statement of Governmental Accounting Standards is issued by the GASB for public comment. Written comments should be addressed to:

Director of Research and Technical Activities
Project No. 3-43

Governmental Accounting Standards Board

- **Proposes revisions to the GASB 34 requirements for asset valuation specifically for *infrastructure assets***
- **Drafted in 2026, to be finalized in 2027**
- **Major changes**
  - Componentization of complex assets
  - Reporting on asset age and assets that have reached 80% and 100% of their useful life
  - Reporting by network
  - ...
- **Also relaxes requirements for use of the modified approach**

Implications for Asset Managers

- **All agencies will need to asses the changes and add additional details on asset value in their financial reports**
- **Agencies using the depreciation approach will need to perform significant additional analysis to break assets into components and report on asset age**
  - See materials on assetvalueguide.com for assistance!
- **Reported asset value will still typically vary between financial reports and TAMPs as financial reports will continue to use historic costs**



Thank You!



NCHRP SYNTHESIS 20-05 · TOPIC 56-07

Practices for Identifying and Incorporating Risk into Bridge Asset Management Planning

State of practice and research needs

Başak Bektaş, PhD
InfraFortis Consulting LLC, Principal
Associate Professor, Minnesota State University, Mankato

TAM Webinar 83
November 18, 2026

Disclaimer

This presentation draws on NCHRP Synthesis 667: Identifying Risks and Incorporating Them into Bridge Asset Management Planning. The views, interpretations, and opinions expressed here are my own and reflect my personal perspective as the synthesis author. They do not necessarily represent the views of the National Cooperative Highway Research Program (NCHRP), the Transportation Research Board (TRB), the National Academies of Sciences, Engineering, and Medicine, AASHTO, the Federal Highway Administration, or any participating agency. This presentation has not been reviewed or endorsed by NCHRP or TRB. For the official findings, please refer to the published synthesis report.

WHY THIS SYNTHESIS

Federal expectations moved faster than bridge practice

2016 · 23 CFR 515

TAMPs must include a risk management analysis for NHS bridges

2017 · 23 CFR 667

Periodic evaluation of facilities repeatedly damaged by emergency events

2021 · BIL §11105

Extreme weather and resilience required in life-cycle planning and risk management

Past practice leaned on condition-related risk because it is readily measurable. DOTs are now adding hazards that are harder to identify, predict, and fund.

OBJECTIVE AND SCOPE

Document how DOTs identify and incorporate bridge risk

1

Risks identified

Natural and human hazards: scour, seismic, flooding, OS/OW vehicles, vessel collision, fire

2

Decision structure

Who decides, which staff are involved, and their roles

3

Prioritization

How risk items are ranked in the bridge management plan

4

Integration

How risk-based priorities reach bridge plans and the TAMP

5

Review and recalibration

How outputs are checked and methods updated

6

Funding impact

What incorporating risk does to funding decisions

APPROACH

Three sources, one national picture

43 of 52

DOTs responded to the survey of AASHTO COBS voting members

83% response rate · 50 states, DC, PR surveyed

5

case example DOTs interviewed: Maryland, Michigan, Minnesota, North Carolina, Texas

All four AASHTO regions represented

TAMPs

and NCHRP, FHWA and AASHTO guidance reviewed for bridge risk content

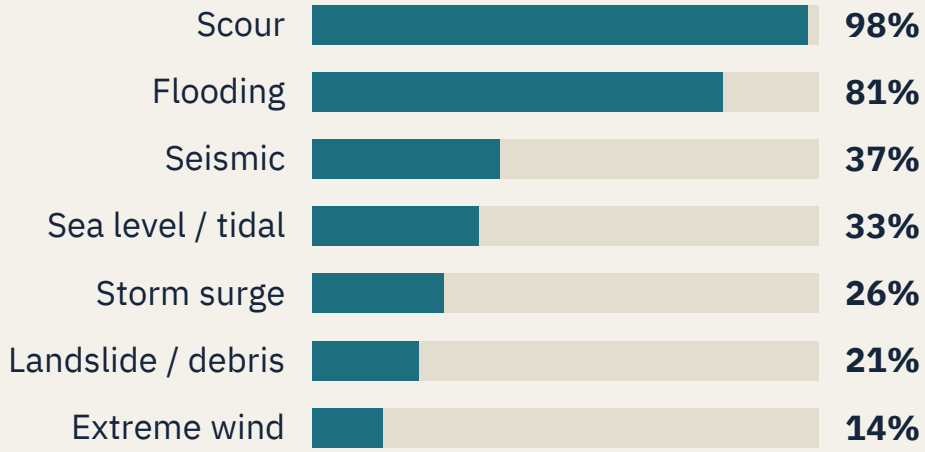
Literature and state TAMP review

Not every DOT answered every question, so some percentages use 41 or 42 respondents.

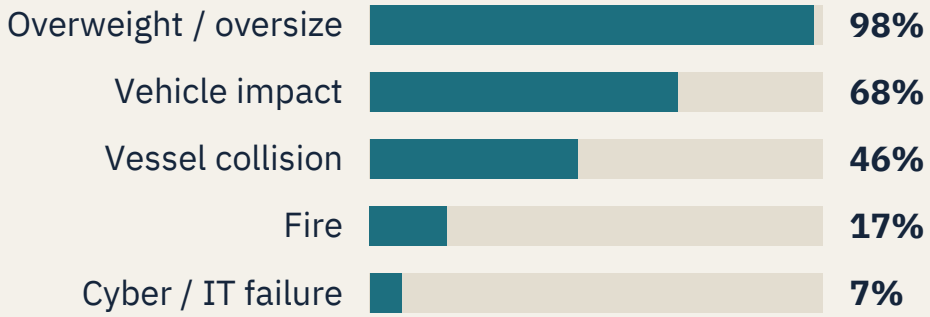
RISKS IDENTIFIED

Scour and overweight vehicles are near-universal; the rest is regional regional

Natural hazards (43 DOTs)

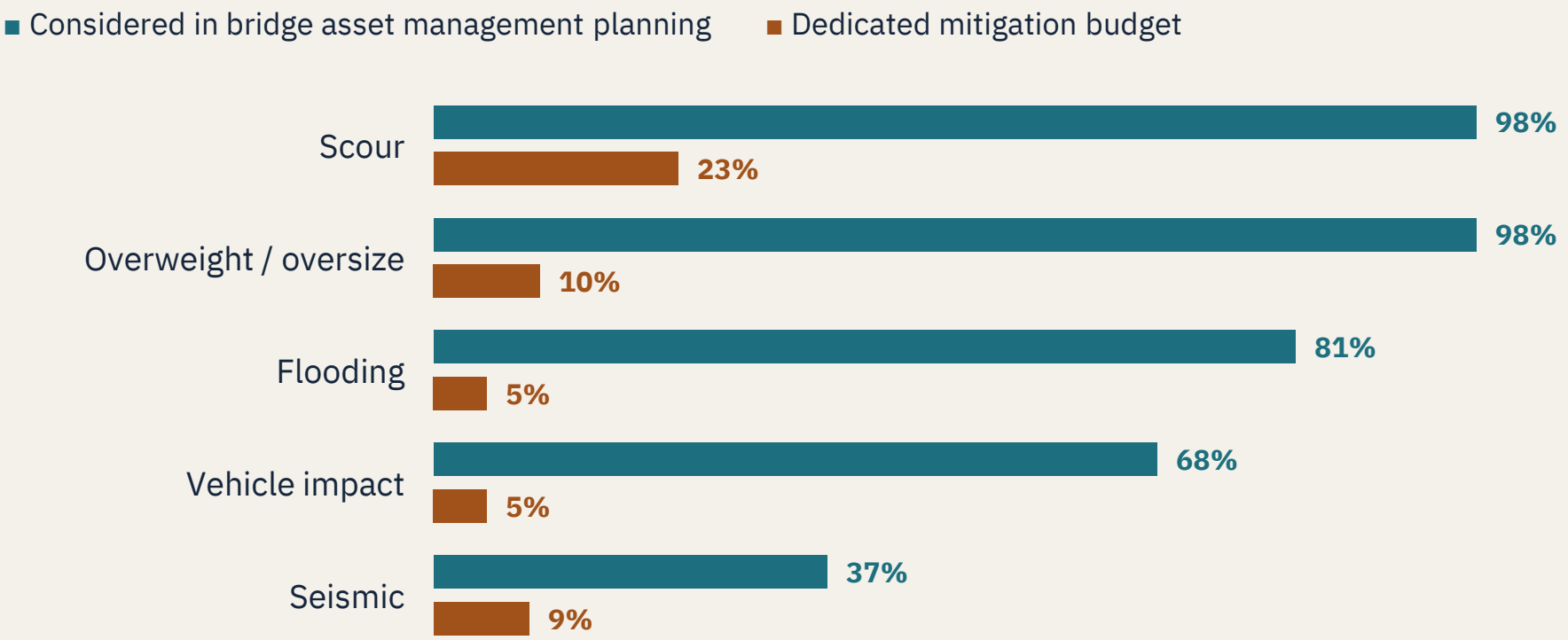


Human-related hazards (41 DOTs)



RISKS IDENTIFIED

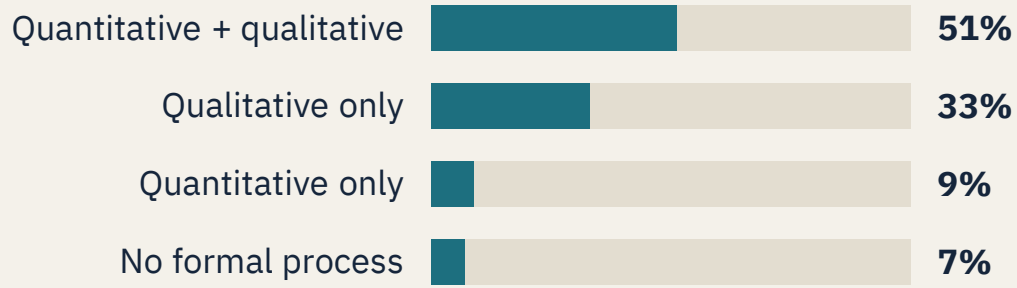
Hazards are widely recognized but rarely have their own budget



PRIORITIZATION

Most DOTs blend scoring with judgment; few are confident

How risk types are prioritized (43)



35%

maintain a bridge-specific risk register (15 of 43)

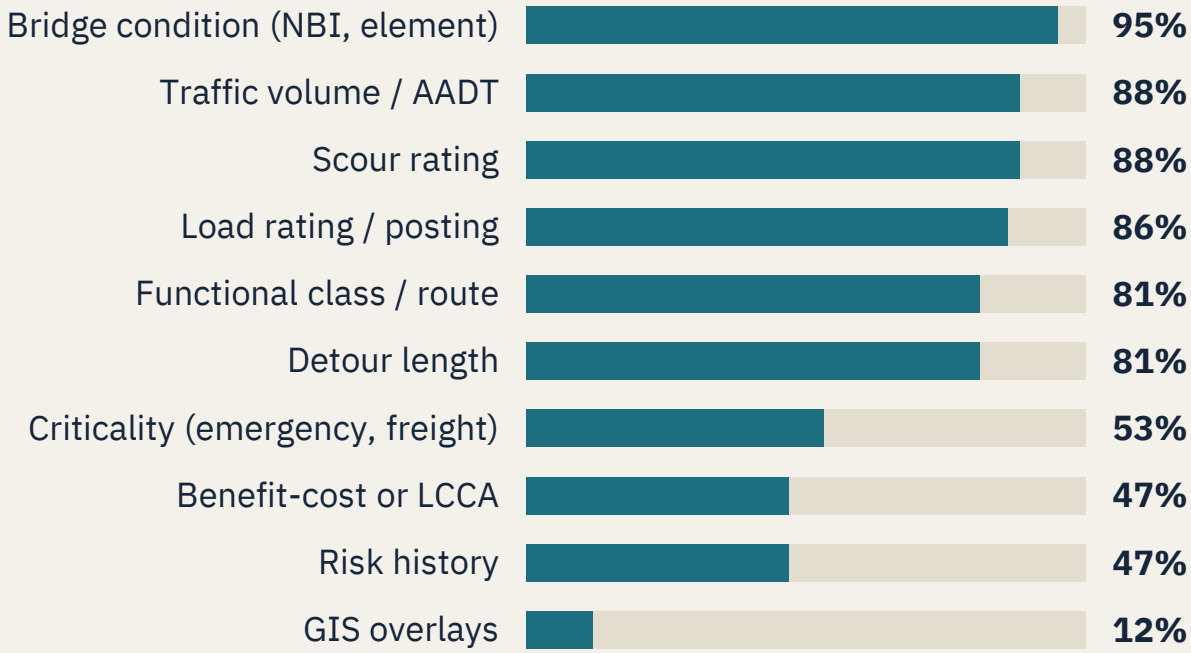
16%

are highly confident estimating the costs and impacts of bridge risks

67% somewhat confident · 16% not confident

PRIORITIZATION

Risk ranking runs mostly on inventory data already in hand

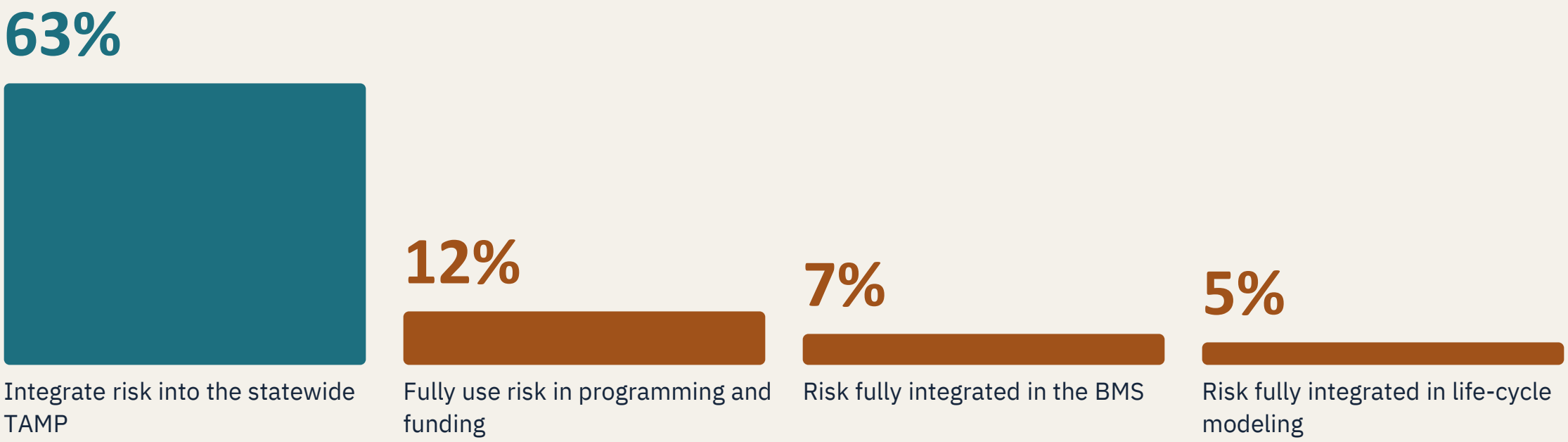


PATTERN

The top six inputs are all inventory or inspection data. Forward-looking or consequence measures are used by half or fewer.

INTEGRATION

Risk is written into plans more often than it drives decisions



DECISION STRUCTURE AND REVIEW

Bridge offices own risk; review loops are uneven

77%

name the central bridge office as primarily responsible for risk identification

Districts 35% · asset management office 30% · planning 16%

76%

have a documented risk management policy that applies to bridges (32 of 42)

49%

have an internal process or working group that periodically reviews bridge risks

72%

do not tie risk evaluation to performance reporting

21% link to federal, 19% to internal reporting

REVIEW AND RECALIBRATION

Change since the 2022 TAMPs has been modest

Since the 2022 TAMP

47%	no change in approach
19%	added resilience and severe-weather risks
14%	enhanced quantitative scoring or modeling

What triggers re-evaluation

58%	condition rating drop
56%	disaster or emergency event
40%	regular review cycle

Next TAMP cycle

60%	unsure whether the approach will be updated
26%	plan to update
14%	no plans

FUNDING IMPACT

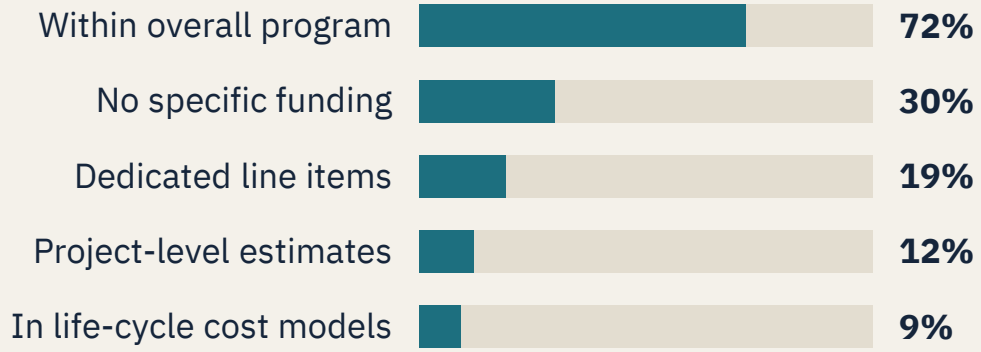
Risk is funded inside the bridge program, and rarely steers it

48%

Note: Risk does not currently influence bridge funding decisions (20 of 42)

Where it does: BMS data 36%, investment or trade-off tools 19%, risk scoring 14%, consultant assessments 10%.

How risk work is funded (43)



CASE EXAMPLES

Five DOTs, five contexts, four AASHTO regions

DOT	Region	Risk context	Highlighted practices
Maryland	1 · NASTO	Coastal flooding	Criticality framework; annual Bridge Tour; Fund 80
Michigan	3 · MAASTO	Great Lakes scour, freeze-thaw	Call for Projects; BCFS forecasting; scour tool
Minnesota	3 · MAASTO	Risk-based planning mandate	Bridge Planning Index; steering committee; workshops
North Carolina	2 · SASHTO	Hurricanes	Balanced statewide weights; HMIP delivery
Texas	4 · WASHTO	Floods, hurricanes, strikes, wildfire	District triage; resilience plan tied to PROTECT

CASE EXAMPLE · REGION 1

Maryland: criticality alongside condition

IDENTIFY

Structure Criticality Framework scores structural, geometric and network factors 1 to 5, so critical bridges can rise before they rate poor.

VALIDATE

Leadership's annual Bridge Tour of about 200–300 priority structures checks the analytics in the field.

FUND

Structures System Preservation Program (Fund 80), about $200M per year; steel coating about $18M per year.

WORTH NOTING

On-call time-and-materials remedial contracts: no NHS bridge permanently posted in about 20 years.

CASE EXAMPLE · REGION 3

Michigan: risk carried into the Call for Projects

INTEGRATE

The Call for Projects Manual turns TAMP goals into selection criteria; regions explain deviations over 10% from the BCFS baseline.

PRIORITIZE

A scour spreadsheet pairs vulnerability (foundation, channel) with criticality (traffic, detour, economic role).

FUND

Statewide mix of fixes from the TAMP model: about 31% replacement, 49% rehabilitation, 20% preventive maintenance.

WORTH NOTING GIS links bridges to USGS stream gauges and precipitation; a network criticality framework is weighing access to emergency and essential services.

CASE EXAMPLE · REGION 3

Minnesota: an index built on probability × consequence

PRIORITIZE

Bridge Planning Index (BPI) = 100 – (probability × consequence), computed in BORIS from condition, fatigue, hazard, importance and cost-effectiveness.

GOVERN

Asset expert groups, a project team and a statewide steering committee coordinate risk; annual risk workshops.

DOCUMENT

Published guidance lists why a high score can be deferred, or a low one advanced, keeping judgment transparent.

WORTH NOTING

Writing down the reasons a project departs from its score keeps both the index and the exceptions credible.

CASE EXAMPLE · REGION 2

North Carolina: balanced weights, division delivery

PRIORITIZE

Statewide weights are set so no single factor, or any one region's dominant hazard, overwhelms the program.

DELIVER

Central Structures Management links statewide goals to division-level delivery through the Highway Maintenance Improvement Program.

MODERNIZE

Legacy PRI retired; new algorithm to use SNBI fields such as richer scour descriptors and evacuation routes.

WORTH NOTING

Post-Helene preparedness: pre-vetted acceleration pathways, vendor capacity checks and pre-ordering long-lead materials.

CASE EXAMPLE · REGION 4

Texas: triage at scale, resilience tied to funding

SCALE

About 35,000 TxDOT bridges across 25 districts; analytics shrink the candidate pool; districts apply local knowledge.

PRIORITIZE

Condition triage flags clear replacements; exposure cues (strikes, scour, debris, detours) elevate fair bridges where closure would have outsized impact.

FUND

The Statewide Transportation Resilience Plan ties hazard assessment to PROTECT and can reduce the state match on formula funds.

WORTH NOTING Using the resilience plan to meet Resilience Improvement Plan requirements turns hazard analysis into a funding advantage.

ACROSS THE CASE EXAMPLES

Four lessons repeat in every state

Scores plus judgment

Every case pairs an index or matrix with structured field or district review.

Preservation is risk mitigation

Steady preventive work keeps fair bridges from becoming poor and avoids closures.

Predictable funding

Consistent annual funding stabilized condition better than one-time increases.

Feedback loops

Integration depends on data moving between central offices, districts and delivery.

THE CENTRAL FINDING

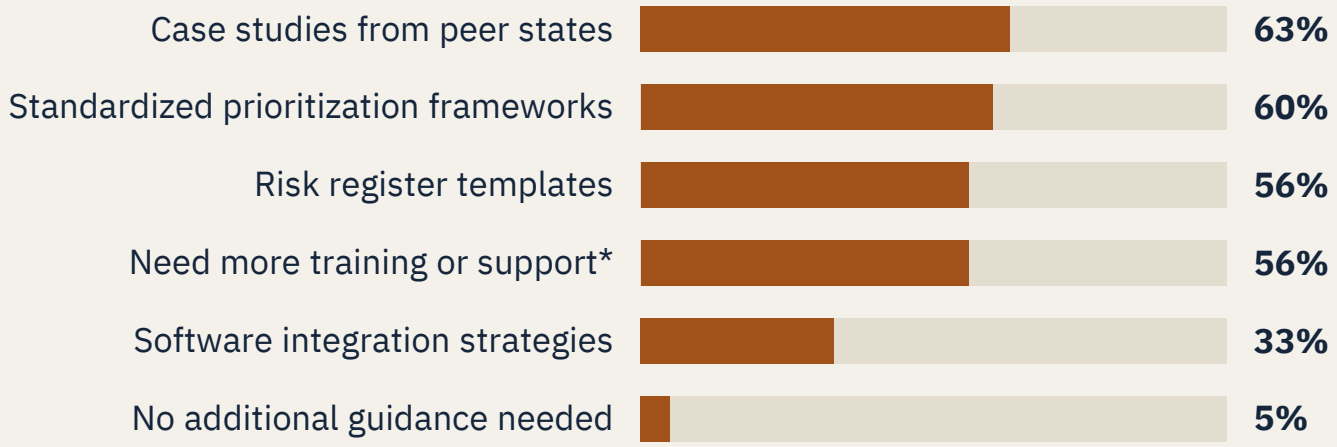
Condition-based needs are well quantified. Risk-based needs are not, yet.

Missing: network-level methods to quantify bridge risk, the cost of mitigation work, and a way to reason across probabilities.

Research needs

WHAT DOTS ASKED FOR

DOTs want peer examples and common frameworks



Base: 43 DOTs; *41 DOTs answered the training question.

RESEARCH NEEDS

The report's research opportunities in four themes

A · Measure and value risk

- Standardized risk metrics and thresholds
- Return on investment for risk and resilience actions
- Outcome metrics for risk programs

B · Build the evidence base

- Multi-jurisdiction incident datasets
- National incident repository and response playbooks
- Strike detection and emergency response

C · Advance hazard and deterioration science

- Compound and cascading risks
- Scenario planning under deep uncertainty
- Future flows in scour and hydraulic assessment
- HYRISK recalibration for SNBI
- Scour prediction and monitoring

D · Integrate decisions and build capacity

- Cross-asset risk framework
- Community criticality in scoring
- BMS calibration and data integration
- Training and capacity building

THEME A · MEASURE AND VALUE RISK

Put risk reduction on the same footing as condition

Standardized metrics and thresholds

A common framework for likelihood and consequence scales and terms, to support benchmarking and peer learning.

60% want standardized frameworks

ROI for risk and resilience

Methods that value avoided closures and emergency costs so resilience work can compete with condition-driven projects.

Named by MN, NC, TX · 5% model risk in LCCA/BCA

Outcome metrics

Measures beyond counts of poor bridges: avoided closures, detour hours, emergency cost per event, time to restore service.

72% don't link risk to performance reporting

THEME B · BUILD THE EVIDENCE BASE

Learn which risks actually drive closures and costs

Multi-jurisdiction incident data

Link observed closures and damage to precipitating factors (strikes, scour, fatigue) to separate consequential risks from merely visible ones.

Named by MD, NC · 16% not confident quantifying risk

Incident repository and playbooks

Structured post-event records of causes, response, timelines, cost and recovery, curated into playbooks for frequent scenarios.

Named by MD, NC, TX · lessons from Helene

Strike prevention and response

Evaluate over-height detection and alert systems and document recovery processes to capture lessons learned.

Named by MI, MN, TX · 68% consider vehicle impact

THEME C · HAZARD AND DETERIORATION SCIENCE

Scour and hydraulics dominate the technical agenda

Future flows

Turn NOAA Atlas 15 rainfall into structure-level flows using non-stationary gage analysis.

Scour considered by 98%

HYRISK for SNBI

Recalibrate to SNBI coding, current scour evaluation practice and hazard profiles.

Aligns with SNBI transition

Scour monitoring

Low-cost, event-triggered monitoring for ungauged basins and migrating channels.

Named by MI, MN, TX

Compound and cascading risk

Scenario models for interacting hazards and network-level impacts.

Storms combine hazards

Deep uncertainty

Scenario planning beyond the 10-year TAMP horizon for extreme-weather variability.

58% acknowledge, don't model

Deterioration models

Add temperature cycles, deicing and loading to fatigue, deck and chloride models.

Named by MN

THEME D · INTEGRATION AND CAPACITY

Compare risk across assets and build the skills to use it

Cross-asset framework

Compatible scales for bridges, culverts, pavements and ancillary assets to allocate funds by system-wide disruption.

Named by MD, MI, MN

Community criticality

Add access to hospitals, schools, emergency services and employers to network-criticality scoring.

Named by MD, MI · 21% use community context

BMS calibration

Test whether exposure variables such as freight, evacuation and closure frequency align optimizers with engineering judgment.

Named by NC, TX · 7% fully integrate risk in BMS

Capacity building

Training curricula, certification modules and case-based learning to sustain implementation.

56% need training or support

WHERE THE CASE DOTS CONVERGE

Six needs were raised independently by three DOTs

Research need	MD	MI	MN	NC	TX
Value resilience / ROI			●	●	●
Outcome metrics beyond % poor	●				
Incident data and risk drivers	●			●	●
Emergency response playbooks	●			●	●
Cross-asset risk comparison	●	●	●		
Network / community criticality	●	●			
Scour and hydraulic monitoring		●	●		●
Over-height impact detection		●	●		●
Prioritization / BMS calibration				●	●

SUGGESTIONS

Three candidate research problem statements

1

Valuing risk reduction in bridge prioritization

BMS-ready methods that convert avoided closures, detour hours and emergency costs into project benefits, with common outcome metrics.

Themes A + D

2

Scour risk for the SNBI era

Recalibrate HYRISK to SNBI and add non-stationary future-flow estimates for structure-level scour and hydraulic risk.

Theme C

3

National bridge incident and outcome database

A shared schema for strikes, scour and flood closures and fatigue events, feeding risk factors and response playbooks.

Theme B

Thank you to everyone who responded to the survey, and to the to the panel for its guidance throughout the project.

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Developing a Framework for Establishing a Risk-Based Geotechnical Asset Management Program in Illinois

Ahmad Alhasan, Ph.D., P.E.
Senior Vice President
Ingios Geotechnics

Illinois Department of Transportation

ILLINOIS CENTER FOR TRANSPORTATION

AASHTO TAM Webinar 83

Wednesday November 18, 2026

ingios GEOTECHNICS

Acknowledgments

- The work summarize in the report was performed by a collaborative team:
- Michael Prohaska (ARA), Jerry DiMaggio (HNTB), Brian Moon (ARA), Zafrul Khan (ARA), Darren Beckstrand (Landslide Technology), Omar Smadi (Iowa State University).
- The input and support from the panel and Illinois DOT personnel was critical, special thanks to:
- Heather Shoup and Laura Heckel.

Illinois GAM Program Objectives

- The long-term objective of developing a GAM program is to establish a consistent process for data-driven decision making for IDOT to:
  - Proactively manage geotechnical assets,
  - Improve the overall network condition, and
  - Minimize the risk of failure and the consequences of these failures, including expensive repairs, injuries, and life safety concerns.









Which Geotechnical Assets

- GAM can include a wide range of assets such as:
- Independent Geotechnical Assets
  - Rock Slopes
  - Soil Slopes
  - Embankments
  - Stabilized Earth Retaining Systems
  - Other Earth Retaining Systems
- Geotechnical Elements
  - Pavements Subgrades
  - Culverts



Illinois GAM Process

Step 1

- **Identify & Locate Assets**
  - Selecting Asset Families
  - Unique Asset Identification Numbers
  - Assets Inventory and Data Management
  - Network Scanning

Step 2

- **Risk-Based Data Collection**
  - Risk Evaluation
  - Data Collection Technologies
  - Data Collection Cycles

Step 3

- **Condition Evaluation**
  - Identify Deterioration and Damage Accumulation Mechanisms
  - Define Distresses
  - Define Condition Indicators

Step 4

- **Performance Modeling and Network Impacts**
  - Define Performance Requirements
  - Relate Asset Performance to Network Performance
  - Performance and Condition Deterioration Modeling

Step 5

- **Investment Strategies and Project Prioritization**
  - Define Potential Maintenance and Rehabilitation Activities
  - Life Cycle Cost Analysis
  - Project Prioritization

Step 6

- **Communication**
  - Data Summaries and Dashboards
  - GAM Program Committee

Step 7

- **Updates and Program Improvements**
  - Gap and Risk Assessment
  - Update Models

Terminology

- Condition
  - A measure of the physical state of the asset in relation to its degradation, as compared to the newly constructed state. Condition can be used as a quantification of asset performance but requires knowledge of asset deterioration and damage.
- Distress
  - A measure of the physical state of the asset or asset component in relation to its degradation, as compared to the newly constructed state. Condition can be used as a quantification of asset performance but requires knowledge of asset deterioration and damage.
- Performance
  - A measurement of the intended purpose of the asset and its functionality. These measurements can include multiple components such as impacts of deformation, closure times, user and agency maintenance costs, detour lengths, service life, and other serviceability measures.

Collection Methods – Survey

- Surveys
  - Desktop
  - In-Field

  Desktop reviews are helpful to identify and prioritize locations with in-field intended for GAM populating.

- Documentation
  - Survey123 Web-Enabled Interface
  - Excel
  - Hardcopies

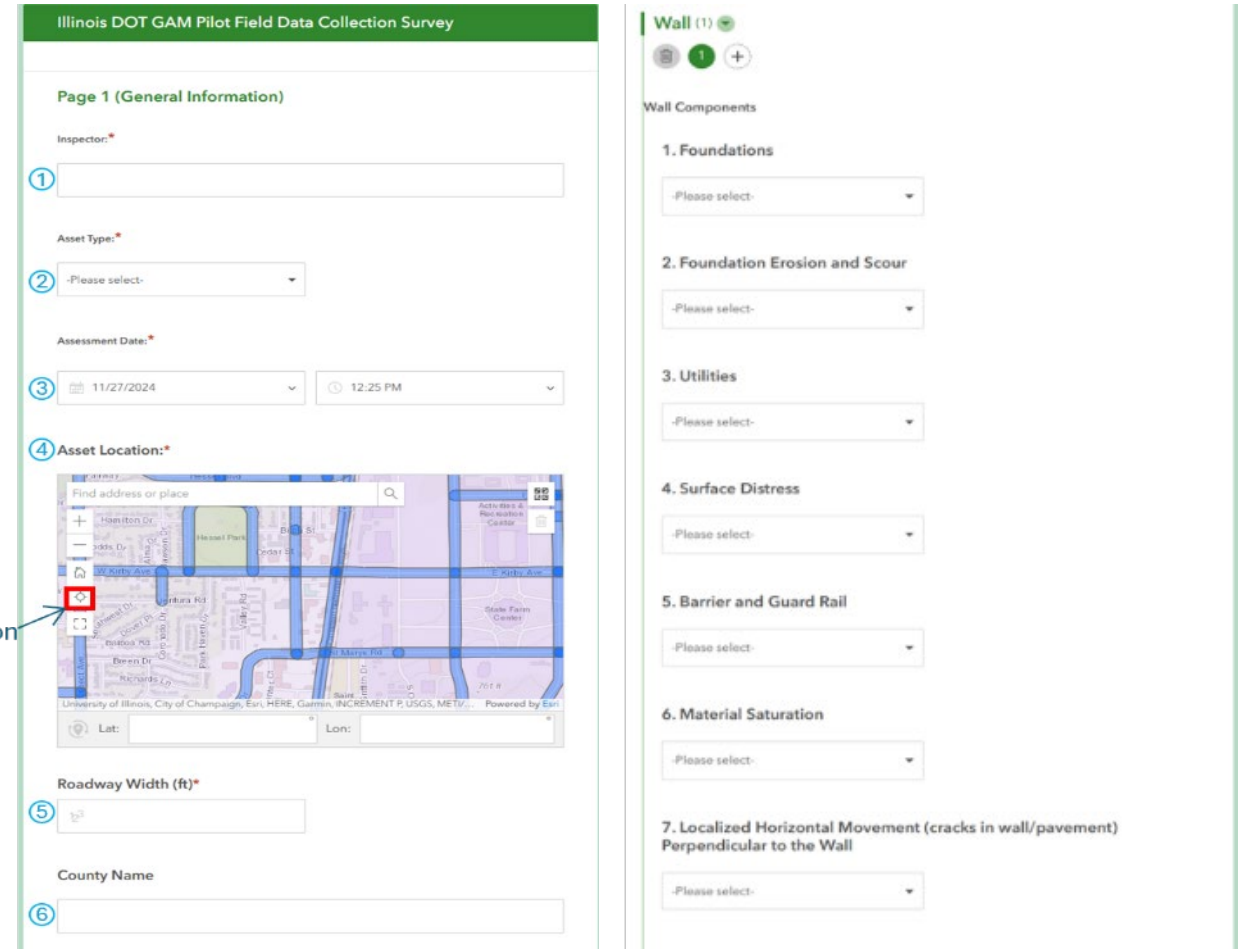
  The same data is used across all forms; the only difference is formatting.





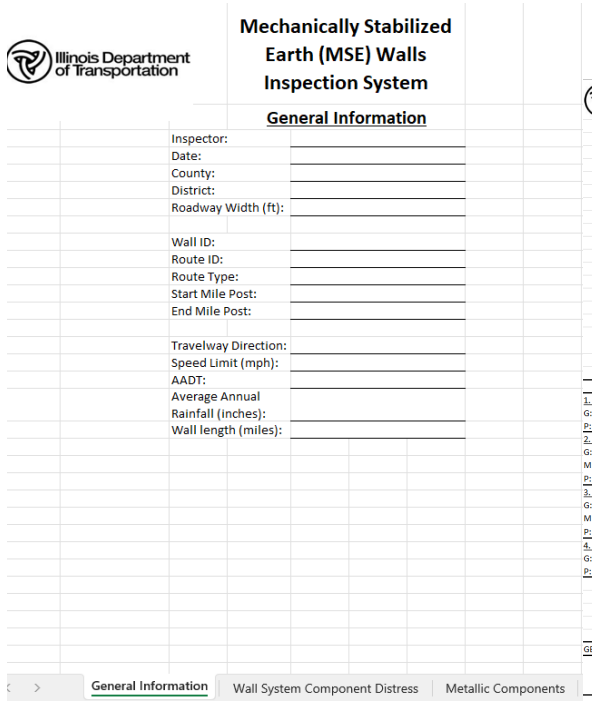
Collection Methods – Survey123

- Web-enabled interface which incorporates national and state data layers to reduce manual pre- and post-inspection data entry.
- Observations and photos are immediately reported.



Collection Methods – Excel/Hardcopy

- Excel forms are readily printed with scoring and guidance explained on individual forms and in the inspection guide.
- Excel forms do not rely on a constant connection and generate on-the-fly scoring enabling on-site determination of secondary inspection needs.



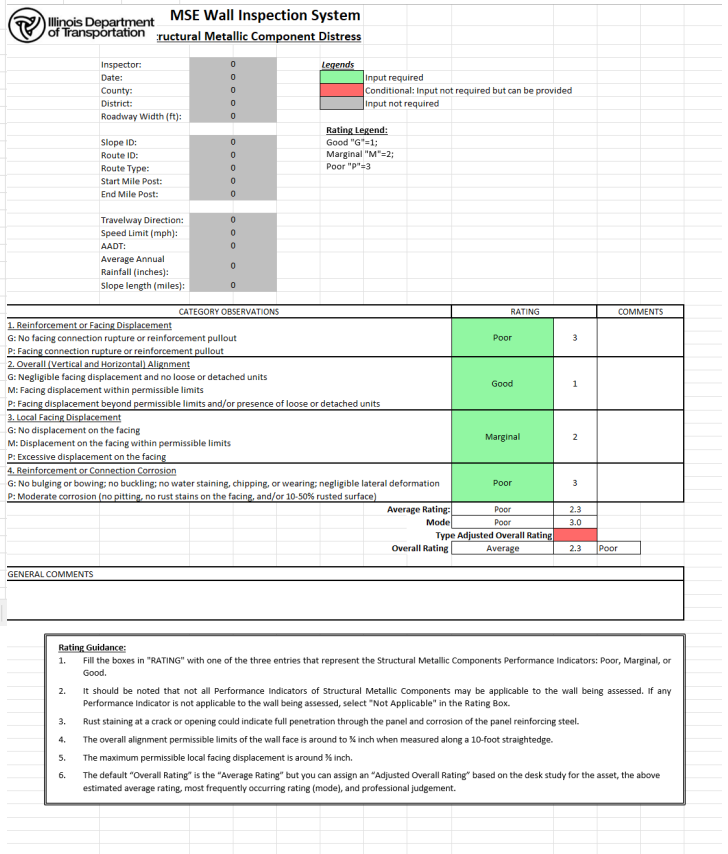
Illinois Department of Transportation

Mechanically Stabilized Earth (MSE) Walls Inspection System

General Information

Inspector:	
Date:	
County:	
District:	
Roadway Width (ft):	
Wall ID:	
Route ID:	
Route Type:	
Start Mile Post:	
End Mile Post:	
Travelway Direction:	
Speed Limit (mph):	
AADT:	
Average Annual Rainfall (inches):	
Wall length (miles):	

General Information | Wall System Component Distress | Metallic Components



Illinois Department of Transportation

MSE Wall Inspection System

ructural Metallic Component Distress

Inspector:	0	
Date:	0	
County:	0	
District:	0	
Roadway Width (ft):	0	
Slope ID:	0	
Route ID:	0	
Route Type:	0	
Start Mile Post:	0	
End Mile Post:	0	
Travelway Direction:	0	
Speed Limit (mph):	0	
AADT:	0	
Average Annual Rainfall (inches):	0	
Slope length (miles):	0	

Legends

- Input required
- Conditional: Input not required but can be provided
- Input not required

Rating Legend:

Good "G"=1;
Marginal "M"=2;
Poor "P"=3

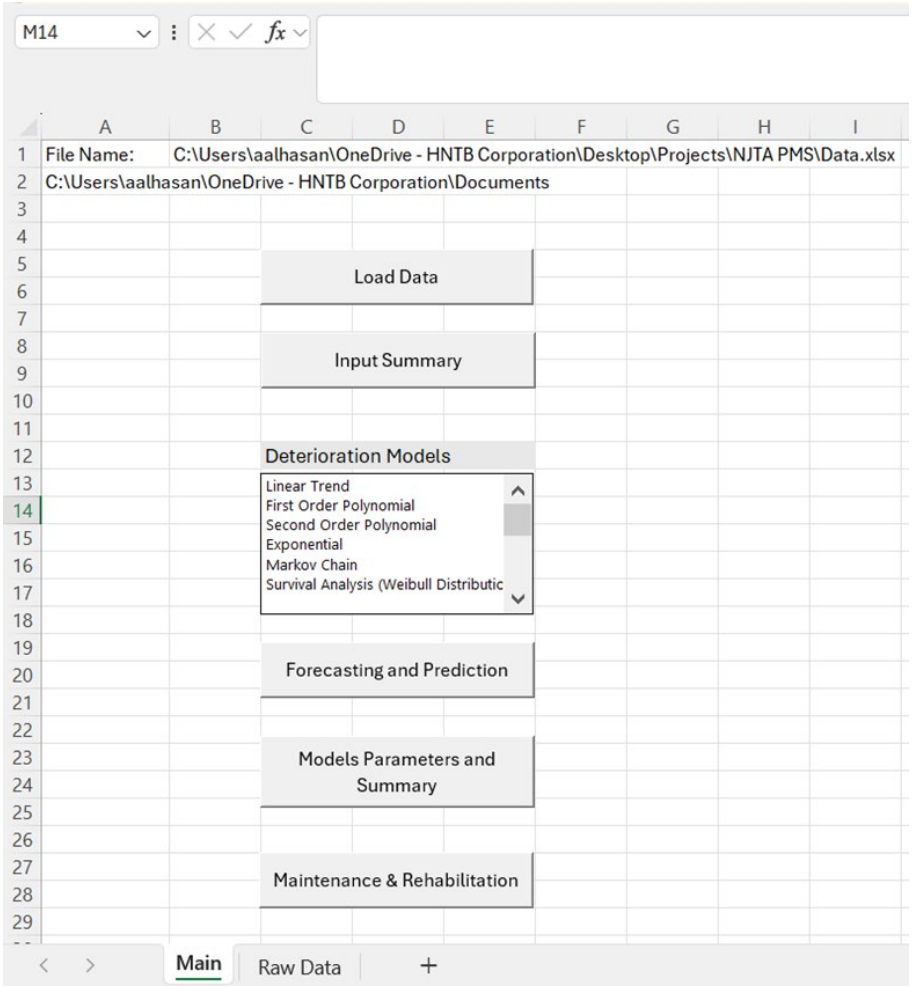
CATEGORY OBSERVATIONS	RATING		COMMENTS
1. Reinforcement or Facing Displacement G: No facing connection rupture or reinforcement pullout P: Facing connection rupture or reinforcement pullout	Poor	3	
2. Overall (Vertical and Horizontal) Alignment G: Negligible facing displacement and no loose or detached units M: Facing displacement within permissible limits P: Facing displacement beyond permissible limits and/or presence of loose or detached units	Good	1	
3. Local Facing Displacement G: No displacement on the facing M: Displacement on the facing within permissible limits P: Excessive displacement on the facing	Marginal	2	
4. Reinforcement or Connection Corrosion G: No bulging or bowing; no buckling; no water staining, chipping, or wearing; negligible lateral deformation P: Moderate corrosion (no pitting, no rust stains on the facing, and/or 10-50% rusted surface)	Poor	3	
Average Rating:	Poor	2.3	
Mode	Poor	3.0	
Type Adjusted Overall Rating			
Overall Rating	Average	2.3	Poor

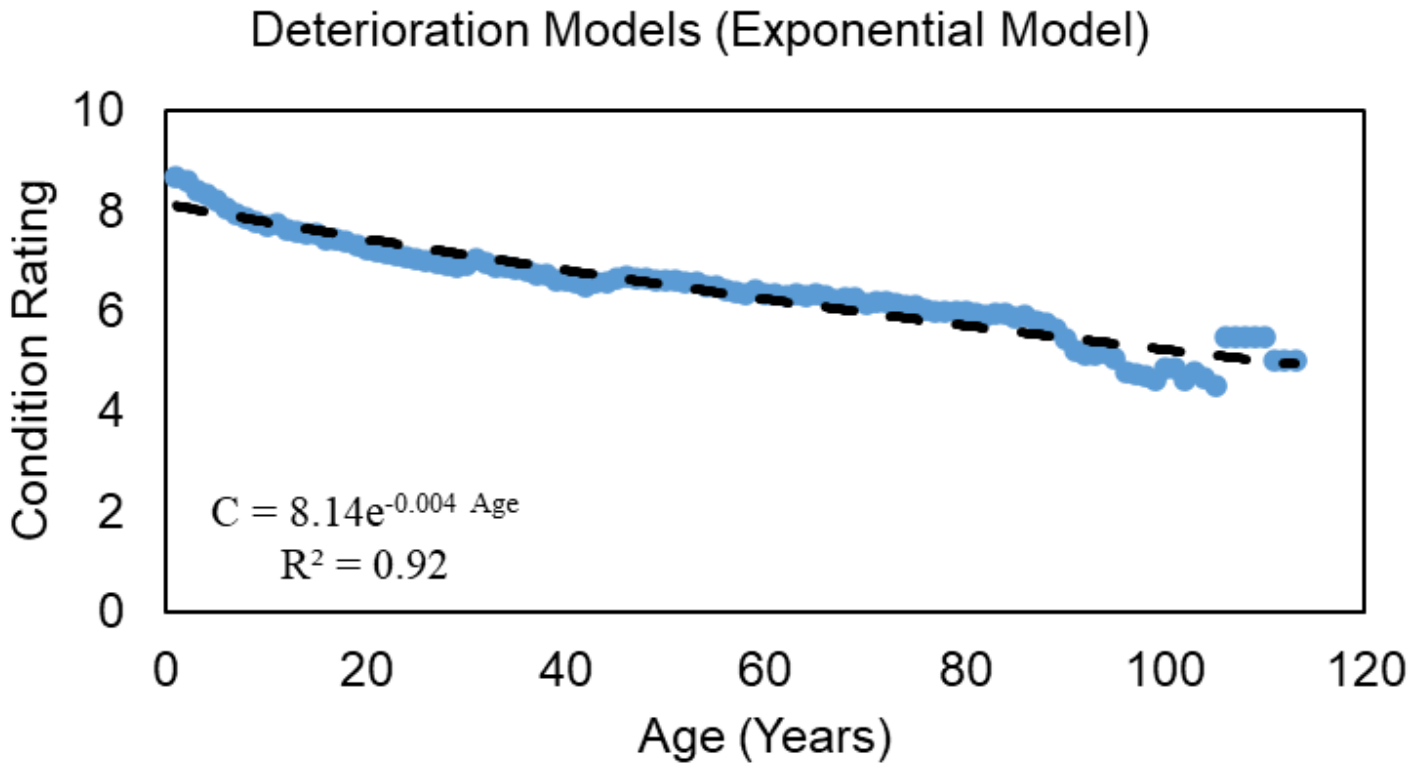
GENERAL COMMENTS

Rating Guidance:

1. Fill the boxes in "RATING" with one of the three entries that represent the Structural Metallic Components Performance Indicators: Poor, Marginal, or Good.
2. It should be noted that not all Performance Indicators of Structural Metallic Components may be applicable to the wall being assessed. If any Performance Indicator is not applicable to the wall being assessed, select "Not Applicable" in the Rating Box.
3. Rust staining at a crack or opening could indicate full penetration through the panel and corrosion of the panel reinforcing steel.
4. The overall alignment permissible limits of the wall face is around to ¾ inch when measured along a 10-foot straightedge.
5. The maximum permissible local facing displacement is around ⅜ inch.
6. The default "Overall Rating" is the "Average Rating" but you can assign an "Adjusted Overall Rating" based on the desk study for the asset, the above estimated average rating, most frequently occurring rating (mode), and professional judgement.

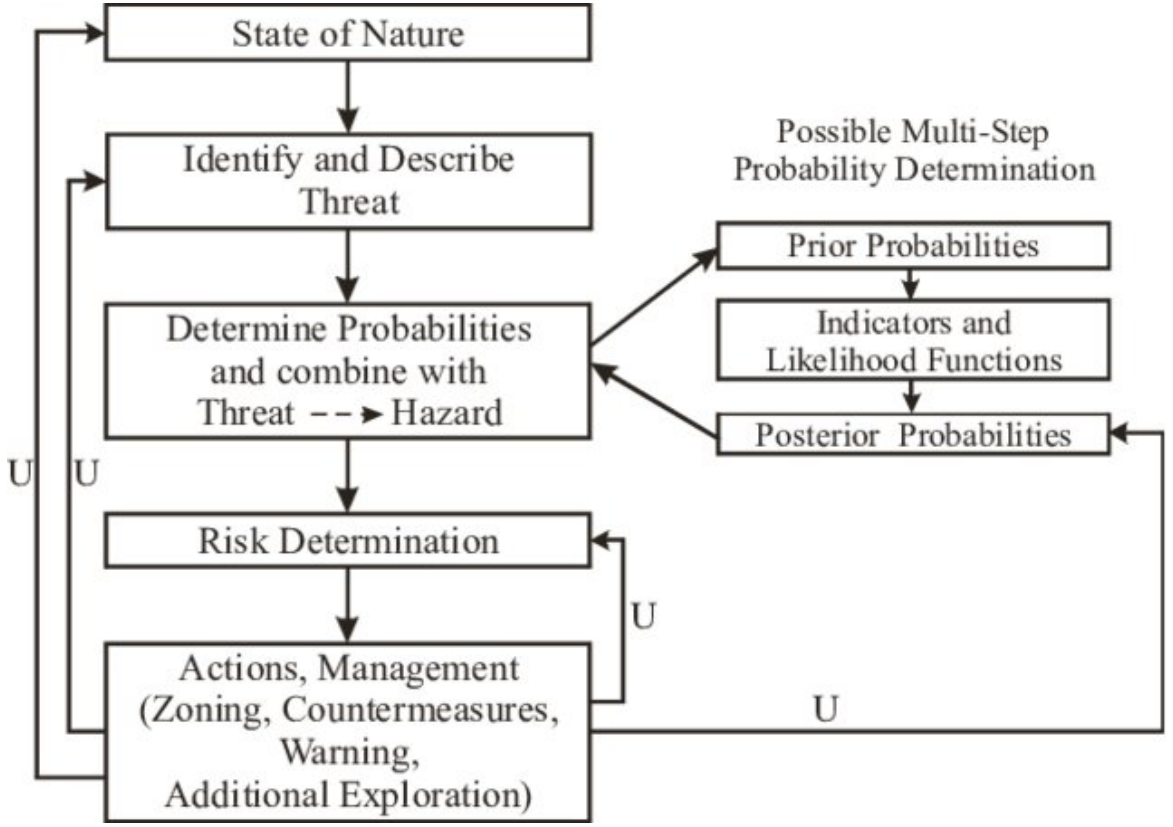
Different Possibilities for Deterioration Models





Decision Making Under Uncertainty

- In GAM you are making a lot of decisions under uncertainties.
- Some of these uncertainties are due to the lack of data.
- Others are due to the lack of experience, while some are due to the lack of predictability.
- Regardless of the case you will always need to follow an iterative process and make sure you accumulate knowledge.



Based on Pratt et al. (1965) and Expanded by Einstein and Karam (2001)

What is Risk?

The effect of uncertainty on objectives

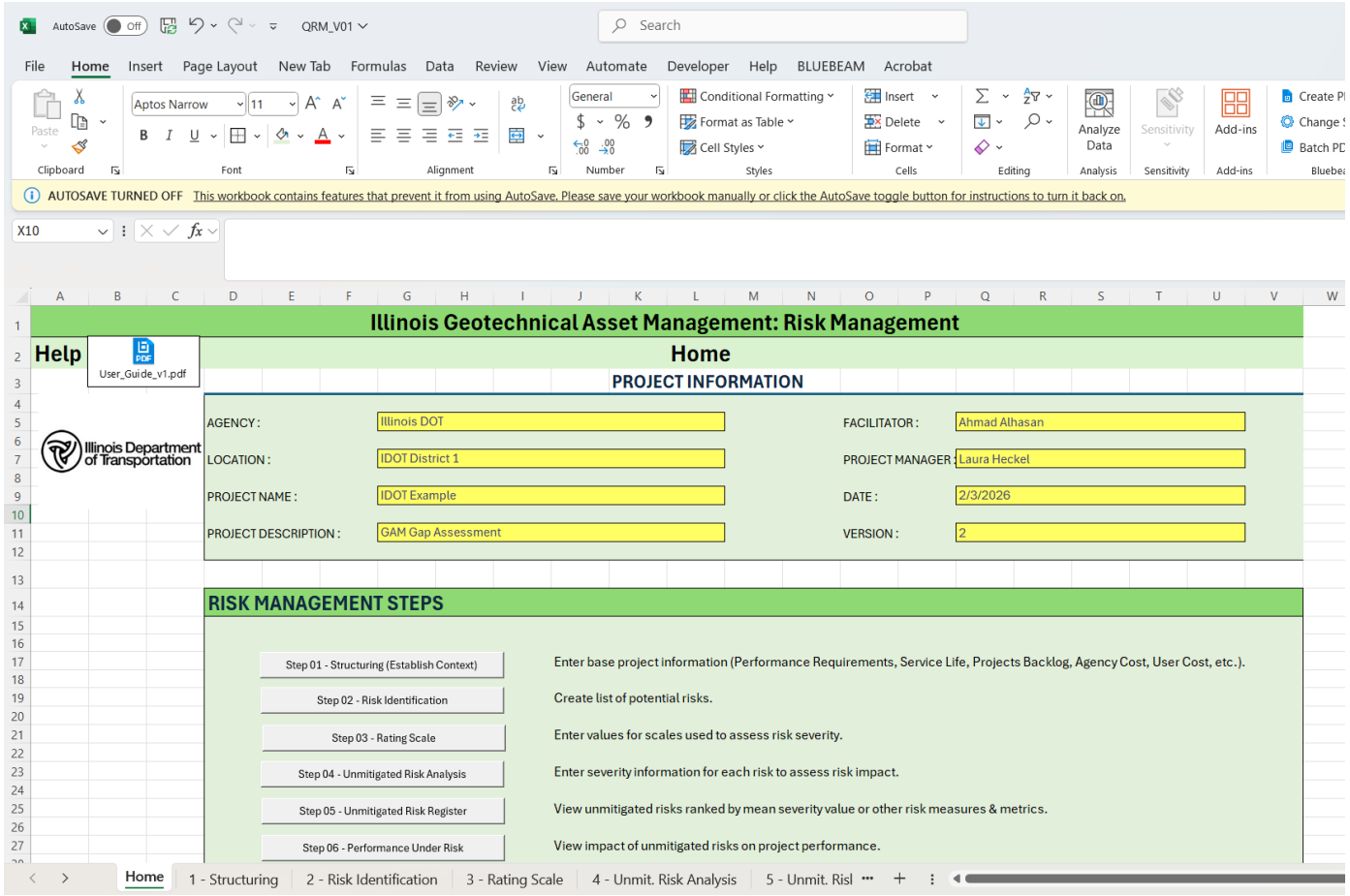
Effect	Uncertainty	Objectives
Positive *or* **Negative**	**Always** in the future May or may *not* happen	**Know** what you are trying to achieve **Apply** to organization, program, or project

Risk and Uncertainty

- Think of events or uncertain process that can affect the change the condition and performance of an asset.
- Uncertainties can be due to:
  - Inability to describe or quantify events (complexity leading to chaotic behavior).
  - Known list of events with unknown occurrence time and severity.
  - Unexpected and unplanned events.
  - Known but overlooked!
- Risk can result from the changes in objectives and needs to extend the

Risk Management Steps

1. Structuring (Establish Context)
2. Risk Identification
3. Rating Scale
4. Unmitigated Risk Analysis
5. Unmitigated Risk Register
6. Performance Under Risk
7. Mitigation Strategies
8. Mitigation Strategies Register
9. Mitigated Risk Register
10. Mitigated Performance
11. Mitigated Risk Ranking
12. Summary and Communication



GAM Implementation Success

- Successful GAM Implementation requires:
  - strong and effective communication across the agency;
  - commitment from the different offices, staff, and management;
  - strong and adaptive stewardship;
  - and a flexible implementation plan.

GAM Implementation Activities

- Develop an Implementation Plan
  - Address Challenges to Implementation!
  - Develop a GAM Policy
  - Build a Geotechnical Asset Inventory (Know your assets)
  - Survey and Assess (Rate) Condition of the Assets
  - Perform Risk Assessment of Assets (Understand the program risks and major assets risk)
  - Program Improvements Strategies

GAM Implementation Activities

- Asset Management System
  - Input the inventory and current conditions
  - Deterioration models
  - Treatments, triggers, and unit costs
  - Budget scenarios
  - Prioritization criteria

GAM Implementation Challenges

- Challenges

1. Incorporating a new process into IDOT.
2. Getting staff to follow the new process.
3. Having sufficient staff to implement the program.

- Solutions

1. Add GAM to an existing Department Policy or create a new Department policy for it.
2. Identify who will be performing the work for the new process and provide training to them.
3. Identify district staff already involved in the functions; supplement existing central office asset management staff

Questions and Discussion

Save the Date!

- To learn more about the Subcommittee on Asset Management, access the series archive, and explore asset management resources, visit the TAM Portal: https://www.tam-portal.com/
- Join us for an upcoming webinar and subcommittee meeting!
  - **Q4 CPBM/TPM TSP Joint Meeting**
    - Thursday December 3rd, 2026 from 2:00 – 4:00 PM EST
  - **TPM Webinar 34**
    - December 18th, 2026 from 2:00 – 3:30 PM EST: Organizational Health and Performance
- **Thank you!!**

