

Executive Summary

Bridge management is about the selection and evaluation of cost-effective programmatic optimal strategies for comprehensive management of bridges and structures. It is concerned with identifying and communicating critical data needs and vulnerability assessments for effective life-cycle cost analysis and management of structures. From a state Department of Transportation asset management perspective, bridges are the next critical asset category after pavements in terms of expenditures. However, bridges represent a significantly greater risk profile than pavements, as road users cannot drive on failed bridges and bridge failures can be catastrophic.

A review of the 2019 Transportation Asset Management Plans (TAMPs) indicated very little documentation on the inclusion of a bridge management system's (BMS) analytic components within the TAMP processes. TAMP processes with analytic components are performance gap identification, life-cycle cost and risk management analysis, and analysis of investment strategies. This disconnect was discussed within the asset management community and within the Federal Highway Administration's Asset Management Expert Task Group. This national scan was an outcome of these discussions and aims to help identify common features and approaches agencies are using to successfully use BMSs within the overall transportation asset management context.

Following the organizational meeting in September 2020, the scan team prepared 82 amplifying questions that focused on understanding the bridge inventory, organizational, and funding structure of the state DOT, identifying the decision support tools, data, performance measures and models used for bridge management; integration of BMS outputs into overall transportation asset management and TAMP; and the sustainability of BMS use and bridge management efforts. A desk scan, including a brief review of the most relevant reports, papers, web resources, the TAMPs submitted by state DOTs prior to June 30, 2019, and a survey of eight state DOTs (Iowa, Louisiana, Michigan, Minnesota, New Mexico, Pennsylvania, Utah, and Virginia) using the amplifying questions was conducted.

Based on the agency interviews and information from TAMPs, most state DOTs were found to be at basic BMS implementation level, based on the BMSWG maturity levels ¹ developed by the AASHTO TSP2 Bridge Preservation BMS National Working Group. There were, however, agencies that are at an intermediate level or agencies that have components of their BMS implementation that can be regarded as intermediate. Based on the desk scan findings, the scan team invited nine state DOTs to the virtual workshop conducted during March 4-10, 2021. The invited agencies from the following state DOTs: Connecticut, Florida, Iowa, Michigan, Minnesota, New Mexico, Pennsylvania, Utah, and Virginia.

1 BMSWG Maturity Levels, Detailed Work Scope by Bridge Management System (BMS) Advancement Tier, AASHTO TSP-2, Bridge Preservation BMS National Working Group:
<https://tsp2bridge.pavementpreservation.org/files/2018/10/BMS-Working-Group-Attachment-A-Final.pdf>

A revised set of amplifying questions was sent to the invited agencies and formed the basis of the agencies' virtual workshop presentations and the roundtable discussions. This report summarizes scan findings on data collection and management, performance measures, BMS models, use of BMS for communication, knowledge transfer strategies, and insights from asset management practitioners, as well as key scan findings and recommendations.

The agency presentations show that there is no one-size-fits-all solution or approach in using BMS to support transportation asset management due to the variability in agencies' organizational structures, funding structures, and bridge networks. While some agencies use consumer off-the-shelf technology software systems, others use in-house developed software or spreadsheets, or procedures followed by staff to perform analysis and make decisions. For some agencies, overall bridge management decision making is driven by BMS; for others, BMS partially supports the decision-making framework or TAMP analysis. All scan agencies were strong in inspection data collection and management. Using information based on element condition data in asset management decision making is limited to date; however, some agencies have made progress in this area, including developing agency custom performance measures; establishing agency-defined elements to produce more accurate work recommendations; and recording environments that, in combination with agency-defined elements, should improve deterioration model accuracy in the future. Scan agencies collectively reported challenges in hiring and sustaining qualified staff and noted that they feel understaffed to keep up with increasing needs. Agencies are finding innovative ways to report and track performance and have made significant progress with the TAMP development in their use and implementation of BMS. However, agencies have challenges and needs: improved models (deterioration, costs, and risks), qualified and increased staffing and retention, improved measures/metrics to define bridge performance, placing less emphasis on worst-first programming, and contrasting bridge performance with other assets, to name a few.

The recommendations to better guide and improve the use of BMSs for asset management and TAMP development presented in this report are based on the key scan findings. The scan team compiled a comprehensive list of recommendations to improve the use of BMSs for asset management and TAMP development, that among others, includes the following:

- Task forces with shared membership from state and national bridge, pavement, and asset management groups that meet regularly to come up with a roadmap to improve the use of BMS in asset management decision making
- The necessity of a strategic vision and process to guide BMS implementation and incorporation of BMS information into overall asset management
- The use of additional measures other than condition for analysis and reporting in order to tell a complete story and give more value to least life-cycle cost strategies
- Executive support for hiring qualified staff
- Strategies to maintain agency knowledge
- Research to support BMS implementation